TN
1
A58
Vol. 16
n/c

REVIEW OF METAL LITERATURE

An Annotated Survey of Articles, Technical Papers and Reports Appearing in Engineering, Scientific and Industrial Journals and Books, Here and Abroad, Prepared at the Center for Documentation and Communication Research, Western Reserve University, Cleveland, Ohio.

Volume 16
1959

MARJORIE R. HYSLOP
Editor

BETTY A. BRYAN
Managing Editor

ALAN M. REES
Manager, Acquisitions and Analysis Department
Center for Documentation and Communication Research
Western Reserve University

Published by
AMERICAN SOCIETY FOR METALS
NOVELTY, OHIO

Copyright, 1960

AMERICAN SOCIETY FOR METALS

LITHOPRINTED IN THE UNITED STATES OF AMERICA BY
CUSHING - MALLOY, INC., ANN ARBOR, MICHIGAN, 1960

PREFACE

The A.S.M. Review of Metal Literature is published monthly by the American Society for Metals and distributed to its members. The present volume is a collation of the issues from January through December 1959. It is the sixteenth volume in a series that began in 1944.

In most instances, the annotations are not intended to serve as a substitute for a reading of the articles listed. They are brief abstracts designed to indicate the scope and content of the article so that the reader may determine whether it is something he wants to read in its entirety. In other words, they are indicative rather than informative abstracts.

The table of contents lists the main headings into which the A.S.M. Review of Metal Literature is subdivided, together with secondary subdivisions indicating the scope of the main heading. The main sections are designated by capital letters, and individual annotations are identified by the appropriate capital letter preceded by a serial number.

The method of classifying the annotations into subject subdivisions is based upon the "ASM-SLA Metallurgical Literature Classification, International (Second) Edition," published by the American Society for Metals in 1958. Each annotation is likewise followed by code symbols which refer to the subdivisions and schedules of the ASM-SLA Classification.

An understanding of this coding system, however, is not essential to the use of this volume of the Review of Metal Literature, which is accompanied by a complete subject index starting on page 1107. Since the annotations are classified primarily by processes and properties, the subject index has been prepared with the emphasis primarily on materials. Subheads are included in sufficient detail to permit the location of articles on any specific subject related to the metal industry. Indexing is based on the content of the article and not merely on the title.

In using the book, if the primary interest is in the broad field of corrosion, or foundry practice, or heat treatment, turn immediately to the respective section as given in the table of contents. If the main interest is in aluminum alloys, or copper, or cast iron, turn to the corresponding heading in the subject index. If interest lies in specific aspects of foundry practices, or a particular type of heat treatment, these broad processes will be found indexed and subdivided in the subject index. An author index is also provided and a list of addresses of the journals and periodicals from which the literature references are taken.

PREFACE

The annotations have been prepared by technical abstractors and translators under the direction of Alan M. Rees, Manager, Acquisitions and Analysis Department, Center for Documentation and Communication Research of Western Research University.

Marjorie R. Hyslop
Editor

May 27, 1960

TABLE OF CONTENTS

Section A. GENERAL METALLURGY 1

History; education; statistics and economics; plant management; industrial relations; health and safety; industrial pollution and waste disposal; research and development; conservation of resources; professional activities; laws and legal actions; literature techniques; audio-visual techniques

Section B. ORE AND RAW MATERIAL PREPARATION 46

Sampling; mining methods; crushing, grinding and sizing; concentration (beneficiation); roasting and calcining; sintering processes; fuel distillation and gasification; processing of fuels; processing of refractories; processing of scrap; water treatment; production of industrial gases

Section C. EXTRACTION AND REFINING 59

Chemical extraction; smelting (except iron and steel); distillation; electrolytic processes; nonferrous vacuum reduction and refining; reduction by metals and gases; precipitation; separation of metals; amalgamation; decomposition; nonferrous melting and casting; isotope separation

Section D. IRON AND STEELMAKING 101

Blast furnace practice; openhearth practice; converter processes; electric arc processes; multistage processes; special processes; ingot casting; oxygen furnace processes

Section E. FOUNDRY 160

Melting techniques; sand casting; permanent mold casting; die casting; centrifugal casting; precision investment casting; other methods; pattern making; sand technology; molding; coremaking; rigging; pouring; casting cleaning; metallurgical control; casting reclamation

Section F. PRIMARY MECHANICAL WORKING 206

Preparation for working; forging (hammer and press); rolling; extrusion of rod, shapes and tube; swaging; tubemaking (except extrusion); drawing of rod and shapes; wire drawing; finishing operations; applied mechanics of primary metalworking (stress analysis)

Section G. SECONDARY MECHANICAL WORKING—FORMING AND MACHINING 230

Presswork in general; shearing; stamping; drawing; impact and cold extrusion; bending; stretch forming; heading; roll forming; thread rolling; spinning; bulging; die sinking; machining (mechanical); grinding; finish machining; flame and arc cutting; finish forming; special machining methods; applied mechanics of forming and machining (stress analysis)

Section H. POWDER METALLURGY 267

Powder production; powder properties; mixing and blending; molding or compacting; sintering; post-sintering operations; fiber metallurgy

Section J. HEAT TREATMENT 285

Homogenization; austenitizing; annealing; normalizing; patenting; quenching; precipitation hardening; case hardening; tempering; residual stress control; heating and cooling methods; other carbon diffusion processes; surface alterations; hardenability

Section K. ASSEMBLING AND JOINING 313

Arc welding; gas welding; resistance welding; thermit welding; forge welding; other welding processes; soldering; brazing; process control; bonding metals to nonmetals; adhesive joining; mechanical assembling

Section L. CLEANING, COATING AND FINISHING 370

Mechanical cleaning and polishing; chemical cleaning and polishing; electrochemical cleaning and polishing; chemical conversion coating; diffusion coating; dip coating; electroplating; electroforming; anodic coating; cathodic oxide coating; cladding or bonding; metal spraying; coating by weld deposition; coating by vapor deposition; painting and organic coating; ceramic coating (vitreous enameling); coating by chemical reduction; other methods

Section M. METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURE 437

Specimen preparation; microscopy; diffraction methods; other techniques; phase diagrams; atomic and molecular structures; crystal structures; primary microstructures; macrostructure

Section N. TRANSFORMATIONS AND RESULTING STRUCTURES . . . 506

Diffusion; nucleation; grain growth; recovery; recrystallization; diffusionless transformations; precipitation; austenite formation and decomposition (Fe-C system); other eutectoid reactions; superlatice formation (order-disorder); other solid-state reactions; liquid-solid reactions; liquid-liquid reactions; gas-solid reactions; gas-liquid reactions

Section P. PHYSICAL PROPERTIES AND THEIR MEASUREMENT . . . 578

Mass and volume; thermal; thermodynamics and kinetics; chemical kinetics; electrical and electrochemical; magnetic; radiation properties (electromagnetic); nuclear

Section Q. MECHANICAL PROPERTIES AND TESTS 646

Elastic properties; anelastic properties; miscellaneous plastic properties; plastic deformation mechanism; stresses; fracture mechanism; tensile properties and tests; compression properties and tests; hardness and hardness tests; torsion properties and tests; shear properties and tests; creep properties and tests; bend properties and tests; impact properties and tests; fatigue properties and tests; damping properties and tests; wear properties and tests; other properties and tests

Section R. CORROSION 801

Mechanism of corrosion; corrosive effects; atmospheric corrosion; by waters; by chemicals, inorganic; by chemicals, organic; by soils; preventive measures; tests

Section S. INSPECTION AND CONTROL 879

Sorting and identification; composition analysis; statistical analysis and control; flaw detection; size, thickness and mass measurement; surface roughness; temperature measurement and control; process control and measurement; radiation detection and measurement; miscellaneous service testing (life testing); standard practice and specifications; calibration

Section T. METAL PRODUCTS AND PARTS 915

Automotive; marine; railroad; aircraft; structures; mining and oil field equipment; chemical processing equipment; electrical and electronic components; ordnance material (excluding explosives); agricultural equipment; civil engineering equipment; tools and hardware; machine parts; arts and crafts; consumer goods; nuclear reactor components

Section W. PLANT EQUIPMENT 942

Plant installations; power generation and distribution; materials handling; general service equipment; ore and raw material preparation; fuel distillation and gasification; furnaces and equipment for primary metallurgy; melting and refining furnaces and equipment; casting; ingot and slab preparation; forging; rolling; forming and shaping; machine tools; powder metal processing; heat treating furnaces; other heat treating equipment; welding, brazing and soldering; mechanical assembling; mechanical cleaning and finishing; chemical and electrochemical cleaning and finishing; other cleaning and finishing

Section X. INSTRUMENTATION—LABORATORY AND CONTROL EQUIPMENT 974

Size, thickness and mass; chemical laboratory; surface properties; thermal properties; electrical properties; nuclear properties; elastic and anelastic properties; mechanical properties; corrosion; radiation detection; optics and microscopy; metallography; photography and other visual aids; sorting and identification; atmosphere and humidity; flaw detection; temperature measurement; electricity; magnetism; pressure; rate, time and flow; computers and business machines; communication

ADDRESSES OF PUBLICATIONS 983

AUTHOR INDEX 999

SUBJECT INDEX 1107

SECTION A

GENERAL METALLURGICAL

1-A.* Vinyl-Metal Laminates. R. P. Hooker. *Machinery (London)*, v. 93, Sept. 17, 1958, p. 649-653.

Vinyl-metal laminated sheets are strong, decorative and easy to fabricate. The laminates can be deep-drawn, sheared, crimped, bent, punched and drilled without injury to the bond or the vinyl and show high resistance to abrasion, rust, chemicals and heat (up to 275° F.). Used commercially in automobiles, furniture tops, shelving and camera cases. (A-general; 7-59)

2-A.* Magnesium. C. E. Nelson. *Metal Progress*, v. 74, Oct. 1958, p. 125-127.

Greatly increased use of Mg is seen in die castings and extrusions. Missile applications also account for larger production. An electroless Ni plating process is now available for Mg whereby parts are immersed in a special Ni solution and plated without the use of electric current. (A-general; 5-61, 4-58, 17-57, Mg)

3-A.* Cast High Alloys. E. A. Schoeffer. *Metal Progress*, v. 74, Oct. 1958, p. 129.

High-strength corrosion resistant CD-4MCu alloy is finding many applications as a replacement for "comparable" 18-8 stainless alloys and contains 25 to 27% Cr, 4.75-6.00% Ni, 0.040% max. C, 1.75 to 2.25% Mo, 2.75 to 3.25% Cu, 1.00% max. Mn, 1.00% max. Si, 0.04% max. P, 0.04% max. S. (A-general; SGA-h, Cr, Ni, Mo, Cu, 17-57, 5-60)

4-A.* Dust Piping Modifications to Prevent Material Buildup and Wear. R. C. Ortgies. *Modern Castings*, v. 34, Aug. 1958, p. 80-82.

Slots and vents introducing dry or room air prevents excessive plugging and abrasion of elbows, pipes and ducts. Illustrates proper venting of sand mixers, aerators, elevators, rotary screens and sand bins. (A8a, E-general)

5-A.* Aluminum . . . Wrought Alloys. J. A. Nock, Jr., and F. Keller. *Metal Progress*, v. 74, Oct. 1958, p. 114-116.

New materials developed include a unique high-strength alloy for aircraft and other structures; a group of intermediate-strength alloys for welded tanks and fabricated structures; several alloys for architectural uses; a new sheet and an extrusion alloy adapted to bright finishing for automotive and appliance trim; a non-staining alloy for cooking utensils; two alloys for Al bus conductors; two alloys for use with porcelain enamel finishes. (A-general; 17-57, Al-b)

6-A.* Stainless Steels. Richard E. Paret. *Metal Progress*, v. 74, Oct. 1958, p. 116-117.

Recent additions to AISI stainless steel grades are Types 201 and 202. Type 202 has slightly greater hardness, tensile strength and ductility than 302 in the annealed condition. Its impact strength is lower than 302 and it provides slightly less resistance to corrosion. New pouring technique, known as "slag washing," produces steel free from harmful stringer-type inclusions or banding. (A-general, Q-general; SS)

7-A.* Ferrous Castings. Thomas E. Eagan. *Metal Progress*, v. 74, Oct. 1958, p. 118-119.

Recent developments in gray, nodular and malleable irons. Unique properties

of nodular iron, such as excellent machinability, good castability, a favorable range of mechanical properties, make it very popular in many applications. Advances in malleable iron have been in improved melting and molding practices. Melting practice has been improved by the use of cupola-air furnace duplexing. Annealing practices have been revised to give shorter cycles. (A-general, E-general; CI, 5-60, 17-57)

8-A.* Steels . . . Alloy and Carbon. E. W. Husemann. *Metal Progress*, v. 74, Oct. 1958, p. 120-123.

Applications of triple-alloy grades (Ni-Cr-Mo steels); boron grades; carburizing grades. Combination of Ni, Cr and Mo is good since the elements complement each other to give toughness and ductility, hardness and depth of hardenability to the heat treated part. (A-general; CN, AY, *Ni, Cr, Mo)*

9-A.* Copper . . . Wrought Alloys. Arthur I. Heim. *Metal Progress*, v. 74, Oct. 1958, p. 123-125.

An entirely new concept in a phosphor bronze strip product has emerged—a spring temper, phosphor-bronze with increased ductility of 200% or more which promises better formability, greater part uniformity and less wear, yet retains all the strength and hardness of regular spring temper bronze. Ni-Si bronze and new Al-bronze alloys discussed. (A-general; Cu-s, 4-53, *Ni, Si, Al*)

10-A.* Nonferrous Castings. D. L. Colwell. *Metal Progress*, v. 74, Oct. 1958, p. 127-128.

Interest in new Mg-base alloys with higher mechanical properties is increasing. The EK series, with additions of rare earths and Zr, the HK alloys containing Th and Zr, and the ZH and ZK alloys containing Zn with rare earths, respectively, give excellent mechanical properties. In both sand and permanent mold castings, these new Mg alloys have better properties at high temperatures than the usual Mg-Al-Zn alloys. (A-general, Q-general; 5-60, 5-63, Mg-b, *Zr, EG-g*)

11-A. Advances in the Application of Radioisotopes and Nuclear Irradiation in Metallurgical Research. M. T. Simnad. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/803, 1958, 21 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $.50.

Application of radioisotopes to the study of segregation, friction, vapor pressure, slag-metal reactions, electrolytic action and corrosion on metal surfaces, diffusion and oxidation. 89 ref. (A-general, 1-59)

12-A. Clean Air and the Foundry Industry. H. T. Angus. *British Cast Iron Research Association, Journal*, v. 7, Oct. 1958, p. 325-329.

The various classes of emissions and effluents discharged by foundry melting furnaces in relation to the particular type of furnace concerned. Methods available for dealing with these emissions. (A8a, E-general)

13-A. Operation of the Cupola to Minimize Emissions. F. M. Shaw. *British Cast Iron Research Association, Journal*, v. 7, Oct. 1958, p. 330-334.

(A8a, E10a)

14-A. The Hot Blast Cupola: Fume Problems. T. R. Eaves. *British Cast Iron Research Association, Journal*, v. 7, Oct. 1958, p. 335-337.

(A8a, E10a)

15-A. Furnaces Used in the Malleable Cast Iron Industry and the Clean Air Act. H. G. Hall. *British Cast Iron Research Association, Journal*, v. 7, Oct. 1958, p. 343-354.

Design and operation of rotary furnaces used in the malleable iron foundry fired by pulverized fuel or oil, with special reference to the Sesci furnace. The malleable annealing furnace fired by solid or pulverized fuel. The emission of grit and fumes does not constitute a problem for such furnaces, since the recuperator acts as a dust catcher. (A8a, E-general, W18b, W27)

16-A. Fire Hazards and Their Avoidance in Organic Finishing. L. A. Smith. *Institute of Metal Finishing Bulletin*, v. 8, Summer 1958, p. 115-128.

Numerous common sources of ignition include open flames, hot surfaces and sparks and the less obvious lower-temperature surfaces and static electricity. 10 ref. (A7p, L26)

17-A. (Rumanian.) Sulphur Dioxide From Dilute Gases in Nonferrous Metallurgy. L. Grigoriu and I. Sebastian. *Studii si Cercetari de Metallurgie*, v. 1, July-Dec. 1956, p. 305-324.

(Allc; BG-a38)

18-A.* The Production of Copper. *Copper Development Association, Technical Survey*, no. 12, July 1958, 43 p.

Production, foundry practice, fabrication, plating, properties, corrosion, joining, powder metallurgy, testing and analysis, applications. 280 ref. (A-general; Cu, 10-54)

19-A.* High Speed Steel—Development of a New Type With 5% W and 5% V. Paul Kovesi. *Iron and Steel*, v. 31, Nov. 1958, p. 529-533.

Toolsteel, containing 1.25 to 1.40% C, 5% W, 5% V, shown to be an economical substitute for usual 12-18% W high-speed steels. 4 ref. (A-general, TS-m)

20-A.* Cobalt. L. Sanderson. *Canadian Mining Journal*, v. 79, Oct. 1958, p. 113-114.

Qualities, properties, uses for Co and its alloys. (A-general; Co)

21-A.* Ford's New High Strength Steels. *Tooling and Gaging*, v. 13, Nov. 1958, p. 7.

Process consists of plastically deforming metastable austenitic steels above the martensite temperature and then transforming them to martensite. High ductility possessed by the as-quenched martensite; toughness and fatigue. (A-general, J26; ST, SGB-a)

22-A.* (German.) Metallurgy of Fissionable Elements. A. Steinegger. *Chimia*, v. 12, Sept. 1958, p. 266-270.

Characteristic properties of uranium; corrosion. Coating materials for reactor bars and their neutron insulating properties. Thermal behavior of U and behavior under radiation. "Dispersion-type" uranium oxide and metallic U-type reactor bars. (A-general, T11, 17-57; U)

23-A.* (German) Electrolytic Regeneration of Used Pickling Solutions. Hans Hohn, Erich Fitzer and Gerhard Jangg. *Stahl und Eisen*, v. 78, Oct. 16, 1958, p. 1462-1469.

Extraction of Fe from used pickling solutions by mercury cathodes. Fe can be recovered from the resulting amalgam by two methods: leaching in a solution of 10 g. per liter trivalent and 50-60 g. per l. divalent iron and 25 g. per l. ammonium sulphate, followed by electrolysis; by slow distillation after increasing the size of iron particles by heat treatment. 23 ref. (A8b, A11d; Fe)

24-A.* (German.) Materials, Tests and Testing Methods. Karl Weilinger and Dietrich Vebing. *VDI Zeitschrift*, v. 100, Sept. 1958, p. 1233.

Survey of literature on filler metals for fusion welding of steel; construction materials for atomic reactors; fission materials; moderator and reflector materials; materials for control and steering apparatus; coolants. Changes of properties of graphite caused by radiation; metallurgical problems with fissionable materials; problems with reactor construction materials; their corrosion resistance in air and water; behavior under radiation; melted metals as coolants. 115 ref. (A-general, S-general, W11p)

25-A. Disposal of Plating Wastes. F. G. Green. *Canadian Technical Information Service*, TIS Report no. 55, Feb. 1958, 16 p.

(A8b, 11-65)

26-A. New Day for Newer Metals. D. J. McPherson. *Frontier*, v. 21, Winter 1958, p. 4-8.

Beryllium, titanium, vanadium, chromium, zirconium, columbium, molybdenum, hafnium, tantalum, tungsten and rhenium are included among the newer metals. Except for Hf and Re they are now promising as structural metals in the tonnage class. Though nearly all of them are expensive, and nine of them have one or both of two basic problems (reactivity with gases in the atmosphere and brittleness), they face a great future. (A-general; Be, Cb, Hf, Cr, Mo, Re, Ti, Ta, V, W, Zr)

27-A. In the Wilderness of Brazil Men Stand on Mountains of Iron Ore as They Search for Tomorrow's Steel. Nathan Federgreen. *Frontier*, v. 21, Winter 1958, p. 18-22.

Exploitation of world's richest iron ore deposits. (A11a, Fe)

28-A. Cadmium. Arnold M. Lansche. *U. S. Bureau of Mines Minerals Yearbook, 1957, Preprint,* 1958, 8 p.

Production statistics, consumption and prices. (A4p; Cd)

29-A. Chromium. Wilmer McInnis and Hilda V. Heidrich. *U. S. Bureau of Mines Minerals Yearbook, 1957, Preprint,* 1958, 15 p.

Production statistics, consumption and prices. (A4p; Cr)

30-A. Iron and Steel Scrap. James B. Larkin. *U. S. Bureau of Mines Minerals Yearbook, 1957, Preprint,* 1958, 29 p.

Production statistics, consumption and prices. (A4p; RM-p, CI, ST)

31-A. Thorium. James Paone. *U. S. Bureau of Mines Minerals Yearbook, 1957, Preprint,* 1958, 11 p.

Production statistics, consumption and prices. (A4p; Th)

32-A. Zirconium and Hafnium. F. W. Wessel. *U. S. Bureau of Mines Minerals Yearbook, 1957, Preprint,* 1958, 8 p.

Production statistics, consumption and prices. (A4p; Zr, Hf)

33-A. (German.) Copper-Bearing Sandstones in Oligozene Strata of Northern Spain. George Burg. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 11, Oct. 1958, p. 478-484.

11 ref. (A11a; Cu)

34-A. (Portuguese.) Gold Will Repair the Brazilian Economy. José Frederico de Souza Martins. *Engenharia, Mineracao e Metalurgia,* v. 28, Sept. 1958, p. 145-150.

Research on exploration of old gold mines. (A11a, B12; Au)

35-A. (Portuguese.) Uranium Ores: Exploration, Concentration and Industrial Use. Octacilio Cunha. *Engenhania, Mineracao e Metalurgia,* v. 28, Sept. 1958, p. 157-159.

Research and development in Brazil. (A9, C-general; U)

36-A. (Portuguese.) Classification of the Main Minerals Found in Brazil. Olivero H. Leonardos. *Engenharia, Mineracao e Metalurgia,* v. 28, Sept. 1958, p. 161.

(A11a)

37-A. (Portuguese.) List of Brazilian Mines. Olivero H. Leonardos. *Engenharia, Mineracao e Metalurgia,* v. 28, Sept. 1958, p. 162-164.

(A11a)

38-A.* Development of Beryllium for Nuclear Reactor Applications. Pt. 2. G. C. Ellis. *Metallurgia,* v. 58, Nov. 1958, p. 243-250.

Production of ingot and powder metal, fabrication, mechanical properties. 25 ref. (A-general; Be)

39-A.* (French.) Thorium, a Fertile Metal. Marcel Englander. *Mines,* v. 13, May-June, 1958, p. 267-271.

Role of Th in atomic energy field; methods of extracting from ores; products of spontaneous disintegration of natural Th; deposits and ores; physical and mechanical properties of metallic Th; toxicity and inflammability. 3 ref. (A-general; Th)

40-A.* (French.) Sheet Metal Clad With Alloy Steel. H. Lejay. *Revue Generale de Mecanique,* v. 42, May 1958, p. 273-278.

Fabrication, machining, flame cutting, welding; advantages for applications in petroleum and chemical industries, in nuclear energy field; base steels and plating alloys. (A-general; ST, AY, 8-66)

41-A.* (French.) Blackheart and Whiteheart Malleable Cast Irons and Their Applications in Machinery Construction. M. Gailly. *Revue Generale de Mecanique,* v. 42, May 1958, p. 283-289.

Heat treatment of white cast iron to produce blackheart, whiteheart and pearlitic malleable; carbon and silicon in these irons; physical and mechanical properties; design limitations for parts of different sizes. (A-general; CI-S)

42-A.* (French.) Hot Work Toolsteels. Paul Wagener. *Revue Technique Luxembourgeoise,* v. 50, July-Sept. 1958, p. 157-179.

Indispensable and desirable properties of steels used in making forged hot work

tools; methods of measuring these properties; influence of alloying elements and heat treatment; standard alloys used in Luxembourg compared with those used elsewhere. Table of 164 American and European designations with chemical composition and hot working applications. 15 ref. (A-general, S22; TS)

43-A. Review of Iron and Steel Literature for 1957. Esther Chesire. Pt. 3. *Blast Furnace and Steel Plant*, v. 46, Nov. 1958, p. 1192-1193, 1226-1228.

140 ref. (A-general, D-general; ST, SS, 11-65)

44-A. Aluminum-Cobalt Alloys. *Cobalt Information Center*, Feb. 1957, 4 p.

Bibliography covering 1897-1957. (A-general; Al-b, Co-b, 11-65)

45-A. Cobalt in Cast Iron. *Cobalt Information Center*, Feb. 1957, 1 p.

Bibliography covering 1930-1956. (A-general; *Co*, CI)

46-A. Cobalt in Stainless Steel. *Cobalt Information Center*, Feb. 1957, 1 p.

Bibliography covering 1941-1957. (A-general; *Co*, SS)

47-A. New Corrosion Research Laboratory. *Corrosion Technology*, v. 5, Nov. 1958, p. 361-362.

Equipment and layout at Carpenter Steel Co., Reading, Pa. (A9h, R-general, 1-53)

48-A. Beryllium: Present and Potential Uses. *Engineer*, Oct. 31, 1958, p. 688-689.

Physical and mechanical properties; toxic hazards. (A-general, 17-57; Be)

49-A. Mill Scale Wastes. Grant A. Pettit. *Industrial Wastes*, v. 3, Nov-Dec. 1958, p. 133-136.

Facilities at Armco Steel Corp., Middletown, Ohio, (A8d, D-general)

50-A. Solid Cyanide Waste Incineration From Diesel Engine Manufacture. C. Fred Gurnham and Charles T. Gruner. *Industrial Wastes*, v. 3, Nov-Dec. 1958, p. 137-140.

Disposal of skimmings from molten salt heat treating baths and rinses and sludges from the electroplating of Cu and Cd. (A8b, A8d; Cu, Cd)

51-A. Heat Endurance. W. Schweisheimer. *Iron & Steel*, v. 31, Sept. 1958, p. 465-466.

Excessive temperature conditions which prevail in various phases of the metal industry affect efficiency of workers. Four factors that determine man's sensation of cold and warmth are: air temperature, humidity, air movement, radiation. Methods to compensate for these abnormal factors. (A7q)

52-A. Lithium: Its History and Growing Importance. M. Schofield. *Mining Magazine*, v. 99, Oct. 1958, p. 201-202.

(A2, A4; Li)

53-A. Production of Nickel-Base Alloys. *Oil Engine and Gas Turbine*, v. 26, Oct. 1958, p. 237-238.

New processing operations for Nimonic alloys. (A-general; Ni-b)

54-A. Coming — 3400° F. Alloys. *Precision Metal Molding*, v. 16, Nov. 1958, p. 35.

Ti-base alloys are useful up to 1600° F; Cb-base alloys may be worked up to 2500° F.; Mo and Mo-base alloys should find use up to 2600° F., W-base materials indicate working temperatures near 3400° F. (A-general; Ti-b, Cb-b, Mo-b, W-b, 2-62)

55-A. Analytical Chemical Laboratories for the Handling of Plutonium. C. F. Metz. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/533, 1958, 22 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Elimination of biological hazards by the drybox or glove box method. (A7r; Pu)

56-A. Economics of Unirradiated Processing Phases of Uranium Fuel Cycles. J. P. Murray, F. S. Patton, R. F. Hibbs and W. L. Griffith. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/439, 1958, 25 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Manufacture of unirradiated U fuel materials, including conversion of uranium hexafluoride to U metal and uranium dioxide; subsequent fabrication into fuel elements; processing and recycle of accrued scrap. 58 ref. (A-general, T11g; U)

57-A. Wanted: a Revolution in Manufacturing. *Steel*, v. 143, Nov. 24, 1958, p. 100-103.

Development work that must be done for aircraft and missile makers and metals industry as a whole. (A-general, T24)

58-A. Beryllium--Lighter and Stronger Than Aluminum, Stiffer Than Steel. Preston L. Hill. *Tooling & Production.* v. 24, Dec. 1958, p. 37-40.

(A-general; Be)

59-A. Aluminum. R. August Heindl, Arden C. Sullivan and Mary E Trought, *U.S. Bureau of Mines Minerals Yearbook, 1957*, Preprint, 1958, 26 p.

Comparative figures in production, trade, consumption, uses and technology throughout the world. 51 ref. (A4, A-general; Al)

60-A. Bauxite. Richard C. Wilmot, Arden C. Sullivan and Mary E. Trought. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 20 p.

World production, consumption and uses, stocks, prices, foreign trade, technology. 25 ref. (A4, A-general; Al, RM-n)

61-A. Copper. A. D. McMahon and Gertrude N. Greenspoon. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 53 p.

Government programs, domestic and foreign production, consumption, prices, foreign trade, technology. 31 ref. (A4, A-general; Cu)

62-A. Minor Metals. C. T. Baroch, William R. Barton, Donald E. Eilertsen, Frank L. Fisher, James Paone and H. Austin Tucker. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 17 p.

Production, consumption and uses, prices, technology of Cs, Rb, Ga, Ge, In, Ra, Re, Se, Si, Te, Tl and rare earth minerals and metals. 64 ref. (A4, A-general; Cs, Rb, Ga, Ge, In, Ra, Re, Se, Si, Te, Tl, EG-g)

63-A. Nickel. Hubert W. Davis. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 18 p.

Domestic production, consumption, substitutes, foreign trade, technology. 35 ref. (A4, A-general; Ni)

64-A. Silver. J. P. Ryan and Kathleen M. McBreen. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 20 p.

Production, foreign trade, consumption, technology statistics. 18 ref. (A4, A-general; Ag)

65-A. Tin. J. W. Pennington and John B. Umhau. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 27 p.

Production, consumption, technology, foreign trade statistics. 29 ref. (A4, A-general; Sn)

66-A. Tungsten. R. W. Holliday and Mary J. Burke. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 16 p.

Production, foreign trade, consumption and technology. 58 ref. (A4, A-general; W)

67-A. Uranium. James Paone. *U.S. Bureau of Mines Minerals Yearbook 1957*, Preprint, 1958, 37 p.

Government regulations, production, technology, consumption, prices, foreign trade. 58 ref. (A4, A-general; U)

68-A. (French-German.) High-Pressure Acetylene Is Safer Now. F. Loos. *Zeitschrift fur Schweisstechnik*, v. 48, Nov. 10, 1958, p. 290-297.

It is possible to install flame or explosion safety valves in conduits of welding and cutting tools by sintered metal processes. (To be continued.) (A8a, K2, W29)

69-A. (Polish.) Application of Radioactive Isotopes in Metallurgy. Leopold Jurkiewicz. *Hutnik*, v. 25, July-Aug. 1958, p. 242-250.

Examination of wear and tear of blast furnace lining. Measurement of samples'

radioactivity and thickness of plates and sheets. Investigation on exchange of phosphorus and sulphur between molten steel and slag. Other research in metallurgical processes by radioactive isotopes. (A-general, D-general, 1-59)

70-A. (Portuguese.) Belgo-Mineira Company Gets Going on Second Expansion Plan. *Engenharia, Mineracao e Metalurgia,* v. 28, Aug. 1958, p. 76.

Existing blast furnaces at Monlevade being rebuilt; new wire mill in partial operation in Belo Horizonte. Goals are 500,000 tons of steel ingots per year, 200,000 tons of wire products. (A4, D-general; ST, 4-61)

71-A. (Portuguese.) Better Organized Supply of Inland Scrap and Possibilities of Importation. Donald J. A. Camargo. *Engenharia, Mineracao e Metalurgia,* v. 28, Sept. 1958, p. 141-142.

(A5e; RM-p)

72-A. Continuous Removal of Fission Products From Uranium-Bismuth Reactor Fuel. O. E. Dwyer, R. M. Eshaya and F. B. Hill. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1781, 1958, 10 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $.50.

Fuel is a dilute solution of U, Mg and Zr in B; Volatile fission products consisting principally of Xe and Kr, represent roughly $\frac{1}{4}$ of the total by weight. The Xe problem is to prevent it from collecting on core surfaces. Fission-product I and Br, as alkali and alkaline-earth halides, are also extracted. (A11d, T11g; U, Mg, Zr, Bi, Xe, Kr)

73-A.* Recovery or Disposal of Plating Wastes? R. J. Keating. *Metal Finishing,* v. 56, Sept. 1958, p. 46-48.

Ion exchange and chemical precipitation, alone or in combination, are accepted methods of solving plating waste problems. Increased use of ion exchange equipment in plating rooms has made possible the recovery of valuable constituents which previously were removed from waste streams and destroyed to meet legal requirements. (A8b; L17, NM-a)

74-A.* (German.) Tantalum - Survey Based on Recent Literature. H. Spindler. *Metall,* v. 12, Oct. 1958, p. 921-924.

Occurrence, preparation, separation of Ta and Cb; methods for winning the metallic powder; sintering; use of Ta scrap; physical and mechanical properties of compacts; working processes with compacts; applications. 12 ref. (A-general, H-general; Ta, Cb)

75-A.* (French.) Titanium. Pierre Vachet. *Metaux-Corrosion-Industries,* v. 33, Sept. 1958, p. 353-365.

History, geology, production data; chemical and metallurgical techniques for production of metallic Ti; hydrogen embrittlement; allotropic forms; alpha-beta alloys; casting, mechanical working, plating, heat treatment; physical and mechanical properties; reactions of Ti at ambient and high temperatures; applications in aircraft, armament, automobile, and chemical industries, electronics and surgery. (A-general; Ti)

76-A.* Future Metals. H. R. Ogden. *Chemical Engineering Progress,* v. 54, Nov. 1958, p. 54-57.

High-temperature properties, general corrosion behavior and applications of V, Cb, Ta, Cr, Mo, W and Re. (A-general, Q-general, R-general; V, Cb, Ta, Cr, Mo, W, Re, 17-57)

77-A.* Stainless Alloys. Present and Future. W. O. Binder. *Chemical Engineering Progress,* v. 54, Nov. 1958, p. 45-50.

Properties and applications of high-manganese stainless, austenitic Cr-Mn steel, precipitation hardening and ferritic high-temperature steels. Data for Ni-Cr and Ni-Cr-Fe alloys. (A-general; SS, Cr, Mn, Ni, Cr, Fe, SGA-h)

78-A.* Nonferrous Castings. How to Get More for Your Metalworking Dollar. *Iron Age,* v. 182, Dec. 11, 1958, p. 121-136.

Current machining practice, composition and properties of Al, Cu, Mg and Zn alloy castings. (A-general, G17; Al-b, Cu-b, Mg-b, Zn-b, 5-61)

79-A.* (Czech.) Problem of Dust in Metallurgical Works. Miloslav Havelka. *Hutnicke Listy,* v. 13, no. 9, 1958, p. 778-786.

Emission of dust in iron works may reach 30 kg. per ton of pig iron produced. Properties, sources, quantities of dust emitted by various shops and installations. Applicability, efficiency, installation and operating costs of dust control systems. 14 ref. (A8a, D-general)

80-A. Columbium (Niobium) and Tantalum. Pt. 2. World Occurrences. R. Williamson and Lorraine Burgin. *Colorado School of Mines, Mineral Industries, Bulletin*, v. 1, Nov. 1958, 16 p.

142 ref. (A11a; Cb, Ti)

81-A. Plating, Heat Treating and Painting Wastes. Pt. 1. J. M. Whalen. *Sewage and Industrial Wastes*, v. 30, Nov. 1958, p. 1379-1383.

Cyanide and chromium wastes. (A8p, L17, L26, J28)

82-A. Steel Manufacturing Wastes. Pt. 2. V. P. Traina. *Sewage and Industrial Wastes*, v. 30, Nov. 1958, p. 1383-1385.

(A8b; ST)

83-A. (German.) Material and Quality Control by a New Recording Practice. Johann Sittard. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1585-1597.

Forms and file cards that allow recording and evaluation of the results at the same time. Practical examples. (A5b)

84-A. (German.) Construction and Equipment of a Modern Steel Mill Laboratory. Peter Dickens. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1597-1603.

(A9h, X-general; ST)

85-A. (German.) Raw Material Situation in the Iron and Steel Industry. Franz Blucher. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1637-1639.

(A4; RM-j42, RM-j43, RM-n, RM-p, ST)

86-A. (German.) German Production of Rolled Steel in the 2nd Half of 1958. Hans-Jorg Sendler. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1640-1641.

(A4p; ST, 4-57)

87-A. (German.) World Steel Production in Fall 1958. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1641-1644.

(A4p; ST)

88-A. (Portuguese.) Manganese Reserves of Brazil. Exportation Regulations. Francisco Jose Pinto de Souza. *Engenharia, Mineracao e Metalurgia*, v. 28, Aug. 1958, p. 73-75.

(A11a; Mn)

89-A. (Portuguese.) List of Brazilian Mineral Resources. Mario da Silva Pinto. *Engenharia, Mineracao e Metalurgia*, v. 28, Aug. 1958, p. 97-98.

(A11a)

90-A. (Portuguese.) List of Brazilian Mines. Olivero H. Leonardos. *Engenharia, Mineracao e Metalurgia*, v. 28, Aug. 1958, p. 111-115.

(A11a)

91-A. (Portuguese.) Aluminum. Mario da Silva Pinto. *Quimica*, v. 10, Mar-May 1958, p. 14-19.

Survey on world reserves and world production and manufacture. (A11a, A4n; Al)

92-A.* Titanium and Its Alloys. M. K. McQuillan. *Discovery*, v. 19, Oct. 1958, p. 427-432.

Theory of metal's structure and formation of alloys, heat treating and machinability problems. (A-general; Ti)

93-A.* How Nickel Affects High-Speed Tool Steels. Pt. 1. R. F. Hehemann and A. R. Troiano. *Iron Age*, v. 182, Dec. 18, 1958, p. 94-96.

Annealing both standard and Ni-containing grades. (To be continued.) (A-general, J23; TS, *Ni*)

94-A.* (Book.) Cobalt and Its Alloys. Summary of Allotropy and Phase Diagrams. 2nd Ed. F. R. Morral. 125 p. 1958. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Bibliography covering period 1896-1957. (A-general, M24; Co)

95-A. (Book-French.) Symposium on Special Problems in Metallurgy, June 1957. Institut National des Sciences et Techniques Nucleaires. 126 p. 1958. Presses Universitaires de France, 108 Blvd. St.-Germain, Paris, France.

Properties of uranium, zirconium, cobalt, magnesium, aluminum, titanium and iron. (A-general; Al, Co, Fe, Mg, Ti, Zr, U)

96-A. (Booklet-Spanish.) Steel Manufacturers' Association, 1956-1957 Report. 47 p. May 1958. Centro de Industriales Siderurgicos, Buenos Aires, Argentina.

Production, consumption, imports of raw materials, steel, iron and mill products in Argentina; steelmaking facilities, planned new facilities, including first integrated plant; comparison statistics on production and consumption in other countries; problems of Argentine steel industry. (A-general, A-4; ST)

97-A. (Translation—SLA, ASLIB-GB29.) Vacuum Techniques in Metallurgy. B. V. Linchevskii. *Metallurg*, no. 7, 1956, p. 3-6.

(A-general, 1-73)

98-A. (Translation—SLA, ASLIB-GB95.) Removing the Dust From Converter Waste Gases. W. Dehne. *Stahl und Eisen*, v. 77, May 2, 1957, p. 553-561.

See item 272-A, 1957. (A8a, D3)

99-A. (Translation—SLA, ATS-29K21.) Current Methods of Beryllium Technology. G. F. Silina, Y. I. Zarembo and G. E. Kaplan. *Tsvetnye Metally*, v. 30, no. 1, 1957, p. 66-71.

(A-general; Be)

100-A.* (German.) Regeneration of Electrolytes Used in the Electrolytic Polishing of Carbon Steel. T. Zak. *Metalloberflache*, v. 12, Dec. 1958, p. 361-363.

In the regeneration, Cr^{+3} is converted into Cr^{+6} by anodic oxidation. The Fe^{+2} is removed by precipitation as iron sulphate. 20 ref. (A11d, L13p; CN)

101-A. New Laboratory Links Research and Production. Robert H. Herrmann. *Foundry*, v. 86, Dec. 1958, p. 66-69.

Facilities and research programs at General Electric's Applied Research and Development Laboratory, Schenectady, N. Y. Research activity includes melting and refining, casting and solidification, cast structures and properties. (A9h, E-general)

102-A. Cupola Grit and Dust Arresters. G. E. Lunt. *Foundry Trade Journal*, v. 105, Nov. 27, 1958, p. 651-658, 660.

(A8a, W13c, W18d)

103-A. Safe Working With Shielded Arc Welding. Henry Allen. *Metalworking Production*, v. 102, Dec. 5, 1958, p. 2139.

Hazards caused by ultraviolet radiation, ozone formation and Be and Cd dust. (A7p, K1d; Be, Cd)

104-A. Reds Spur All-Out Drive to Catch Up With West. *Steel*, v. 143, Dec. 22, 1958, p. 32-36.

Present and planned industrial production in USSR, China, East Germany, Poland, Czechoslovakia, Hungary, Bulgaria and Rumania. (A4p)

105-A. (German.) New Approaches to Dust and Fume Control in Foundries. Torsten Wrene. *Giesserei*. v. 23, Nov. 6, 1958, p. 698-700.

Advantages of sucking dust and fumes through floor instead of using ceiling installations include lower buildings, absence of ducts along walls or ceilings, simplified air blower systems, increased illumination resulting from lighter walls and ceilings, and cleaner floors. (A8a, E-general, 18-67)

106-A.* (German.) Economics of the Foundry. Alfred Naundorf and Georg Schmidt. *Giessereitechnik*, v. 4, Oct. 1958, p. 243-249.

Characteristics of various manufacturing processes in East Germany and factors influencing their selection. Preparation and formulation of production reports. 6 ref. (A4, E-general)

107-A.* (Rumanian.) Austenitic Manganese Cast Iron With Nodular Graphite. N. Popescu. *Studii si Cercetări de Metalurgie*, v. 3, no. 1, 1958, p. 33-38.

Melting, chemical composition, physical and mechanical properties, in comparison with a cast iron of analogous composition, but containing lamellar graphite. Nodular graphite can be obtained by treatment prior to melting with Al-Ca-Mg and subsequent tempering at 950° C. and final air cooling. The nodulization improves the mechanical properties but weakens the physical properties. 5 ref. (A-general; CI-r, *Mn*)

108-A.* (Russian.) Important Laboratory Investigations at Dneprospetsstal' Works. I. P. Zabaluev. *Stal'*, v. 18, Nov. 1958, p. 1003-1004.

Review of major research activity in 1957 in regard to: electromelting of ball bearing steel, effect of vacuum treating of ferrochromium on quality of stainless steel, use of nickel oxide in place of metallic Ni in melting steel in electric arc furnace, properties of alloy electrosteel worked in vacuum and using argon in pouring electrosteel. (A9, D-general; ST)

109-A.* (Russian.) Main Trends in Development of Steel Rolling and Tube Production. A. I. Tselikov. *Stal'*, v. 18, Nov. 1958, p. 1005-1011.

The rapid growth of rolled steel production should be directed toward the expansion of sheet steel output (mainly through the use of continuous mills), welded tubes and of economic sections (wide-flange beams, thin-walled sections and tubes, bent sections, bars with variable cross-sections, cold rolled shapes, pressed shapes and tubes as well as superthin stripes). Compared with 1913, Soviet rolled steel production increased 11-fold, U.S. 2-fold and Britain 2.5-fold. 9 ref. (A4p; ST, 4-53, 4-55, 4-60)

110-A. (Japanese.) Recollections on the Magnesium Industry. R. Komatsu. *Metals*, v. 28, Nov. 1958, p. 813-816.

(A-general; Mg)

111-A. (Japanese.) Vacuum Metallurgy. H. Kawamura, K. Kawada, E. Fujita, H. Shibata, K. Tsuya and Y. Mishima, *Metals*, v. 28, Nov. 1958, p. 837-840.

(A-general, 1-73)

112-A.* High Temperature Metals. E. Skinner. *Chemical Engineering*, v. 65, Dec. 15, 1958, p. 137-147.

Behavior of ferritic steels, austenitic steels, Ni-base alloys, cast irons, cast stainless (ACI types) and superalloys from 400 to 2000° F. Physical, chemical and mechanical properties; oxidation and scaling; resistance to H and N attack. 21 ref. (A-general; SS, Ni-b; CI, 17-57, 2-62)

113-A.* Metals and Alloys Above 1200° C. *Nature*, v. 182, Nov. 22, 1958, p. 1418-1419.

Properties of Pt, W, Mo and Ti-C alloys; crystal structure of Be 5 up to 1290° C.; methods for determining thermodynamic activities of alloy constituents at high temperatures. (A-general; Pt, W, Mo, Ti, C, 2-62, 17-57)

114-A. Data on World Wide Metals and Alloys. *Alloy Digest*, Dec. 1958, 20 p.

Properties and applications for Alcan 250, Monel 403, Haynes Stellite Alloy No. 6, Aluminum 112, Timken 16-13-3 steel, Climax 42 (16 Cr-3 Mo), Vasco-WCC, Croloy 5 Si, Unitemp, Waspaloy. (A-general; SGA-h, Al-b, Ni-b, SS)

115-A. Data on World Wide Metals and Alloys. *Alloy Digest*, Jan. 1959, 18 p.

Properties and applications for Duronze 632, Apex 39, Waukesha Metal No. 23, Zilloy 15, Meehanite GM, G-E Alloy J-1300, Oilgraph and Wearpact. (A-general, Cu-b, CI, 6-71)

116-A. New Stainless Better Than Type 316. R. B. Norden. *Chemical Engineering*, v. 65, Dec. 15, 1958, p. 194-196.

An improved stainless—D319—with superior corrosion resistance is strongly bidding to replace Type-316 in chemical process equipment. (A-general, T29, 17-57; SS, SGA-g)

117-A. The Integrated Iron and Steel Works. W. B. Wright and W. Eland. *Chemistry and Industry*, Nov. 22, 1958, p. 1526-1532.

Flow diagrams and current practices. (A-general, D-general, 1-52)

118-A. Lead as a Material of Construction for Chemical Plant. J. G. Openshaw. *Corrosion Technology*, v. 5, Dec. 1958, p. 381-383.

Problems of fabrication, homogeneous Pb lining for towers and coolers, ducting, atomic shield for atomic radiations. (A-general; Pb-b, 17-57)

119-A. Beryllium. *Design News*, v. 13, Dec. 8, 1958, p. 24-25.

Mechanical, nuclear, electrical and optical applications. (A-general, 17-57; Be)

120-A. Recovering Uranium From Unirradiated Fuel Element Scrap. G. R. Jasny, J. R. Barkman, T. P. Sprague and R. P. Smith. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 1777, 1780.

18 ref. (A11d, T11g; U, RM-p)

121-A. Uranium Recovery From Magnesium Fluoride Slag. R. G. Werkema and G. P. Lang. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 1781-1784.

Carbonate leaching recovers essentially all U in slag and may become commercially useful. 5 ref. (A11d; U, RM-q)

122-A. Coke and By-Products in 1957. I. E. Madsen. *Iron and Steel Engineer*, v. 35, Dec. 1958, p. 73-78.
(A-general; RM-j43)

123-A. New Metals and Processes. Robert C. Bertossa. *Metal Treating*, v. 9, Nov-Dec. 1958, p. 2-4.
Melting point, tensile strength of W, Mo, Ta and Cb. High-temperature research and testing equipment. (A-general; W, Mo, Ta, Cb, EG-d, 1-66)

124-A. Which Alloy for High-Temperature Processes? E. N. Skinner and J. J. Moran, Jr. *Petroleum Refiner*, v. 37, Dec. 1958, p. 133-140.
17 ref. (A-general, 17-57, SGA-h)

125-A. Some New Aspects of Ancient Mesopotamian Metallurgy. *Scientia*, v. 93, no. 10, 1958, p. 269-273.
Methods of smelting Cu, Au and Ag alloys. (A2, C21; Cu, Au, Ag)

126-A. Iron Ore. Horace T. Reno and Helen E. Lewis. *U. S. Bureau of Mines Minerals Yearbook, Preprint*, 1957, 29 p.
Production statistics, prices and consumption trends. (A4p; RM-n, Fe)

127-A. Safe Handling of Pyrophoric and Radioactive Metal Powders. W. B. Harris. Paper from "Powder Metallurgy and Nuclear Engineering". American Society for Metals, 1958, p. 242-260.
Toxicity and maximum permissible exposure levels for Zr, Ti, Be, Pu and Th. 15 ref. (A7r; Zr, Ti, Be, Pu, Th, 6)

128-A. Metal Powder Industries Year-End Report for 1957. Kempton H. Roll. Paper from "Proceedings of the 14th Annual Meeting", Metal Powder Assoc., New York, 1958, p. 19-22.
Production statistics, consumption trends and applications. (A4p, H-general, 17-57)

129-A. Present Status of the Powder Metallurgy Industry in Japan. J. Miyauchi. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 55-64.
Production statistics, trends in consumption, manufacturing facilities and applications from 1951 to 1956. (A4p, H-general, 17-57)

130-A. (English.) Acid-Resistant Silicon Nodular Cast Irons. Traian Dumitrescu, Valentin Medeleanu, Maria Nicolaid and Ion Dinu. *Revue de Métallurgie (Bucarest)*, v. 3, no. 2, 1958, p. 19-27.
In comparison with Si lamellar irons, the nodular irons have lower machinability, and although the surfaces present a better appearance, they have much better resistance to corrosion. Castings of higher service efficiency are obtained. (A-general; CI-r, *Si*)

131-A. (Czech.) Systematic Development of Automation in Metallurgical Works. Milan Krejeik. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 692-697.
Experiences with automation in Czechoslovak metallurgical plants. Principles of automation. (A5a, 18-74)

132-A. (Czech.) Economical Use of Phosphoric Acid for Etching. Josef Rones. *Korose a Ochrana Materialu*, v. 2, no. 5-6, 1958, p. 68-72.
Use of the expensive acid is suggested only when regeneration is possible. Regeneration process with resins in the presence of Fe as ion exchangers. (A8b)

133-A. (Czech.) Safety Measures in the Application of Point Within an Electrostatic Field. Bohuslav Cihelka. *Korose a Ochrana Materialu*, v. 2, no. 5-6, 1958, p. 75-78.
(A7n, A7p)

134-A. (French.) Annual Session of French Metallurgical Society. *Revue de l'Aluminium*, v. 35, Sept. 1958, p. 824, 826, 830, 832.
Papers devoted to light and ultra-light metals; rupture mechanism; use of ultrasonics in control of light alloys; intergranular brittleness in Al-Zn and Al-Zn-Mg and influence of polygonization on brittleness; corrosion of Al monocrystals in water at high temperature; crystallization of pure alloys Al-Al_2Cu. (A-general; Al-b, Eg-a39)

135-A. (French.) Aluminum, Metal of the Century. Raoul de Vitry. *Revue de l'Aluminium*, v. 35, Sept. 1958, p. 874-880.
Progress and future of Al presented at International Exhibition in Brussels. Output of principal producers. Expansion of markets. France's contribution to Al technology. Perspectives for future growth. (A4p, 17-57; Al)

136-A. (German.) Discoveries During Recent Excavations on Prehistoric and Ancient Forge Sites in Czechoslovakia. Radomir

Pleiner. *Stahl und Eisen*, v. 78, Nov. 27, 1958, p. 1748-1754.

Evolution of forge techniques from 600 A.D. up to the 12th century. Melting furnaces with sunken and half hearths or conically shaped sunken hearths of the Schaner type, stationary shaft furnaces with slag tapping, and small forges with melting pits. 12 ref. (A2, W18)

137-A. (German.) The Cryptomelane and Jaspilite Deposits of Corumba, Matto Grosso, Brazil. Hannfrit Putzer. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 11, Nov. 1958, p. 527-538.

Location, geography, deposit structure, mining and genesis of Cryptomelane (a manganese ore), and Jaspilite or Proto-Itaribite (an iron ore). Cryptomelane, a Psilomelane variety, is of low BaO but high K_2O content. Jaspilite contains 55% Fe. (A11a; Fe, Mn, RM-n)

138-A. (Japanese.) Melting Procedures and Properties of High-Purity Metals and Alloys. Pt. 2. Ti-Al Alloys. Hidetake Kusamichi. *Light Metals (Tokyo)*, v. 8, Mar. 1958, p. 53-58.

11 ref. (A-general; Ti, Al, 2-64, 9-19)

139-A. (Russian.) Steel Industry in Eastern Siberia. A. B. Rozentreter. *Metallurg*, v. 3, Nov. 1958, p. 1-2.

Conference on building Siberian steel industry as part of 7-year plan for economic development. Resources of iron ore, Mn and chromite, electric power and railroad facilities. (A-general, A11a; ST, *Mn, Cr*)

140-A. (Russian.) Twenty-Fifth Anniversary of "Zaporozhstal'". L. D. Yupko. *Stal'*, v. 18, Oct. 1958, p. 865-866.

After being largely destroyed in World War II, mill has made great progress in terms of increased productivity, reduction of coke consumption, extensive mechanization, reduction of down-time. Much of progress due to improvements suggested by employees—of which there were some 8152 since the plant was built, resulting in saving of 85 million rubles. (A-general; ST)

141-A. (Russian.) Tin Recovery From Waste Products of Tin-Plating. I. N. Treiger, N. A. Kashcheeva and A. P. Savranskya. *Stal'*, v. 18, Oct. 1958, p. 957-959.

Chemical method of recovering tinplate waste products permits combining Sn sediment in solution with Zn using a tinning flux. (A11d, L17; Sn, Zn)

142-A. (Russian.) Automation Trends in Rolling Mills. A. I. Tselikov. *Vestnik Mashinostroeniya*, v. 38, Nov. 1958, p. 40-46.

To attain annual steel production of 120 million tons in next 15 years will call for rolling mill capacity of 90 million tons. Need to increase speed of rolling mills; expand heavy machine building; increase precision of rolling and tube mills. (A4p, W23, 18-74)

143-A.* Nickel in Industry. Sidney M. Renof. *Australasian Engineer*, v. 50, Oct. 7, 1958, p. 65-66.

Ni and its alloys; uses. (A-general, 17-57; Ni)

144-A.* Columbium (Niobium) and Tantalum. Pt. 2. World Occurrences. R. Williamson and Lorraine Burgin. *Colorado School of Mines Mineral Industries Bulletin*, v. 1, Nov. 1958, 15 p.

Listing in table and map form with production data for recent years. 142 ref. (Alla, A4p; Cb, Ta)

145-A.* Germanium and Silicon. Gustav Szekely. Paper from "Modern Materials". Academic Press, Inc., New York, 1958, p. 273-305.

Electrical and chemical properties, preparation, refining by zone melting and crystal growth. Determination of trace impurities. 65 ref. (A-general; Ge, Si, EG-j)

146-A.* Zirconium. G. L. Miller. Paper from "Modern Materials". Academic Press, Inc., New York, 1958, p. 307-386.

Occurrence, applications, extraction from ore, separation from Hf, production of metal. Melting, forging, rolling, extrusion, tubemaking, wiredrawing, cold forming, cold working, welding, brazing, soldering, annealing, cleaning, finishing, machining, grinding, powder metallurgy. Physical, electrical, crystallographic, atomic, nuclear, mechanical, impact, creep and corrosion properties. 104 ref. (A-general; Zr)

147-A.* (Japanese.) Vacuum Metallurgy of Metallic Lithium. M. Kobayashi. *Metals*, v. 28, Dec. 1958, p. 933-936.

In a vacuum furnace Li_2Co_3 is converted into Li_2O with CaO at 800° C. and then ground and heated with Si at 1000° C. It is used for deoxidation of Cu, for production of Li-Mg and Li-Al for aeronautic and atomic industries. (A-general, C25; Li)

148-A. Nickel. L. Sanderson. *Canadian Mining Journal*, v. 79, Dec. 1958, p. 65-67.

Physical and electrical properties; extraction and refining, applications. (A-general; Ni, 17-57)

149-A. Cutting-Tool Materials--Today and Tomorrow. Robert T. Hook. *Machinery*, v. 65, Jan. 1959, p. 116-119.

High-speed steels, tungsten carbide, titanium carbide, ceramics, titanium boride, cemented diamonds. (A-general; SGA-j)

150-A. (Japanese.) Home-Produced Beryllium Copper. G. Ojima and S. Yabuki. *Metals*, v. 28, Dec. 1958, p. 905-911.

History. (A2; Cu-b, *Be*)

151-A. (Japanese.) Electronic Cooling and Heating by Semiconductors. N. Makino and H. Shidara. *Metals*, v. 28, Dec. 1958, p. 946-950.

Bi_2Ti_3 -Bi and Bi_2Te_3 examined. HgTe, PbTe, PbS, PbSe, Sb_2Te_3, Bi_2S_3 and SbZn considered. (A-general; EG-j)

152-A.* Beryllium and Beryllium Alloys. Pt. 1. A. R. Collins. *Australasian Engineer*, v. 51, Nov. 7, 1958, p. 52-56.

Properties, applications, extraction, fabrication of Be metal; Cu-Be casting and wrought alloys; health hazards. (A-general, A7; Be, Cu)

153-A.* A Range of Ferrous Alloys to Combat Abrasion, Corrosion and Heat. H. G. Horrell. *South African Mechanical Engineer*, v. 8, Nov. 1958, p. 89-116.

Characteristics of austenitic Mn steel, high-Cr white iron, martensitic steel, austenitic Fe-Cr-Ni, Fe-Cr-Ni-Mo and Fe-Cr-Ni-Mo-Cu regarding abrasion, corrosion and heat resistance. 7 ref. (A-general, Q9, R-general, 2-62; AY, SS, CI-p)

154-A.* (German.) Apprentice Training in the Foundry Industry. G. Jentsch. *Giesserei Praxis*, no. 19, Oct. 10, 1958, p. 389-395.

Curriculum comprising such courses as small coremaking, molding, large coremaking, molding of heavy castings, patternmaking, cupola technique, cleaning of castings, inspection methods and sand preparation. System of progress charts on which teaching should be based. (A6k, E-general)

155-A.* (German.) Utilization of Gas Scrubber Sludge. Bernhardt Weilandt and Fritz Kruse. *Stahl und Eisen*, v. 78, Nov. 13, 1958, p. 1657-1662.

Nature of gas sludge, admissible Zn content in blast furnace burden and removal of Zn in sintering. Sintering of gas sludge and efficiency of the process depends on amount of differently treated gas sludge in the sintering mixture. Effect of moisture content of ore and amount of additional lime. 15 ref. (A11d, D1; *Zn*)

156-A. (Hungarian.) Weldable Constructional Steel Type ST-52 With High Yield Point. Istvan Balsai. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 72-80.

New series of steels containing primarily Mn-Si, Mn-Si-Cu and Mn-Cr-Cu alloys, but other compositions are also used. (A-general, K9s; SGB-s, ST)

157-A.* (Hungarian.) Use of Radioactive Isotopes in Metallurgy. Sandor Simon. *Kohaszati Lapok-Ontode*, v. 9, Feb-Mar. 1958, p. 42-46.

Practical application in various branches of metallurgy and foundry practice depends on reliable measurement of radioactivity of artificial isotopes added to natural ones; both have to participate in the same chemical composition. Equipment and method of computation used to perform and to correlate measurements. 10 ref. (A-general, 1-59)

158-A. (Book.) Modern Materials. v. 1. Henry H. Hausner, Ed. 402 p. 1958. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. $12.50.

Sections on wood, synthetic rubbers, fiber materials, high-voltage insulation papers, special glasses for nuclear applications, modern ceramics, Zr, Ge and Si. Papers on Ge and Zr abstracted separately. (A-general; Ge, Zr)

159-A. (Book.) History of British Iron and Steel Industry. H. R. Schubert. 445 p. 1958. Macmillan Co., 60 5th Ave., New York, N. Y. $12.

From earliest times to introduction of steam power. (A2, D-general; Fe)

160-A. (Book.) English-Russian, Russian-English Electronics Dictionary. Dept. of the Army. 943 p. 1958. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $8.

Some 22,000 Russian terms and abbreviations of radio, radar, telegraphy, television, tubes, X-rays, electroacoustics, etc., collected from literature published in U.S.A., U.S.S.R. and U.K. and from Soviet factories, research institutions and scientists. (A-general, X15, 11-67)

161-A. (Book-French-English.) Nonferrous Metals Statistics. 131 p. Sept. 1958. Organisation for European Economic Cooperation, 2 Rue Andre-Pascal, Paris 16e, France. $1.50.

Production, consumption, foreign trade, breakdown of uses, from 1955 to 1957, for Sn, Zn, Cu, Al and Pb. (A4; Sn, Zn, Al, Cu, Pb)

162-A. Oxygen: Demand to Rocket. *Chemical and Engineering News*, v. 37, Jan. 19, 1959, p. 78-84.

Production statistics, applications. (A-general; O, 17-57)

163-A. The Structure of Steel. Pt. 9-10. Edwin Gregory and Eric N. Simons. *Edgar Allen News*, v. 37, Dec. 1958, p. 275-276. (A-general; ST-b)

164-A. Growth of Grey-Iron Castings Production and Some Factors Affecting It. Lars Villner. *Foundry Trade Journal*, V. 106, Jan. 1, 1959, p. 3-10.

Review of production during the last decade. (A4p; CI-n)

165-A. Build $2-Million Facility to Study Rare Metals. *Industrial Laboratories*, v. 10, Jan. 1959, p. 74-76, 78-81

Research program at Nuclear Metals Inc., Concord, Mass., in the development of W, Mo, Ta, Ch, Be. (A9; W, Mo, Ta, Cb, Be, 17-57)

166-A. Are American Steel Methods Growing Old? J. B. Austin. *Industrial Research*, v. 1, Jan. 1959, p. 19-28.

American steel industry compared with Britain, Sweden, West Germany, France and Russia. (A-general, D-general)

167-A. Statistical Computations Increase Production. Melvin J. Greaves. *Iron and Steel Engineer*, v. 36, Jan. 1959, p. 99-102.

Computers make possible statistical production studies previously impractical. (A4p, S12, X14k)

168-A. The Air Pollution Situation Today With Special References to Control Legislation. Allen D. Brandt. *Iron and Steel Engineer*, v. 36, Jan. 1959, p. 103-108. (A8a, A13p)

169-A. Developments in the Iron and Steel Industry During 1958. I. E. Madsen. *Iron and Steel Engineer*, v. 36, Jan. 1959, p. 112-158. (A-general, D-general; Fe, ST)

170-A. (Dutch.) Lifetime of Bentonite. *Gieterij-Centrum Berichten*, v. 6, Nov. 1958, p. 63-64.

Regeneration by the addition of soda. (A11d; NM-f45)

171-A. (German.) Experimental Melt in a Prehistoric Blooming Fire. Josef Wilhelm Gilles. *Stahl und Eisen*, v. 78, Nov. 13, 1958, p. 1690-1695.

Experimental smelting in a bloomery furnace with natural draft, built like a furnace of La Tene period. The result of 30 hr. of smelting was a slag lump in which iron with 0.09% C was present in the form of different size grains. 8 ref. (A2, D8; Fe)

172-A. (German.) Utilization of Surplus Blast Furnace Gas. Georg Bremer. *Stahl und Eisen*, v. 78, Dec. 25, 1958, p. 1867-1871. (A8a, A11d; RM-m39)

173-A. (Hungarian.) Curriculum of Metallurgical Engineers' Education in Hungary and in Foreign Countries. Zoltan Horvath. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 51-69.

Curricula of the technical universities of various countries including Russia. (A3)

174-A.* Two New Superalloys Excel at Elevated Temperatures. E. E. Reynolds and R. K. Pitler. *Iron Age*, v. 183, Jan. 22, 1959, p. 70-71.

Precipitation hardening steels, D979 and A71, developed by Allegheny Ludlum for gas turbines, missiles and airframes. (A-general; ST, SGA-h)

175-A.* High-Temperature Metallurgy. Robert Bakish. Digest from "Notes on the Third Internal Plansee Seminar", Reutte, Tyrol, Austria. *Metal Progress*, v. 75, Jan. 1959, p. 142, 144.

Papers on effect of oxygen in Cb, Ta-O and Ta-N systems; Mo coating, investigation of new alloys, metallographic studies and nuclear applications. (A-general, R11h, T11, 2-62; Cb, Mo, Ta, SGA-h, 11-57)

176-A.* Fabrication of Beryllium. K. G. Wikle. *Metal Industry*, v. 93, Dec. 26, 1958, p. 529-533.

Vacuum hot pressing Be powder into blocks. Extrusion, rolling, forming, machining, forming, joining, annealing and surface treatment of Be metal. Toxicity. (A-general, G-general, H-general, Be)

177-A.* Treatment of Effluents in the Metal Finishing Industry. Richard Justh. *Electroplating and Metal Finishing*, v. 12, Jan. 1959, p. 11-14.

Treatment of harmful effluents from pickling, bright dipping, soldering, electroplating and hardening processes. (To be concluded.) (A8b)

178-A. Solid State Division, Annual Progress Report. Oak Ridge National Laboratory. *U.S. Atomic Energy Commission*, ORNL-2614, Nov. 20, 1958, 176 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $3.

Results of 47 research projects evaluated. Includes irradiation of Ge; gamma irradiation of n-type Si; neutron damage effects in metals at low temperatures; irradiation and quenching experiments on Cu-Al alloys; radiation metallurgy. (A-general, A9; Ge, Si, Cu, Al, 2-67)

179-A.* Uses of Cobalt. *Cobalt*, no. 1, Dec. 1958, p. 5-12.

Historical survey, uses of heat resisting alloys, magnetic alloys, hard facing alloys, cermets, high-speed toolsteels, wear resistant and other alloys. 11 ref. (A-general; 17-57; Co)

180-A.* (German.) Sparking of Metals and Rocks. P. Brenner and P. Eversheim. *Aluminium*, v. 34, Dec. 1958, p. 700-701.

Al alloys examined by drop, friction and impact tests for safety as structural material in mines. Among alloys, Al-Mg-Si and Al-Zn-Mg (besides pure Al and other soft alloys) had best spark resistance in methane-air mixture. Resistance increased by addition of Be. 5 ref. (A7p, Q-general, T28m; Al-a, Al-b, *Mg, Si, Zn*)

181-A.* (Hungarian.) Utilization of Blast Furnace Slag in Agriculture. Istvan Palfalvi. *Kohaszati Lapok*, v. 13, no. 8, 1958, p. 367-374.

Effect of blast furnace slag on pH and hydrogen acidity values of the soil poor in Ca. 4 ref. (A11d; RM-q)

182-A. Growth of Grey-Iron Castings Production and Some Factors Affecting It. Lars Villner. *Foundry Trade Journal*, v. 106, Jan. 8, 1959, p. 29-37.

6 ref. (A4p; CI-n)

183-A. Metallurgy in Israel. Ariel Taub. *Metal Progress*, v. 75, Jan. 1959, p. 75-78. (A3, A4, A6)

184-A. Institute of Metals. Its First 50 Years. J. C. Chaston. *Metal Progress*, v. 75, Jan. 1959, p. 95-97. (A2, A12g)

185-A. Metallurgy in the U.S.S.R. J. Herbert Hollomon. *Metal Progress*, v. 75, Jan. 1959, p. 120-123. (A-general)

186-A. Health and Safety Considerations for Uranium Fuel Fabrication Facilities. William A. Brobst. Chicago Operations Office. Aug. 1, 1958. *U. S. Atomic Energy Commission*, COO-212, 50 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Contamination control; monitoring and sampling; maximum permissible levels and concentrations. (A7r, T11g; U)

187-A. Fire Prevention and Protection in Welding and Cutting Operations. Roger Cholin. *Welding Engineer*, v. 44, Jan. 1959, p. 57-58.

Safety tips applicable to various situations met in welding. (A7p; K-general)

188-A. (Hungarian.) Development of Metal Founding in the Middle Danube Valley, Up to the Introduction of Iron. Viktor Zsak. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 128-132.

Bronze culture flourished from 15th to 5th Century B.C. around Lake Balaton. Cu was alloyed with 10-18% Sb in the absence of Sn to make bronze. Excavated Avarian dress ornaments of 6th Century B.C. contain: 5% Sn, 8% Zn, 2.5% Pb, 1% Sb, 83.5% Cu. (A2, E-general; Cu-b, Cu-s)

189-A. (Hungarian.) 1600 Year Old Wrought Iron Column in New Delhi, India. Laszlo Takats. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 133.

The chemical composition of the 7.25-m. long dull black column is 0.08% C, 0% Mn, 0.046% Si, 0.06% S, 0.114% P, 0.034% Cu and the rest iron. Yearly average precipitation in New Delhi is 660 mm. (A2; Fe-m)

190-A.* What's Happening to Titanium Alloys? *Journal of Metals*, v. 11, Jan. 1959, p. 29-32.

New alloys with improved ultimate strength and elongation include crucible B120VCA, 8Al-1Mo-V, Rem-Crucible 900 and Ti-6Cu-7Al-6Zr. (A-general, Q-general; Ti-b, 2-62)

191-A.* (German.) Nodular Iron; a New Material. Pt. 1. Mechanical Properties,

Manufacture and Use. *Schweisstechnik*, v. 12, Nov. 1958, p. 141-144.

Nodular iron, both unalloyed and Ni-alloyed, in as-cast and heat treated states compared with standard qualities of steel castings, malleable cast iron and pure gray iron with respect to mechanical, physical and technological properties. (A-general, Q-general; CI-r)

192-A. Problems Connected With the Plutonium Factory at Marcoule and Their Solution. R. Galley. *Institution of Chemical Engineers*, v. 36, no. 6, 1958, p. 401-414.

Production of Pu from natural U is primarily a problem of neutron control, but its extraction from thousands of fuel elements taken from the pile where they were irradiated for many months is quite another problem. Chemical and technological questions and solutions adopted. (A11d, A8c; Pu)

193-A. The Early Ironworker and Public Opinion Through the Ages. H. R. Schubert. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 18-19.

17 ref. (A2; Fe)

194-A. Pyrophoricism in Metals. Henry Allen. *Metal Treatment and Drop Forging*, v. 26, Jan. 1959, p. 31-32.

(A7p, P13; Zr, U, Na, Li, Al, Zn, Mg, Ti)

195-A. Zirconium: Where It Is; Where It's Going. *Steel*, v. 144, Jan. 26, 1959, p. 76-77.

(A-general; Zr)

196-A. Bibliography of Zirconium. Eleanor Abshire. *U.S. Bureau of Mines, Information Circular 7830*, 1958, 216 p. Free.

Supplement to Information Circular 7771. (A-general, 11-65; Zr)

197-A. (French.) Foundry Displays at the 1958 Brussels Fair. J. V. Bairiot. *Fonderie Belge*, v. 28, Sept-Oct. 1958, p. 272-277.

(A12j; E-general)

198-A. (French.) Structure and Professional Organization of Belgian Iron Foundries. P. de Keyser. *Fonderie Belge*, v. 28, Sept-Oct. 1958, p. 278-279.

(A4p, A12g, E-general)

199-A. (French.) A Medieval Masterpiece: The Baptismal Fonts in St. Bartholomew's Church in Liege. Francois Boussard. *Fonderie Belge*, v. 28, Sept-Oct. 1958, p. 280-283.

7 ref. (A2, E-general, T9q)

200-A. (French.) Survey of Trends in the Beneficiation of Iron Ores; Effects on World Trade and Supply. J. Astier. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 5-13.

(A4, B-general; Fe)

201-A. (German.) Fighting Industrial Noise by Confining the Noise Spectrum. Reinhard Kohler. *Stahl und Eisen*, v. 79, Jan. 8, 1959, p. 37-41.

Analysis of various noise sources; machine specifications for reducing generation of noise. 6 ref. (A7s, S22)

202-A. (Portuguese.) Domestic Production Now Fills All Brazilian Tin Requirements. *Engenharia, Mineracao e Metalurgia*, v. 28, Oct. 1958, p. 209-210.

(A4p; Sn)

203-A. (Russian.) Comparative Costs in Casting Openhearth and Electric Furnace Steels. N. S. Sachko. *Liteinoe Proizvodstvo*, Nov. 1958, p. 4-6.

Electric furnace steel requires less fuel, raw materials and labor time. (A4s, D2, D5, ST-e, ST-f)

204-A. (Slovenian.) Lead, Zinc and Molybdenum Deposits in Mezica, Yugoslavia. Stanko Grafenauer. *Rudarsko-Metalurski Zbornik*, no. 3, 1958, p. 263-294.

47 ref. (A11a; Pb, Zn, Mo)

205-A. Twenty Years of Progress in Raw Materials. John Pace. *Metal Forming & Fabricating*, v. 21, Jan. 1959, p. 28-31.

Galvanized and cold rolled steel, coating, Al and its alloys, superalloys, Ti, Ch and heat resistant alloys. (A4p; ST, Al, SS, Ti, Cb, SGA-h, SGB-a)

206-A. Foamed Aluminum. *Modern Castings*, v. 35, Feb. 1959, p. 37.

Fabrication and properties. (A-general; Al-b, *Mg*)

207-A. (Czech.) Equilibrium State and Its Importance in Metallurgy. Ladislav Jenicek. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1058-1061.

Historical survey on the development of the science of equilibria. 28 ref. (A2, M24e)

208-A. (Dutch.) Main Facts From the Iron and Steel Market. T. Hagtingius. *Metalen*, v. 13, Dec. 31, 1958, p. 444-445. (A9q)

209-A. Semi-Annual Summary Research Report in Metallurgy for July-December 1957. Iowa State College. *U.S. Atomic Energy Commission ISC-977*, Oct. 15, 1958, 101 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $2.50.

Results of 29 research projects summarized and evaluated. Topics include purification and separation studies; preparation of pure compounds; preparation of V, Cb, Th, Y, U; alloy systems; corrosion studies; solid state investigation; vacuum fusion analysis of metals. (A-general, A9; V, Cb, Th, Y, U)

210-A.* (German.) Use of Radioactive Isotopes in Metallurgical Research. K. Sagel. *Metall*, v. 13, Jan. 1959, p. 25-30.

Applications as source of radiation and as tracer; preparation of specimens, diffusion tests, oxidation test, friction test, metal-slag reactions, steam pressure measurements, activation analyses. 116 ref. (A-general, 1-59)

211-A.* Fifty Years' Progress in Non-Ferrous Metals Technology. G. L. Bailey. *Institute of Metals Journal*, v. 87, Dec. 1958, p. 97-111.

Advances in the fields of smelting and refining, melting and casting, rolling, wire drawing, tube drawing, extrusion, forging, thermal treatment, inspection and control. 6 ref. (A-general; EG-a38)

212-A. Properties and Handling Practices for Magnesium: A Literature Survey. M. Breederman, G. A. Bennett, L. Burris, I. G. Dillon, I. O. Winsch, M. W. Nathans, E. Greenberg and J. Wolkoff. Argonne National Laboratory. U.S. Atomic Energy Commission, ANL-5749, Mar. 1958, 132 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $2.75.

Cost and availability of various high-purity grades, safe handling considerations, methods of distillation and production, physical and thermodynamic properties. 157 ref. (A4, A11, A7p, P-general, Q-general; Mg)

213-A. Pilot Production, Fabrication and Evaluation of Promising Titanium Alloys. F. A. Crossley, B. R. Rajals and D. W. Levinson. Illinois Institute of Technology. (Wright Air Development Center.) U.S. Office of Technical Services, PB 131978, Mar. 1958, 46 p. $1.25.

Fabrication and evaluation of approximately 300 lb. of Ti-7Al-3Mo alloy which was distributed to various jet engine manufacturers. 140 J-57 7th stage compressor blades were produced from 70 lb. of hot rolled, centerless-ground bar. The endurance limit for these blades bench-tested at room temperature under completely reversed stress was 75,000 psi. (A-general, Q-general, 2-66; Ti-b, *Al, Mo*)

214-A. (Book.) Dictionary of Metallurgy. A. D. Merriman. 401 p. 1958. Pitman Publishing Corp., 2 West 45th St., New York 36, N. Y. $25.

Includes engineering as well as metallurgy; over 7000 definitions, 283 illustrations and 236 tables. (A-general, 11-67)

215-A. (Book.) Marks' Mechanical Engineers' Handbook. Theodore Baumeister. Sixth Ed. 2270 p. 1958. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $23.50.

Eighteen sections of facts, descriptions, formulas, methods, tables, diagrams of mechanics of materials; numerical analysis and computing machines; vibrations; aerodynamics; jet propulsion; atomic power; automobiles; steam boilers; instruments and controls; railway engineering; aircraft propellers; corrosion; industrial engineering; turbo compressors; gas turbines; displacement pumps; fans; pipe and pipe fitting; lubricants and lubrication; structural design of buildings; welding. (A-general, 11-68, 11-67)

216-A. (Book.) Semiconductor Abstracts. Battelle Memorial Institute, Compiler, v. 4, 1956. 456 p. 1959. John Wiley & Sons, Inc. 440 Fourth Ave., New York 16, N. Y. $12.

Compilation of abstracts for 1956 arranged by material. Principle materials are Ge, Si, C, Se, intermetallics, oxides, arsenates, phosphates, silicates and tungstates. (A-general; EG-j, 11-65)

217-A. (Book.) Soviet Research in Fused Salts. Pt. 2. Electrochemistry; Aluminum and Magnesium, Corrosion, Theoretical; Thermodynamics; Slags and Mattes. 268 p. 1958. Consultants Bureau, Inc., 227 W. 17th St., New York. $20.

Articles selected from Soviet journals on electrochemistry, including Al and Mg. Electrochemical theory, corrosion, ther-

modynamics and properties of slags and mattes. Some papers abstracted separately. (A-general, C23n, P12, P15, R6; Al, Mg, RM-q)

218-A. (Book.) Soviet Research in Fused Salts. Pt. 1. Systems. 146 p. 1958. Consultants Bureau, Inc. 227 W. 17th St., New York. $30.

Articles selected from Soviet journals. Phase diagram studies of binary systems, ternary and quaternary reciprocal systems. Papers deal with melts containing halides, oxides or mixtures. (A-general, B19, M24, NM-a33)

219-A. (Book—German.) Statistical Tables on Aluminum, Lead, Copper, Zinc, Tin, Cadmium, Magnesium, Nickel, Mercury and Silver. 247 p. 1958. Metallgesellschaft Aktiengessellschaft, Frankfurt am Main, Germany.

Statistics on prices, production and consumption from 1948 to 1957. Survey on countries and continents. Summary of metal industry in 1957 and first half of 1958. (A4p, A4s; Al, Pb, Cu, Zn, Sn, Cd, Mg, Ni, Hg, Ag)

220-A. (Book.) 1959 Wire Industry Encyclopaedic Handbook. 484 p. 1959. Wire Industry Ltd., 33 Furnival St., London, England.

A 1957 trade summary; buyers guide to supplies; identifies manufacturers with brand names; technical and commercial terms; wire tables; British Standards; directory of recent articles in journal; general tables; associations, societies. (A-general, 4-61, 11-67)

221-A. (Translation—BISI, no. 1195.) Wetting Agents in Dust Control and Special Reference to the Wetting of Finely Distributed Iron Oxides in Steelworks Smoke. Robert Meldau. *Archiv fur das Eisenhuttenwesen,* v. 28, Oct. 1957, p. 615-621.

See item 254-A, 1958. (A8a; ST)

222-A.* (Japanese.) High Silicon-Aluminum Alloy. Shiro Terai. *Sumitomo Metals,* v. 10, July 1958, p. 174-185.

Effects of Cu, Mg, P, Na, As, B, Be, Cd, Co, Cr, Fe, Mn, Ti and Zn on tensile strength. Grain refinement. (A-general, 2-59, 2-60, 3-71; Al-b, *Si, Na*)

223-A. Data on World Wide Metals and Alloys. *Alloy Digest,* Feb. 1959, 16 p.

Data on Firth-Vickers FV .520 (age-hardenable stainless steel), Carpenter K-W (water hardening toolsteel, Type F2), TI-Namel (enameling steel), AISI 4320 (alloy carburizing steel), Inconel 713 "C" (high-temperature nickel alloy), Unitemp L-605 (high-temperature alloy), Magnesium ZH62A (high-strength casting alloy), Aluminum 2618 (heat treatable aluminum alloy). (A-general; SS, TS, AY, Mg-b, Al-b, SGA-h)

224-A. Higher Temperature Metals and New Forming Methods Mark 1958 as Year of Progress in Metals. Clarence H. Lorig. *Industrial Heating,* v. 26, Jan. 1959, p. 46, 48, 50, 52, 56.

Outstanding achievements include melting metals in jets of heat ranging up to 30,000° F., steels with strengths exceeding 400,000 psi., perfection of techniques for the forming of metal parts by controlled explosions and the rolling of metal strip directly from metal powders. (A-general)

225-A. Purification of Chromic-Acid Solutions by Means of Cation Exchangers. Gunnar Gabrielson. *Metal Finishing Journal,* v. 5, Jan. 1959, p. 19-21.

(A8b, L17)

226-A. Plating Waste Disposal. Walter Mikos and Alfons Szkudlapski. *Metal Finishing,* v. 57, Feb. 1959, p. 61-64.

(A8b, L17)

227-A. Science for the Coatings Technologist. Pt. 12-2. E.S. Beck. *Metal Finishing,* v. 57, Feb. 1959, p. 65-68, 75.

Mildewcidal paints; toxicity of Hg, Cu and other pigments. 5 ref. (A7p; Cu, Hg, NM-g30)

228-A. Maunsel White. An Early Worker on High Speed Steels. Eric N. Simmons. *Metallurgia,* v. 59, Jan. 1959, p. 10-12.

(A2; TS-m)

229-A. Improved Material Handling Methods. Stephan E. Schattman. *Precision Metal Molding,* v. 17, Jan. 1959, p. 54-56.

Equipment and layout at the new Zn die casting foundry of the Wolverhampton, England, Die Casting Co., Ltd. (A5a, E13; Zn)

230-A. Research Life-Blood of the Steel Industry. J. Stubbs Walker. *Steel Review,* v. 13, Jan. 1959, p. 10-21.

Research programs of the British Iron and Steel Association and some British companies. (A9; ST)

231-A. Consett of Durham. Earl B. Thomas. *Steel Review*, v. 13, Jan. 1959, p. 23-31.

Story of the Consett Iron Co. from the days of the first small ironworks, established nearly 120 years ago, to the present integrated million-ton capacity plant. (A2; ST)

232-A. (Japanese.) Treatment of Waste From Metal Finishing Industry. Tetsuo Ide. *Metal Finishing Society of Japan, Journal*, v. 9, Dec. 1958, p. 466-468.

(A8b, L-general)

233-A.* (Japanese.) Study on High-Purity and Iron-Free Magnesium and Its Alloys. Hiroshi Asada, Shinichi Komori, Kenichiro Aoki and Kozo Aoyama. *Light Metals*, v. 8, Nov. 1958, p. 65-73.

Manufacture of 99.99 to about 99.999% Mg by the distillation method and its mechanical and corrosion resistant properties. (A-general; Mg-a)

234-A.* (Russian.) Beryllium. G.A. Meerson, D.D. Sokolov and N.F. Mironov. *Atomnaya Energiya, Akademiya Nauk, SSSR*, v. 5, Dec. 1958, p. 624-630.

Methods of extraction developed by SSSR; variants of powder metal technology in manufacturing Be products; structure and properties. 4 ref. (A-general; Be)

235-A. Selection and Evaluation of Rare and Unusual Metals for Application to Advanced Weapons Systems. B. Love. Research Chemicals, Inc. (Wright Air Development Center.) *U.S. Office of Technical Services*, PB 151311, June 1958, 185 p. $3.

Survey of literature dealing with the rare earth metals, hafnium, rhodium and ruthenium; aimed at utilization of the promising high-temperature properties of these scarce materials in weapons. (A-general, 2-62; Hf, Rh, Ru, 11-65)

236-A. Some Metallurgical Applications of Radioactive Isotopes. W.R. Ellis. *Australasian Engineer*, v. 51, Dec. 8, 1958, p. 61-64.

(A-general, 1-59)

237-A. Soviet Steel—Expansion and Research. R. Sewell. *British Steelmaker*, v. 25, Feb. 1959, p. 52-57.

Planned plant building, estimated production; blast furnace development, steelmaking trends, steelmaking research. 14 ref. (A4p, A9; ST)

238-A. Versatile Molybdenum. M. Schofield. *Mining Magazine*, v. 100, Jan. 1959, p. 11-14.

Brief review of element and its compounds. (A-general; Mo)

239-A. Why Use Magnesium Castings? *Precision Metal Molding*, v. 17, Feb. 1959, p. 38-39.

Advantages include favorable weight to strength ratio, lower machining costs, reduced shipping charges. (A-general; 5, Mg-b, 17-57)

240-A.* Magnesium Alloy Investigation. *Metal Industry*, v. 94, Jan. 30, 1959, p. 87, 92.

New wrought Mg-base alloys (Mg-Mn-Zn) with improved mechanical and physical properties; effect of Ti, Hf, Rh, Y, Ni, Co, Ta, Cr, V, Cb, B, W and Mo additions. (A-general, Q-general, 2-60; Mg-b, *Zn, Mn, Ti, Hf, Rh, Y, Ni, Co, Ta, Cr, V, Cb, B, W, Mo*)

241-A.* The Fabrication and Properties of Commercially Pure Beryllium. J. Williams. *Metallurgical Reviews*, v. 3, no. 9, 1958, p. 1-44.

Refining processes; melting and casting; powder production; compacting and sintering; extrusion; rolling; forging; machining; welding; brazing; mechanism of deformation. Corrosion behavior; heat treatment; mechanical properties of polycrystalline Be at room and elevated temperatures. Effect of processing conditions; brittleness and health hazard. 70 ref. (A-general; Be)

242-A.* State of the Art: Beryllium. *Space Aeronautics*, v. 31, Feb. 1959, p. 48-51.

Microstructure, fabrication, mechanical properties, applications. (A-general; Be)

243-A. Beryllium: Hazard Evaluation and Control in Research and Development Operations. E. C. Hyatt, H. F. Schulte, R. N. Mitchell and E. P. Tangman, Jr. *A.M.A. Archives of Industrial Health*, v. 19, Feb. 1959, p. 211-220.

6 ref. (A7p; Be)

244-A. Problems in the Control of Operations in a Berryllium-Processing Plant. Harry M. Donaldson. *A.M.A. Archives of Industrial Health*, v. 19, Feb. 1959, p. 221-224.

(A7p; Be)

245-A. Control of Beryllium Machining Operations. Richard I. Chamberlin. *A.M.A.*

Archives of Industrial Health, v. 19, Feb. 1959, P. 231-238.
(A7p, G17; Be)

246-A. Treatment of Effluents in the Metal Finishing Industry. Richard Justh. *Electroplating and Metal Finishing*, v. 12, Feb. 1959, p. 47-50.
Disposal of plating solutions; handling chromate effluents; Lang Process. (Concluded.) 5 ref. (A8b, L17; Cr, Ca, Zn)

247-A. Problems Connected With the Plutonium Factory at Marcoule and Their Solution. R. Galley. *British Nuclear Energy Conference, Journal*, v. 4, Jan. 1959, p. 1-11.
Extraction of Pu from spent fuel elements for use in scientific studies. (A11d, C19n, T11g; Pu, U)

248-A. Density of Solid Blast-Furnace Slag Separator Being Developed by BISRA. *Iron and Coal Trades Review*, v. 178, Feb. 6, 1959, p. 327.
Equipment to separate usable from porous slag. (A11c; RM-f, 1-52)

249-A. How to Design Stainless Steel Extrusions. Pt. 2. Applications and Design Concepts. Richard E. Paret. *Machine Design*, v. 31, Jan. 22, 1959, p. 118-121.
Design fundamentals, fitting the extrusion to the product, how to modify existing shapes, stepped, tapered and multiple extrusions. (A-general, 3-73; SS, 4-58, 17-51)

250-A. (French.) Hazards of Vanadium. *Machine Moderne*, v. 53, Feb. 1959, p. 59.
Maximum permissible concentration levels for V, V_2O_5, VCl_4 and VCl_3. (A7p; V)

251-A.* (French.) Zirconium and Its Alloys. *Metallurgie et la Construction Mecanique*, v. 91, Jan. 1959, p. 29-34.
Properties, present and future applications; production methods; influence of O and N on properties; effect of Hf, Ti, Al, Cu, Ta and Be as alloying additions. (A-general, 2-60; Zr-b, *Hf, Ti, Al, Cu, Ta, Be*, 17-57)

252-A.* Rare Earths (Lanthanons). D. R. Williamson and Lorraine Burgin. *Colorado School of Mines Mineral Industries Bulletin*, v. 2, Jan. 1959, p. 1-16.
Sources, extraction and applications. (A11a, C-general; EG-g, 17-57)

253-A.* Aluminum + Foamed Plastic = . *Modern Metals*, v. 15, Feb. 1959, p. 32-34.
Versatile new sandwich material with a very high strength-weight ratio, exceptional stiffness and dimensional stability, superb insulation value, excellent moisture resistance. (A-general; Al-b, NM-d, 17-57, 7-59)

254-A.* Materials. A. W. Herbenar and G. R. Heckman. *American Society of Mechanical Engineers*, Paper no. 58-A-468, 1958, p. 5-11.
Intrinsic and extrinsic properties of stainless steels, low-alloy steels, superalloys, iron-base, nickel-base, cobalt-base and chromium-base alloys and analysis of critical gas-turbine components. 6 ref. (A-general, T7h; SS, ST, Fe-b, Co-b, Cr-b, Ni-b, 17-57)

255-A.* Plutonium. Bernhard Blumenthal. *Journal of Metals*, v. 11, Feb. 1959, p. 125-129.
History, extraction, properties, applications. 18 ref. (A-general; Pu)

256-A.* Zirconium Alloys. *Advanced Materials Technology*, v. 1, Dec. 1958, p. 6-7.
Physical and mechanical properties, including strength and heat treatment response when alloyed with Hf, Al, Si, Cb, Mo, Ti and steel. (A-general, P-general, Q-general, 2-60, 2-64; Zr-b, *Hf, Cu, Si, Al, Cb, Mo, Ti, ST*)

257-A.* (French.) Beryllium. R. Syre. *Metaux Corrosion-Industries*, v. 33, Oct. 1958, p. 406-419.
Characteristic properties and applications; casting and powder metallurgy techniques; physical properties of primary products and of drawn and rolled material; fabrication processes; toxicity. (A-general; Be, 17-57)

258-A.* (French.) Metals of the Future. H. Frenay and C. Ek. *Revue Universelle des Mines, de la Metallurgie de la Mechanique*, v. 15, Feb. 1959, p. 80-89.
Heat resistance and properties, corrosion resistance of Zr, Ti, V, Ta, Cr, W, Cb and Mo. Problems in extraction and refining; applications. 17 ref. (A-general, Q-general, R-general, C-general; Zr, Ti, V, Ta, Cr, W, Cb, Mo, 17-57)

259-A.* (German—French.) Aluminum Alloys in Reactor Construction. *Zeitschrift fur Schweisstechnik*, v. 49, Jan. 1959, p. 25.
Comparative listing of standardized denomination, composition and properties of some 14 Al alloys used in U. S., Great

Britain, Germany, Switzerland and Holland. (A-general, S22, T11, Al-b, 17-57)

260-A. Tungsten. L. Sanderson. *Canadian Mining Journal*, v. 80, Jan. 1959, p. 71-73.
Sources, extraction, properties, applications. Emphasis on W carbide. (A-general; W, 6-96)

261-A. New Handling and Storage Techniques. *Foundry*, v. 87, Mar. 1959, p. 132-134, 136-139.
System of overhead double-chain tray conveyors provides for the indexing, storage, circulation and delivery, on demand, of investment casting process patterns and castings. (A5a, E15)

262-A. (Italian.) Present Status and Future Trends in the Refractories Industry. Luigi Pompei. *Fonderia*, v. 7, Oct. 1958, p. 444-471.
Applications in the iron and steel industry. 17 ref. (A4p, D-general; RM-h)

263-A. Pearlitic Malleable Iron (High Strength Cast Iron). *Alloy Digest*, CI-26, Mar. 1959, 2 p.
Recommended for dependable service, strength and machinability in highly stressed parts at work in mobile and stationary mechanisms. (A-general; CI-s, SGB-a)

264-A. Dynavar (High Strength Cobalt Alloy). *Alloy Digest*, Co-16, Mar. 1959, 2 p.
Corrosion resistant, nonmagnetic, age-hardening type Co-base alloy with good hot and cold working properties characterized by high fatigue resistance, tensile strength, torque values and corrosion resistance. (A-general; Co-b, *Cr, Ni, Fe, Mo*)

265-A. Haynes Alloy No. 36. (High-Temperature Alloy). *Alloy Digest*, Co-17, Mar. 1959, 2 p.
Cobalt-base alloy having excellent strength up to 1800° F. Used successfully in jet engine blading and nozzle vanes. (A-general; Co-b, *Cr, Ni, W*)

266-A. NI-VEE Type C (Constructional Bronze). *Alloy Digest*, Cu-72, Mar. 1959, 2 p.
Leaded precipitation hardening Ni bronze alloy suitable for constructional, pressure and bearing metal casting. (A-general; Cu-s, *Pb*, Ni)

267-A. Udimet 700 (High Temperature Alloy). *Alloy Digest*, Ni-51, Mar. 1959, 2 p.
New vacuum-induction melted Ni-base alloy having excellent mechanical properties at high temperature. (A-general; Ni-b, *Co, Cr, Mo, Ti, Al*)

268-A. Alloy 300 M (Ultra-High-Strength Steel). *Alloy Digest*, SA-81, Mar. 1959, 2 p.
Alloy steel with a combination of hardenability, ductility and toughness at tensile strengths from 280,000 to 320,000 psi. (A-general, Q-general; AY, SGB-a)

269-A. Jethete M.160 (Heat Resisting Steel). *Alloy Digest*, SS-85, Mar. 1959, 2 p.
A 12% Cr air hardening alloy steel having high resistance to stress-corrosion cracking recommended for use at temperatures approaching 1200° F. (A-general, R1d, 2-62; SS, *Cr*, SGA-h)

270-A. Croman (Oil Hardening Tool Steel). *Alloy Digest*, TS-80, Mar. 1959, 2 p.
Properties of new high-carbon, Cr-Mg-Mo toolsteel for fine-edged tools. (A-general; TS, *Cr, Mg, Mo*)

271-A.* Why and Where to Use Carbide-Base Cermets. William W. Wellborn. *Materials in Design Engineering*, v. 49, Feb. 1959, p. 79-81.
Corrosion and oxidation resistance, high-temperature properties, physical and mechanical properties and applications of WC-Co, Cr-C, and Ti-C base cermets. (A-general; 6-70, 6-69, W, Co, Cr)

272-A.* (French.) Development of Light Bearing Alloys. Charles Guinard. *Revue de l'Aluminium*, v. 36, Jan. 1959, p. 64-69.
Applications for Al-base bearing alloys, including Al-Si, Al-Zn, Al-Sn and Zn-Al. 11 ref. (A-general; Al-b, *Si, Zn, Sn*, SGA-c, 17-57)

273-A. (Pamphlet.) Phosnic Bronze. 8 p. 1959. Chase Brass & Copper Co., Waterbury 20, Conn. Free.
Brochure on high-Cu (1.10% Ni, 0.25% P) alloy with high strength, and high electrical and thermal conductivity. (A-general; Cu-s, *Ni, P*)

274-A. (Pamphlet.) Titanium. 35 p. 1959. Harvey Aluminum, Inc., Titanium Div., Torrance, Calif. Free.
Brochure on reduction, fabrication, properties and applications of Ti. (A-general; Ti, 17-57)

275-A. (Book.) Glove Boxes and Shielded Cells for Handling Radioactive Materials.

G. N. Walton. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. $16.80.

Symposium on radiation shielding. Safe handling of plutonium, uranium-233 and cesium isotopes. (A7r, 1-52; Cs, Pu, U, 14-63)

276-A. (Book.) Elements of Physical Metallurgy. A. G. Guy. 528 p. 1959. Addison-Wesley Publishing Co., Inc., Reading, Mass. $9.50.

Second edition of text for engineering and science students. Added sections include: introduction to dislocation theory, additional material on electron theory of metals and a new chapter, "Phases in Metal Systems". (A-general, M-general, N-general)

277-A. (Book.) New Fabrication Techniques. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio, 1958, 62 p. $2.95.

Compilation of papers presented at the First Southwestern Metal Congress, Dallas, Tex., May 12-16, 1958. Items abstracted separately. (A-general, G-general K-general)

278-A. (Book.) Iron and Steel Industry in Europe. 146 p. July 1958. Organization for European Economic Cooperation, 1346 Connecticut Ave., N. W., Washington 6, D. C. $1.50.

Capacity, production and supplies; problems in the industry. Forecast of raw material requirement in 1961. (A4p; ST)

279-A. (Book.) Market Sampling Study on Iron and Steel Products. Results of a Pilot Study Carried Out in Switzerland, Project no. 328. 116 p. June 1958. Organization for European Economic Cooperation, 1346 Connecticut Ave., N. W., Washington 6, D. C. $1.25.

Demand for Fe and steel products at present and for the next five years. (A4p, D-general)

280-A. (Book.) Radioisotopes in Scientific Research. 4 vol. 1958. Pergamon Press, 122 E. 55th St., New York 22, N. Y. $7.00 each vol.

Metallurgical papers abstracted separately. (A-general, 1-59)

281-A. (Translation—BISI no. 1065.) Possible Uses of Blast Furnace Gas for the Synthetic Production of Hydrocarbons. H. Kolbel. *Stahl und Eisèn*, v. 78, Aug. 21, 1958, p. 1165-1169.

See item 667-A, 1958. (A11e, A8a; RM-m39)

282-A.* Clad Aluminum Alloys. F. C. Porter. *Metallurgia*, v. 59, Feb. 1959, p. 67-73.

Manufacture, properties and applications. 24 ref. (A-general, T24, T29; Al-b, 8-66)

283-A.* 3 New Alloys Beat Heat, Nuclear Barriers. *Chemical Engineering*, v. 66, Feb. 23, 1959, p. 168-172.

Armco 22-4-9, a stainless steel with very high carbon content, retains hardness to 1600° F. New Jones and Laughlin series of carbon steels do not retain radioactivity. New group of National Research Corp. Fe-Al-Mn alloys combine light weight, excellent ductility, high-temperature strength, and oxidation resistance. (A-general, P17, Q29, 2-62; SS, CN, Fe-b, *Al, Mn*)

284-A. Refractory Metals and Their Alloys. Thoedore F. Davis. Technical Information Service Extension, Oak Ridge National Laboratory. *U. S. Atomic Energy Commission, TID-3524*, Jan. 1959, 10 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

93 references to unclassified AEC and non-AEC reports relating to Mo, Ta, Cb, V and W. (A-general; Mo, Ta, Cb, V, W, EG-d37)

285-A.* Beryllium, J. W. F. Blizard, Jr., and Frank A. Twitchell. *Materials in Design Engineering*, v. 49, Mar. 1959, p. 91-93.

Practical report on properties, fabrication and uses. (A-general, Q-general; Be)

286-A.* Why and How to Use Gray and Ductile Iron Castings. Richard C. Meloy. *Modern Castings*, v. 35, Mar. 1959, p. 24-26.

Properties and applications of iron castings with emphasis on economy and design. (A-general; CI-n, CI-r, 17-57)

287-A.* Why and How to Use Steel Castings. C. W. Briggs and G. K. Dreher. *Modern Castings*, v. 35, Mar. 1959, p. 30-33.

Properties and applications of carbon and alloy steel castings. (A-general; ST, CN, AY, 5-60, 17-57)

288-A.* (French.) Semi-Stainless High-Strength Steels for Welded Construction Produced in the United States. J. Pitaud. *Revue du Nickel*, v. 24, Nov-Dec. 1958, p. 105-115.

Principal compositions, mechanical properties, impact strength, wear and corrosion resistance, fabrication, applications. 15 ref. (A-general, Q-general; SS, SGB-a, 17-57)

289-A. Vanadium. Ronald Cowgill and Jack Bishop. *Colorado Engineer*, v. 55, Jan. 15, 1959, p. 10-13.

History, mineralogy, chemistry, refining, properties, use as a catalyst. 11 ref. (A-general; V)

290-A. Annual Report-1958. *International Tin Research Council*, Publication no. 294, 1958, 39 p.

Activities, research program, publications. (A9; Sn)

291-A. New Look Comes to Steel. *Metal Progress*, v. 75, Mar. 1959, p. 126-127.

Vinyl-coated steel; properties, applications. (A-general; ST, NM-d, 7-59)

292-A. Atomic Hazards During Fires. F. R. Farmer. Digest from "Radioactive Materials and Industrial Fire Protection, Industrial Fire Officers' Conference", May 15, 1958. *Metal Progress*, v. 75, Mar. 1959, p. 184, 189A.

Protective measures for firemen and others during and after fires creating atomic hazards. (A7r)

293-A. Vanadium. *Metal Treatment and Drop Forging*, v. 26, Feb. 1959, p. 77-78.

Reduction processes; mechanical and working properties; applications. (A-general, Q-general; V, 17-57)

294-A. Aluminum and Its Alloys in 1958. E. Elliott. *Metallurgia*, v. 59, Feb. 1959, p. 79-89.

Research and technical progress in the various aspects of the metallurgy of Al and its alloys, including extraction, founding, fabrication, constitution, properties and standardization. 102 ref. (A-general; Al)

295-A. Copper and Copper Alloys. E. Voce. *Metallurgia*, v. 59, Feb. 1959, p. 88-92.

Raw material resources, extraction, fabrication, finishing and properties. (A-general; Cu)

296-A. Health Protection in Beryllium Facilities. Summary of Ten Years of Experience. A. J. Breslin and W. B. Harris. Health and Safety Laboratory, New York Operations Office. *U. S. Atomic Energy Commission, HASL-36*, May 1, 1958, 58 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

In-plant design and operation; transfer of material; waste disposal; maximum permissible exposure levels. 35 ref. (A7; Be)

297-A. (Italian.) The Metal of Necklaces Found in Ancient Tombs Near St. Peter's Bridge in Castro d'Ischia, Naples. L. Cambi. *Rendiconti*, v. 92, no. 2, 1958, p. 169-172.

Scientific examination revealed that these relics of Bronze Age were made of Sb instead of Sn as previously supposed. 4 ref. (A2; Sb)

298-A.* (Hungarian.) Plutonium. Rezso Hantos. *Kohaszati Lapok*, v. 91, Oct-Nov. 1958, p. 513.

Methods of producing pure metallic Pu; physical properties; reactor applications. (A-general, T11g; Pu, 17-57)

299-A. How Science Serves Canadian Foundries. Pt. 1. S. L. Gertsman. *Canadian Metalworking*, v. 22, Mar. 1959, p. 26-28, 30, 32.

Canadian Department of Mines and Technical Surveys facilities and programs in field of foundry practice. (To be continued.) (A9h, E-general)

300-A. Horsehay Blast Furnaces. R. A. Mott. *Engineer*, v. 207, Mar. 13, 1959, p. 424-425.

Historical note on blowing equipment. 7 ref. (A2, D1)

301-A. Design Pointers for Investment Castings. W. O. Sweeny. *Materials in Design Engineering*, v. 49, Mar. 1959, p. 110-112.

(A-general, 5-62, 17-51)

302-A. Aid for the Design Engineer: Foundrymen! "Accentuate the Positive". Jules J. Henry. *Modern Castings*, v. 35, Mar. 1959, p. 53-60.

Engineering advantages of castings include design freedom, reduction of stress concentrations, low end cost, uniform strength, good appearance, choice of properties. 16 ref. (A-general; 5, 17-51)

303-A. Design Engineering as Related to Magnesium Castings. George H. Found. *Modern Castings*, v. 35, Mar. 1959, p. 67-72.

10 ref. (A-general; Mg, 5, 17-51)

304-A. Development of Steel. W. R. Patterson. *Yale Scientific Magazine*, v. 33, Feb. 1959, p. 21-28.

Historical review of iron and steel making. (A2, D-general)

305-A. (French.) Copper Metallurgy Among the Ancients. Andre Roos. *Cuivres, Laitons, Alliages*, v. 46, Nov-Dec. 1959, p. 32-36.
Antiquity of Cu and bronze metallurgy; As in ancient coppers. (A2; Cu, Cu-s, As)

306-A. (French.) Complexity of Materials Handling Problems in the Foundry. *Journal d'Informations Techniques des Industries de la Fonderie*, Oct. 1958, p. 11-14.
(A5a, E-general)

307-A.* Manufacture and Applications of a Cobalt-Base Alloy. P. van Bleyenberghe. *Cobalt*, no. 2, Mar. 1959, p. 3-10.
Alloy containing 50% Co and 50% ferrochromium is easy to cast, requires no heat treatment and may be used in applications requiring high strength and corrosion resistance at elevated temperature. (A-general; Co-b, *Cr, Fe, Mo*, 17-57)

308-A.* (Italian.) Boron in Steels. Pt. 1. Low-Boron Steels. D. Pittoni. *Metallurgia Italiana*, v. 51, Jan. 1959, p. 21-30.
Development of boron steels. Effects of B on hardenability, case hardening processes and isothermal and martensite transformations. Mechanical and technological properties. Manufacturing principles and techniques; ferroboron alloys used, deoxidation of bath prior to B addition. Spectrographic and chemical methods of analysis. 18 ref. (A-general, N-general, J-general, Q-general, 2-60, S11k; AY, *B*)

309-A.* (Italian.) Boron in Steels. Pt. 2. High-Boron Steels. D. Pittoni. *Metallurgia Italiana*, v. 51, Jan. 1959, p. 31-34.
B, B_4C and BN for nuclear reactor control rods; mechanical, physical and technological properties of these steels; manufacture, mechanical working. 4 ref. (A-general, Q-general, T11j; ST, *B*)

310-A.* Production and Use of Plutonium. F. Foote. *Organization for European Economic Co-Operation, Information Conference on Nuclear Energy for Management*, June 1957, p. 123-132.
Properties, reduction, applications. (A-general; Pu, 17-57)

311-A. Noral 62S (Aluminum Extrusion Alloy). *Alloy Digest*, Al-77, Apr. 1959, 2 p.
Composition, characteristics, physical and mechanical properties. (A-general. P-general, Q-general; Al-b, 4-58)

312-A. Ambraloy-901 (Aluminum Bronze, 5%). *Alloy Digest*, Cu-73, Apr. 1959, 2 p.
Characteristics, physical and mechanical properties of ductile Cu alloy. (A-general, P-general, Q-general; Cu-s, *Al*)

313-A. Unitemp M-252 (High-Strength Nickel-Base Forging Alloy). *Alloy Digest*, Ni-52, Apr. 1959, 2 p.
Composition, characteristics, physical and mechanical properties. (A-general, P-general, Q-general, 2-62; Ni-b, 4-51)

314-A. MST 3A1-2.5V. *Alloy Digest*, Ti-18, Apr. 1959, 2 p.
Composition, characteristics, physical and mechanical properties of a new weldable Ti alloy. (A-general, P-general, Q-general, 2-62; Ti-b)

315-A. CHW (Hot Work Steel, Type H24). *Alloy Digest*, TS-81, Apr. 1959, 2 p.
Composition, characteristics and properties. (A-general, Q-general; TS)

316-A. A.C.I. Type HI (Heat and Corrosion Resisting Steel). *Alloy Digest*, SS-86, Apr. 1959, 2 p.
Composition, characteristics, physical and mechanical properties of new stainless steel. (A-general, P-general, Q-general, R-general, 2-62; SS)

317-A. Rytense (Free-Cutting Machinery Steel). *Alloy Digest*, CS-9, Apr. 1959, 2 p.
Composition, characteristics, physical and mechanical properties of new carbon steel. (A-general, G17k, P-general; CN)

318-A.* Fabricating Techniques for High-Strength Superalloys. H. E. Haley. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 175. American Society of Tool Engineers, Detroit, 1958, 13 p.
Classification, elevated-temperature properties, surface preparation, joint design, welding techniques, production of vessel linings, forming, heat treatment, descaling and forging. (A-general, K-general, J-general, G-general, L12g, F22; SS, Ni-b, Co-b, SGA-h, SGB-a)

319-A.* Fabrication of Beryllium. K. G. Wikle. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 176. American Society of Tool Engineers, Detroit, 1958, 16 p.
Mechanical properties at room and elevated temperatures of vacuum hot pressed Be powdered compacts and of forms following extrusion or rolling. Physical properties, machining, forming, joining

and stress relief. (A-general, Q-general, H-general; Be)

320-A.* (German.) Beryllium—New Research Results in U.S.A. H. Weik. *Metall*, v. 13, Mar. 1959, p. 202-213.
Historical development, preparation, chemical and physical properties and fabrication of Be. 66 ref. (A-general, Q-general; Be, 17-57)

321-A. Nickel Applications. *Corrosion Prevention & Control*, v. 6, Feb. 1959, p. 47-48.
Consumption figures of 1958 show that corrosive, mechanical and thermal properties provided new and restoration of older uses. (A-general; Ni, 17-57)

322-A. Lanthanons and Yttrium. R. J. Callow. *Drug and Chemical Exports*, v. 19, Feb. 1959, p. 27-30.
Sources, preparation, properties, uses. (A-general; EG-g, La, Y)

323-A. Iron and Steel Industry of Japan. Tetsuo Shimamura. *Journal of Metals*, v. 11, Mar. 1959, p. 163-167.
Development, production, consumption and raw materials. (A4p, A11a; ST)

324-A. Metallurgical Research in Japan. Tokushichi Mishima. *Journal of Metals*, v. 11, Mar. 1959, p. 168-169.
Past and current work with iron and steel; high-temperature metals; fabrication; magnetic materials; nuclear metallurgy and metal physics. (A9)

325-A. Slag Recovery at Yawata Works. Kamekichi Wada. *Journal of Metals*, v. 11, Mar. 1959, p. 187-188.
Beneficiation and magnetic separation of openhearth slag; use in blast furnace and sintering plant. (A11d, RM-q)

326-A. Aluminum and Its Alloys in 1958. E. Elliott. *Metallurgia*, v. 59, Mar. 1959, p. 109-116.
Properties, corrosion, applications and standards. 222 ref. (A-general; Al)

327-A. Copper and Copper Alloys. A Survey of Technical Progress During 1958. Pt. 2. E. Voce, *Metallurgia*, v. 59, Mar. 1959, p. 131-138.
Properties, corrosion, joining, powder metallurgy, chemical analysis, history. 303 ref. (A-general; Cu)

328-A. Cadmium. Robert L. Mentch and Arnold M. Lansche. *U. S. Bureau of Mines, Information Circular*, 7881 (Revised), 1958, 43 p.
Geology, sources, beneficiation and war-time controls. (A-general; Cd)

329-A. (German.) Metallographic Examination of Prehistoric and Ancient Iron Objects. Radomir Pleiner. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 294-298.
Fabrication methods included welding of steels with widely differing carbon content to produce tools, and carburizing of tool edges. 17 ref. (A2, K-general, J28g; ST, Fe)

330-A. (Hungarian.) Dust Control in Foundry Operations. Lajos Hirsch. *Kohaszati Lapok-Ontode*, v. 91, Oct-Nov. 1958, p. 246-249.
5 ref. (A8a, E-general)

331-A. (Italian.) Metallographic Examination of Gallic Sword Blades From the Second Century B. C. C. Panseri and M. Leoni. *Metallurgia Italiana*, v. 51, Jan. 1959, p. 5-12.
10 ref. (A2, Fe)

332-A.* Metallurgy of the Less Common Metals. Arthur R. Lytle. *Chemistry & Industry*, Mar. 21, 1959, p. 378-385.
Ta, Cb, W, Be, Li and rare earths. (A-general; Be, Cb, Li, Ta, W, EG-g)

333-A. (Book.) ASTE Collected Papers 1958. v. 58, Book no. 2. n.p. 1958. American Society of Tool Engineers, 10700 Puritan, Detroit 38, Mich.
Technical papers and panel conferences presented at 26th semi-annual meeting. Papers abstracted separately. (A-general, G-general)

334-A. (Book.) The Engineer Buyers Guide. 959 p. 1959. The Engineer, 28 Essex St., Strand, London, W.C.2, England. 9s 3d.
Lists technical societies, commercial firms, British Government offices. Principal sections include sheet metal working machinery, machine tools, electrical equipment. (A-general, W24, W25, 11-67)

335-A. Rhenium. L. Sanderson. *Canadian Mining Journal*, v. 81, Mar. 1959, p. 70-72.
(A-general; Re)

336-A. Tantalum. Pt. 2. G. L. Miller. *Chemical Industry and Engineering*, v. 12, Feb. 1959, p. 41-44.
19 ref. (A-general; Ta)

337-A. Rare-Earth Carbides. Pt. 1-3. R. C. Vickery, R. Sedlacek and Ardys Ruben.

Chemical Society, Journal, Feb. 1959, p. 498-510.
26 ref. (A-general; EG-g, NM-a35)

338-A. Production, Fabrication, Properties and Uses of Some Newer Metals. N. P. Inglis. *Machinery Market,* no. 3043, Mar. 12, 1959, p. 25-28.
Titanium, zirconium, beryllium. (To be continued.) (A-general; Be, Ti, Zr)

339-A. Aircraft and Missile Problems Spur Successful Western Metal Congress. *Metal Progress,* v. 75, Apr. 1959, p. 96-F-96N.
Technical sessions included discussion of selection criteria for materials, carbon control in heat treating and hydrogen embrittlement, vacuum melted alloys, welding of high-strength metals for pressure vessels, materials for extremely high temperatures and radiation effects on materials. (A-general)

340-A. Manganese. Marvin J. Udy. *Mines Magazine,* v. 49, Mar. 1959, p. 26-31.
Sources of ores. (Alla; Mn)

341-A. Role of National Metallurgical Laboratory in Ferrous Metallurgical Research and Development in India. B. R. Nijhawan. *NML Technical Journal,* v. 1, Feb. 1959, p. 29-40.
(A9h; Fe)

342-A. Industrial Sources of Air Pollution. Pt. 4. Metallurgical. Thomas C. Wurts. Paper from "National Conference on Air Pollution, Proceedings," U. S. Public Health Service, Publication 654, 1959, p. 161-164.
Dust control in the iron and steel industry. (A8a; D-general)

343-A. The Use of Bio-Assays in the Safe Disposal of Electroplating Wastes. Clarence M. Tarzwell. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society,* 1958, p. 60-62.
Detection and measurement of various metal process wastes. (A8b, L17)

344-A. Industrial Waste Treatment and Water Reclamation. A Case Study. Wayne L. Gasper. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society,* 1958, p. 63-67.
Procedures for disposing of electroplating wastes. (A8b, L17)

345-A. (German.) Testing and Measuring Apparatus in the Metal Industry. A. Schwarz. *Metall,* v. 13, Apr. 1959, p. 313-318.
8 ref (A-general, X-general)

346-A.* How to Get More for Your Metalworking Dollar: Tool Steels With a Directory of AISI Types. *Iron Age,* v. 183, Apr. 1959, p. 109-124.
Composition, heat treatment, fabrication and mechanical properties of water hardening, shock-resisting, cold work, hot work, high speed and special-purpose toolsteels. (A-general; TS)

347-A. Symposium: Technology of Molybdenum and Its Alloys. Office of Naval Research. *U. S. Office of Technical Services,* PB 131793, Sept. 1956, 16 p. $.75.
Abstracts of papers on metallurgy, fabrication and applications. (A-general; Mo)

348-A. Steelmaking, U.S.A. Pt. 1. Leo F. Reinartz. *Journal of Metals,* v. 11, Apr. 1959, p. 261-264.
Development of early bessemer and openhearth plants. (A2, D2, D3)

349-A. Zirconium and Beryllium. N. P. Inglis. *Machinery Market,* no. 3044, Mar. 19, 1959, p. 312-315.
(To be continued.) (A-general; Be, Zr)

350-A. Bulk Handling Titanium Sponge. A. E. Williams. *Mining Magazine,* v. 100, Mar. 1959, p. 137-140.
Methods and equipment used at the New York State plant of the National Lead Co. (A5a, W12; Ti, 6-74)

351-A.* (French.) New Refractory Alloys Developed in Czechoslovakia. Adolphe Plesinger. *Fonderie,* Feb. 1959, p. 75-89.
Lamellar and spheriodal graphite 3-8% Si iron alloys, 28-30% Al "Pyroferal": melting procedures, metallurgical control, furnace requirements, pouring and molding; principal mechanical and physical properties, resistance to oxidation, fracture, structure, applications. Defects found in "Pyroferal" casting. 16 ref. (A-general, E-general, P-general, Q-general, R1h; CI-q, *Si, Al,* 9)

352-A.* (French.) Bronze and Its Application. Pierre Weill-Couly. *Technique de L'eau,* no. 147, Mar. 15, 1959, p. 37-43.
Cu-Al alloys (Inoxyda 3, 3P, 53, 72, 85 and 90) containing Br, Ni, Fe and Mn; mechanical, physical, chemical properties. (A-general, Q-general, P-general; Cu-s, *Br, Ni, Fe, Mn, Al,* 17-57)

353-A. Emissions From Iron Foundries. F. M. Shaw. *Foundry Trade Journal,* v. 106, Apr. 16, 1959, p. 439-444.

Smoke, grit and dust can be reduced. 7 ref. (A8a, D-general)

354-A. Dust and Fume Problems in the Finishing Industry. J. B. Stribling. *Industrial Finishing (London)*, v. 11, Apr. 1959, p. 21-24.
(A8a, W13c, L-general)

355-A. Removal of Dust and Fume From Openhearth Waste Gases. Pt. 1. Non-Electric Filtering Methods. K. Guthmann. *Iron & Coal Trades Review*, v. 178, Apr. 10, 1959, p. 831-838. (From *Radex Rundschau*, v. 6, 1958.)
33 ref. (A8a, D2, W13c)

356-A. (French.) Copper Through the Ages: Some 16th Century French Founders. *Cuivre, Laitons, Alliages*, Feb. 1959, p. 24-27.
(A2; Cu)

357-A. Department of Defense Titanium Sheet Rolling Program, Status Report no. 4. H. R. Ogden. *Defense Metals Information Center*, Report no.46F, PB 151065, Mar. 20, 1959, 84 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)
Progress in the development of Ti-6Al-4V, Ti-4Al-3Mo-1V, Ti-2.5Al-16V and Ti-13V-11Cr-3Al (B12OVCA) alloys. Data on fabrication processes, heat treatment and mechanical properties. (A-general, J-general, Q-general; Ti-b, 4-53, *Al, V, Mo, Cr*)

358-A.* Beryllium—Past, Present and Future. Charles T. Baroch. *Mines Magazine*, Apr. 1959, p. 19-22.
Resources, applications, cost. 10 ref. (A-general; Be, 17-57)

359-A.* New Metals. M. K. McQuillan. *Birmingham Metallurgical Society, Journal*, v. 39, Mar. 1959, p. 3-17.
Ti, V, Cr, Zr, Cb, Mo, Hf, Ta, W. (A-general; Cb, Cr, Hf, M, Ta, Ti, V, W, Zr)

360-A.* Some Trends in American Metallurgy. W. O. Alexander. *Birmingham Metallurgical Society, Journal*, v. 39, Mar. 1959, p. 18-33.
Resources, production, technology, research. (A-general)

361-A.* Current Tin Research. *Corrosion Prevention & Control*, v. 6, Mar. 1959, p. 55-58.
Latest developments in following tin industry techniques: tin plating, hot tinning, testing, electroplating, alloying, soldering, sintering. (A-general, 17-57; Sn)

362-A.* Newer Metals. N. P. Inglis. *Mass Production*, Apr. 1959, p. 65-68, 113-114.
Ti, Zr, Be and Cb. (A-general; Be, Cb, Ti, Zr)

363-A.* Niobium (Columbium)—Its Future Prospects. J. Sandor. *Metallurgia*, v. 59, Apr. 1959, p. 185-194.
Sources; consumption; advances in extraction techniques; physical properties. Use in steels, heat resisting alloys and nuclear engineering. 28 ref. (A-general, C-general, P-general; Cb, SGA-h, SGB-p)

364-A.* For Many Thin Parts Powder Metallurgy Can Compete With Stamping. John Haller. *Product Engineering, (Design Show Issue)*, v. 30, May 11, 1959, p. 82-83.
Powder metal parts are less costly for thin parts and bearings and in cases where stampings require excessive secondary forming operations. (A-general, T7d; 4-59, 6-72, 17-57, 17-53)

365-A.* (Hungarian.) Production and Use of Beryllium Bronze. Pt. 1. Fulop Balazs and Bela Paar. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 8-13.
Composition and effect of impurities; mechanical properties with and without preliminary heat treatment; grain size and growth related to annealing time and temperature. (A-general, J-general, Q-general, N3, 3-69; Cu-s, *Be*)

366-A. Wrought Iron Learns New Tricks. *Chemical Engineering*, v. 66, Mar. 9, 1959, p. 172, 174, 176.
New type shows improved resistance to corrosion by atmosphere, acids and alkalies. (A-general, R-general; Fe-m)

367-A. The Measurement and Control of Dust in Foundries. A. H. Sully, C. M. Stoch and J. M. Slater. *British Foundryman*, v. 52, Apr. 1959, p. 193-211.
44 ref. (A8a, E-general)

368-A. The Forging Industry. Past, Present and Future. G. H. Jackson. *Metal Treatment and Drop Forging*, v. 26, Apr. 1959, p. 137-144.
History of iron and steel forging. Development of forging hammers and open and closed die techniques. 8 ref. (To be continued.) (A2, F22, W22; ST)

369-A. (Russian.) Borides of Rare Earth Metals. G. V. Samsonov. *Uspekhi Khimii*, v. 28, no. 2, 1959, p. 189.

A survey of structure and properties of boride rare earth metals. 72 ref. (A-general; EG-g, NM-a37, *B*)

370-A. (Book.) National Conference on Air Pollution, Proceedings, Nov. 1958. *U. S. Public Health Service*, Publication 654, 1959, 525 p. $1.75.

Papers of interest are abstracted separately. (A8a)

371-A. (Book.) Metal Industry Handbook and Directory, 1959, 564 p. 1959. Iliffe & Sons Lts., Dorset House, Stamford St., London, S. E. 1., England. 22s. 9d.

Data on metals and processes; British standards, directory, trade names. (A-general, 11-67)

372-A. (Book.) Industrial Procurement: Galvanized Steel Sheets. 36 p. 1959. American Zinc Institute, Inc., 60 East 42nd, New York 17. Free.

Properties, applications, specification, purchase and maintenance of galvanized steel sheet for industrial uses. (A-general; ST, Zn, 4-53, 8-65)

373-A. (Book.) Seamless Aircraft Tubing: Carbon and Alloy Steels. Ohio Seamless Tube Div. of Copperweld Steel Co., Technical Handbook no. A-2, 7th Revision, May 1, 1959, 70 p. Free.

Definitions, specifications, properties and mill practice. (A-general, S-22; AY, CN, 4-60)

374-A. (Book.) Radioisotopes in Scientific Research. v. 1, R. C. Extermann, Editor. 761 p. 1958. Pergamon Press, 122 E. 55th St., New York 22. $22.50.

Proceedings of the International Conference held in Paris, Sept. 1957. Pertinent papers previously abstracted separately. (A-general, 1-59, 14-63)

375-A. (Translation.) Removal of Dust and Fume From Openhearth Waste Gases. Pt. 2. The Electrostatic Filter. *Iron & Coal Trades Review*, v. 178, Apr. 17, 1959, p. 903-908. (From *Radex Rundschau*, v. 6, 1958.)

16 ref. (A8, D2, W13c)

376-A. (Translation.) Germanium. A. Lubke. *Metal Treatment and Drop Forging*, v. 26, Mar. 1959, p. 103-106. (From *Metall*, July 1958.)

(A-general; Ge)

377-A. (Translation—BISI no. 1154.) Utilization of the Sludge From Gas Scrubbers. B. Weilandt and F. Krause. *Stahl und Eisen*, v. 78, Nov. 13, 1958, p. 1657-1662.

See item 155-A, 1959. (A11d, D1, Zn)

378-A.* (French.) Semifinished Cast and Sintered Beryllium Products Compared. R. Syre, A. Saulnier and M. Perex. *Revue de Metallurgie*, v. 56, Apr. 1959, p. 359-370.

Advantages and disadvantages of Be ingot and part preparation by casting and powder metallurgy techniques; machining; crystal structure in annealed, extruded and rolled conditions; mechanical properties. (A-general, E-general, H-general, Q-general; Be)

379-A.* (French.) Titanium and Titanium Alloys in Aircraft Construction. Pierre Vachet. *Technique et Science Aeronautiques*, v. 5, Oct. 1958, p. 221-241.

Physical metallurgy, influence of impurities and addition elements; mechanical working, heat treatment, welding, brazing, descaling, electroplating; mechanical properties at ordinary and high temperatures; economic factors. 29 ref. (A-general, Q-general, 2-60, T24; 17-57, Ti)

380-A.* (German.) Beryllium in Modern Engineering. R. Reinbach. *Industrie-Anzeiger*, v. 81, Mar. 24, 1959, p. 15-17.

Properties and uses of pure Be and Be alloys. (A-general, 17-57, Q-general; Be)

381-A.* (German.) New Materials for Chemical Industry. R. Oppenheim. *Industrie-Anzeiger*, v. 81, Feb. 17, 1959, p. 191-198.

Composition and properties of stainless steels; Cr-Ni steels with low carbon content; high Mn steels; ferritic-austenitic Cr-Ni-Mo steels; precipitation hardening steels; nuclear reactor steels; high-temperature resistant steels; corrosion resistant special alloys; Ti and Zr. 17 ref. (A-general, T29, Q-general; SS, SGA-h, SGA-g, 17-57, *Ti, Zr*)

382-A.* (German-French.) Properties and Weldability of New Metals and Alloys. C. G. Keel. *Zeitschrift fur Schweisstechnik, Journal de la Soudure*, v. 49, Apr. 10, 1959, p. 103-110.

Physical, chemical and mechanical properties of Zr, V, Hf, Be, Pu, Rh, Ta and U. Machinability, weldability and brazing properties; industrial applications. 37 ref. (A-general; Zr, V, Hf, Be, Pu, Rh, Ta, U, 17-57)

383-A. Beryldur (Beryllium-Copper Alloy). *Alloy Digest,* Cu-74, May 1959, 2 p.

Low-cost, easy to work alloy having age-hardening characteristics, high tensile properties and excellent corrosion resistance. (A-general, Q-general; Cu-b, *Be,* 17-57)

384-A. Aluminum Brass. *Alloy Digest,* Cu-75, May 1959, 2 p.

Used in tubes for condensers, evaporators, heat exchangers and distillers. (A-general; Cu-n, *Al,* 17-57)

385-A. Ti-155A (Titanium-Base Alloy). *Alloy Digest,* Ti-19, May 1959, 2 p.

Ti alloy having guaranteed heat treat capability up to 175,000 psi. tensile strength for bar stock and 180,000 psi. for forging stock. Used as forgings for aircraft applications such as propeller blades. (A-general, Q-general; Ti-b, 4-51, 17-57)

386-A. (Czech.) Economical Composition for Austenitic Stainless Cr-Mn-Ni-N Steels. Karel Hybek, Jan Solc and Marcela Zezulova. *Hutnicke Listy,* v. 14, Apr. 1959, p. 287-237.

Metallographic, corrosion, mechanical, deformability and weldability tests with samples of various compositions. Effect of nitrogen on the preservation of austenitic structure. 18 ref. (A-general, Q-general, R11, K9s, 2-60; SS-e, *Cr, Mn, Ni, N*)

387-A.* Radioisotopes Utilization in the Foundry Industry. M. Pobereskin and D. N. Sunderman. *Modern Castings,* v. 35, May 1959, p. 69-74.

Applications include wear measurement, tracing of chemical reactions, measurement of thickness, location of alloying elements. (A-general, E-general, 1-59)

388-A. Meltron AM503 (Wrought Magnesium Alloy). *Alloy Digest,* Mg-41, May 1959, 2 p.

Medium strength Mn-type Mg-base alloy does not respond to a hardening heat treatment but is useful where maximum formability, weldability, and resistance to corrosion are desired. (A-general; Mg-b, *Mn,* 17-57)

389-A. Lukens Nine Nickel (Nickel Alloy Steel). *Alloy Digest,* SA-83, May 1959, 2 p.

Dependable for service to -320° F. and resistant to brittle fracture at low temperatures. Used for storage and process vessels handling liquified gases. (A-general, 2-63; AY, *Ni,* 17-57)

390-A. Westinghouse W545 (High Strength, High Temperature Alloy). *Alloy Digest,* SS-87, May 1959, 2 p.

Heat treatable alloy with good high-temperature strength and oxidation resistance, designed for high temperature, high stressed parts in missiles and turbines. (A-general, R-general, 2-62; SGB-a, SS, 17-57)

391-A. AISI Type 431 (Corrosion and Heat Resisting Steel). *Alloy Digest,* SS-88, May 1959, 2 p.

A ferromagnetic, corrosion and heat resistant stainless steel suitable for aircraft and marine applications. (A-general, R-general, Q-general, 2-62; SS, 17-57)

392-A. Ferro-Tic Gr. C (Machinable Cemented Carbide). *Alloy Digest,* TS-82, May 1959, 2 p.

Can be fabricated in the annealed condition with conventional tools and subsequently hardened. Used for dies, cutting tools, gages, valves and shafts. (A-general, G17k, J-general; Ti, 6-69, 17-57)

393-A.* (German.) New Developments in Nickel Containing Materials. *Metall,* v. 13, May 1959, p. 420-427.

Composition and characteristics of Cr-Ni stainless steels, Ni-Cr, Ni-Cr-Fe, Ni-Mo-Fe, Ni-Mo-Cr-W alloys and a Ni-Mo-Fe alloy with V that shows corrosion and wear resistant Ni-alloyed cast iron. Ni-Fe alloys with special magnetic properties; effect of Ti on the elastic limit of Ni-Co-Fe alloys; magnetorestriction in Co-Ni alloys. (A-general, R-general, P16; Ni-b, *Fe, Cr, Mo, W, V, Co*)

394-A. Progress Relating to Civilian Applications During January 1958. Russell W. Dayton and Clyde R. Tipton. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1253, Feb. 1, 1958, 62 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Summary of research relating to Zr-clad and Al-clad fuel elements, uranium and uranium alloy fuels, fatigue studies on Inconel, reactor materials and components, and corrosion problems associated with the recovery of spent reactor fuel elements. (A-general, T11g, Q7, R-general, A8c; U, *Zr, Al,* Ni-b)

395-A. Further Studies of Sintered Refractory Uranium Compounds. Arch B. Tripler, Jr., M. Jack Snyder and Winston H. Duckworth. Battelle Memorial Institute.

U. S. Atomic Energy Commission, BMI-1313, Jan. 27, 1959, 46 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Properties of a number of refractory binary compounds of uranium. Methods of preparation, fabrication and some physical and chemical properties of UC, UC_2, UBe_{13}, UN and UB_2. 16 ref. (A-general; U, *B, C, N, Be,* 6-71)

396-A. Steel in the German Economy: A Comparison With Britain. *Steel Review,* no. 14, Apr. 1959, p. 11-25.
(A-general, D-general; ST)

397-A. Another Look at the History of Stainless Steel. *Vancoram Review,* v. 14, no. 1, 1959, p. 13-14.
(A2; SS)

398-A. (French.) Beryllium. P. Vachet. *Chimie et Industrie,* v. 81, Jan. 1959, p. 64-77.
(A-general; Be)

399-A. (French.) The New Industrial Metals. Emile Pruvot. *Societe Francaise des Electriciens, Bulletin,* v. 9, Jan. 1959, p. 16-27.

Ores, extraction, metallurgy, properties, applications of Be, Ti, Zr, Ta, Cb. (A-general, 17-57; Be, Ti, Zr, Ta, Cb)

400-A.* (Hungarian.) Production and Use of Beryllium Bronze. Pt. 1. F. Balazs and B. Paar. *Kohaszati Lapok,* v. 92, Feb-Mar. 1959, p. 55-60.

Influence of tempering temperature and time on strength and electric conductivity, changes in properties due to cold working between quenching and drawing, grain boundary precipitations. Production methods such as melting, casting, hot and cold forming, heat treatment and pickling. 12 ref. (A-general, P-general; Cu-s, *Be,* 17-57)

401-A. Trends in Metals—Aluminum's on the Move. *Steel,* v. 144, June 8, 1959, p. 103-118.

Review of Al industry. (A-general, A4n; Al)

402-A. Technical Survey of the Two-Million-Ton Expansion Program. *TISCO (Technical Journal of the Tata Iron & Steel Co.)* v. 6, Jan. 1959, 67 p.

Planning, transportation and construction activities of the Tata Co. in conjunction with the expansion program. (A-general, D-general; ST)

403-A. Thorium Data Manual. E. L. Francis. *United Kingdom Atomic Energy Authority,* IGR-R/R-303, Oct. 6, 1958, 19 p.

Compilation of best available unclassified data on physical, mechanical, chemical and irradiation properties. 19 ref. (A-general; Th)

404-A. Niobium Data Manual. E. L. Francis. *United Kingdom Atomic Energy Authority,* IGR-R/R-304, Oct. 16, 1958, 15 p.

Compilation of best available data on physical, mechanical and chemical properties of columbium (niobium). (A-general; Cb)

405-A. Vanadium Data Manual. E. L. Francis. *United Kingdom Atomic Energy Authority,* IGR-R/R-306, Oct. 29, 1958, 16 p.

Compilation of the best available unclassified data on the physical, mechanical and chemical properties. (A-general; V)

406-A. Zirconium: A Review and Summary of Published Data. H. Loevenstein and H. L. Gilbert. Harvey Aluminum. *U. S. Atomic Energy Commission,* AECU-3818, Oct. 1958, 227 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $3.50.

Physical, chemical and mechanical properties; corrosion resistance of Zr and Zr alloys; crystal structure; working and fabrication techniques. (A-general; Zr)

407-A. Tantalum Breaks Through With New Production and Fabrication Techniques. Burton Payne. *American Machinist,* v. 103, June 1, 1959, p. 109-111.
(A-general; Ta)

408-A. Treatment of Waste Acid and Effluent From Continuous Strip Pickling Lines. A. E. Matthews. *Wire Industry,* v. 26, May 1959, p. 453-455, 457-459, 492.
(A8b, L12g)

409-A.* (Italian.) Titanium: Production, Properties, Applications. Eugenio Hugony. *Ingeneria Meccanica,* v. 8, Feb. 1959, p. 25-31.

Preparation and refining processes. Behavior of Ti in the presence of corrosive agents of varying concentration and at different temperatures. Improvement of mechanical properties and hot strength by alloying with Al and Sn (alpha alloys). Beta alloys of high plasticity are obtained by adding Mn, V, Cr, Mo. Alpha and beta (Ti-Al-Mn) alloys combine hot strength

and plasticity. (A-general, Q-general, C26, R-general, Ti-b, *V, Mo, Al, Sn, Mn*)

410-A.* Metals for the Future—The Rare Earths. R. B. Howes. *Metal Progress*, v. 75, June 1959, p. 108-112.

Ion-exchange separation, developed during World War II, helped these little-known metals to achieve individuality. With purer metals and oxides available, these metals are now being used as scavengers for steel melts, sources for X-rays and getters for vacuum pumps. In the future, their unique nuclear properties will probably make them valuable as structural materials in reactors. (A-general; EG-g, 17-57)

411-A.* Steel Castings for the Aircraft Industry. Y. J. Elizondo. *Modern Castings*, v. 35, June 1959, p. 79-85.

Requirements for quality steel castings are high strength steels capable of operating at temperatures as high as 1500° F., reproducibility of results, guaranteed strength levels, adequate inspection criteria, improved tolerances, improved cost and time estimates. (A-general, Q-general, 2-62, T24; SS, 5-60, 17-57)

412-A. New Alloy More Resistant Than Pure Ti. *Chemical Engineering*, May 18, 1959, p. 200.

Ti with 0.1% of a noble metal is much more of a "wonder" metal for corrosive service than pure Ti. (A-general, R-general, 2-60; Ti, *EG-c*)

413-A. Rhenium Metal for High Temperature Uses Being Produced at Chase Brass & Copper Co. *Industrial Heating*, v. 26, May 1959, p. 977-978, 980.

Properties, applications, powder metallurgy techniques. (A-general, H-general; Rh, 17-57)

414-A. Production, Fabrication, Properties and Uses of Some of the Newer Metals. N. P. Inglis. *Institution of Production Engineers Journal*, v. 38, May 1959, p. 219-237.

Ni, Hf and Ta. (A-general, Ni, Hf, Ta, 17-57)

415-A. Steelmaking Processes in Relation to Atmospheric Pollution. R. J. Sarjant. *Iron & Steel*, v. 32, May 1959, p. 185-190.

27 ref. (A8a, D-general)

416-A. Collection and Filtration of Toxic Particles. *Machinery (London)*, v. 94, May 27, 1959, p. 1193-1195.

Equipment for handling Be and other toxic substances in finely divided form. (A8c, A7r; Be)

417-A. Industrial and Engineering Uses of the Platinum Metals. A. R. Myhill. *Mechanical World and Engineering Record*, May 1959, p. 198-202.

The noble metals belonging to the Pt group (Pt, Pd, Ir, Rh, Os and Ru) although expensive in first cost, are employed extensively in many industries since their high melting point and resistance to corrosion at all temperatures enable them to be used for purposes where it would be impracticable to use other materials. (A-general; EG-c, 17-57)

418-A. (Book.) Fabrication of Molybdenum. 221 p. 1959. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $6.50.

Alloy development, rolling, welding, brazing, machining, press extrusion, forming, forging and coating. Application requirements. Papers abstracted separately. (A-general; Mo)

419-A. (Book.) Physical Metallurgy. C. Ernest Birchenall. 323 p. 1959. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 26, N. Y. $8.50.

Textbook for advanced undergraduate students in engineering and science, structures and equilibria; kinematics of physical and chemical reactions with emphasis on plastic deformation mechanisms; diffusion and solid-solid reactions. Solidification, ingot formation and zone melting; diffusion in metals and oxides, recovery and age hardening. (A-general)

420-A.* (Italian.) Properties and Applications of Nickel Silver. *Nickel*, no. 78, Feb. 1959, p. 1-16.

Composition and mechanical properties of 65-10, 65-12, 65-12 Pb, 65-15, 65-18-46, 5-10 Pb, 64-18, 64.18 Pb-B 149.52-No. 10A, 11A, 11B in relation to temperature, corrosion behavior, heat treatment, cold working, welding, machining, polishing and finishing. (A-general, J-general, Q-general, R-general; Cu-b, *Ni, Pb*)

421-A.* (Italian.) Cast Chromium-Nickel Austenitic Stainless Steels. *Nickel*, no. 78, Feb. 1959, p. 17-19.

Mechanical properties, heat treatment, machining, welding of CF8M and CF12M (18-21 Cr, 9-12 Ni, 2-3 Mo) steels. (A-general, Q-general, J-general, K-general; SS-e, *Cr, Ni, Mo*, 5-60)

422-A.* (French.) U.S.S. Ti-Steel. An American Construction Steel, Fully Heat Treated, Weldable and Semi-Stainless. *Revue du Nickel*, v. 25, Mar-Apr. 1959, p. 27-29.

Composition and heat treatment, mechanical properties, abrasion and wear resistance. Corrosion behavior (industrial, marine and rural atmosphere). Hot and cold working, welding and applications. (A-general, J-general, Q-general, R-general; SS, 17-57)

423-A. Progress in the Development and Application of Steel Plates. W. Barr. *Iron & Steel*, v. 32, May 22, 1959, p. 219-223.

Development of notch ductile steels in Britain for ship and boiler plate; problems of crack initiation, brittle fracture, mechanical properties; heat treatment of plate. (A-general, Q26, Q-general, J-general; CN, 4-53)

424-A. Columbium: Is It Headed for a Boom? *Mining World*, v. 21, May 1959, p. 38-41.

(A-general; Cb, 17-57)

425-A. (French.) Improvement of Productivity in Small and Medium-Size Foundries by Job Analysis and Introduction of New Methods. Gabriel Delatour. *Fonderie*, no. 159, Apr. 1959, p. 176-179.

(A5b, E-general)

426-A. (Japanese.) Design for Steel Castings. Tsuguyoshi Matsuura. *Japan Foundrymen's Society, Journal*, v. 31, Jan. 1959, p. 41-47.

Comments and exemplifications. (A-general; ST, 5-60, 17-51)

427-A. (Portuguese.) Sonics in Modern Industry. Pt. 3. L. S. Nepomuceno. *Engenharia, Mineracao e Metalurgia*, v. 29, Apr. 1959, p. 171-173.

12 ref. (Conclusion.) (A-general, 1-74, K6r, S13g)

428-A.* How to Select the Right Stainless Steel. Richard E. Paret. *Machine Design*, v. 31, June 11, 1959, p. 162-169.

Alloy classification, properties and applications. Available mill shapes and finishes. (A-general, Q-general, G17k, R-general; SS, 17-57)

429-A.* Future Trends in Vacuum Metallurgy. James H. Moore. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 435-442.

Future possibilities and applications of vacuum techniques in reduction and distillation, molten refining and casting, powder metallurgy, heat treatment and brazing and vacuum coating. (A-general, 1-73)

430-A. (Italian.) Development of Titanium Alloys in U.S.A. *Alluminio*, v. 38, Apr. 1959, p. 186-187.

(A-general, Q-general; Ti, 17-57)

431-A.* Plutonium Metallurgy in the United Kingdom. M. B. Waldron. *Journal of Metals*, v. 11, May 1959, p. 339-343.

British research programs and achievement. 20 ref. (A-general, P-general, M24b; Pu, *Zr*, *U*)

432-A. Aluminum 357 (High-Strength Aluminum Alloy). *Alloy Digest*, Al-80, July 1959, 2p.

Composition and properties of a casting alloy with high tensile and high yield strengths and with good ductility for highly stressed aircraft and missile structures. It has exceptionally high purity which permits the use of more complete artificial aging to develop the full potential strength values without approaching brittleness. (A-general, Q-general, N7a; Al-b, SGB-a)

433-A. Cupro Nickel, 10%-755 (Copper-Nickel Alloy). *Alloy Digest*, Cu-77, July 1959, 2 p.

Composition and properties of a Cu-base alloy having high resistance to corrosion and erosion, particularly in salt or brackish water. It is primarily a condenser tube alloy which, because of its composition, is less costly than 30% cupro-nickel, and its performance under certain operating conditions compares favorably. (A-general, R-general; Cu-b, *Ni*)

434-A. Berylco 50 (Beryllium-Copper Alloy). *Alloy Digest*, Cu-78, July 1959, 2 p.

Properties and characteristics of a resistance welding electrode material which offers high electrical conductivity, low surface contact resistance and resistance to mushrooming. It responds to an age hardening heat treatment. (A-general, Q-general, P15g; Cu-b, *Be*, SGA-q)

435-A. Dodge D-1 (Alloy Steel Castings). *Alloy Digest*, SA-86, July 1959, 2 p.

Properties and characteristics of a water quenched steel, designed for a wide variety of parts requiring combinations of high impact, high tensile and wear resistant properties at minimum costs. The

addition of Mo practically eliminates any tendency toward temper brittleness and stabilizes the mechanical properties at hardness and increases the depth of hardening by slowing down the heat treatment transformation rate. (A-general, Q-general; AY, 5-60)

436-A. Timken CBS-600 (Carburizing Steel). *Alloy Digest,* SA-87, July 1959, 2 p.

Composition and properties of Si-Cr-Mo case hardening steel that maintains good case hardness at temperature and recovered hardness at room temperature after service up to 600° F. (A-general, Q29n, J28; Ay, *Si, Cr, Mo*)

437-A. Carpenter Stainless No. 3 (Heat Resisting Chromium Steel, Type 443). *Alloy Digest,* SS-91, July 1959, 2 p.

Properties and characteristics of a heat resisting steel which stands up very well under destructive scaling conditions up to 1600° F. This grade compares favorably with 18-8 grades in both corrosion resistance and scale resistance. It is a ferritic alloy that does not respond to any thermal treatment for hardening or strengthening. (A-general, Q-general, R-general; SS-d, SGA-L)

438-A. Crucible A-40 (Commercially Pure Titanium). *Alloy Digest,* Ti-20, July 1959, 2 p.

Composition, characteristics and mechanical properties of a special grade of unalloyed Ti for applications requiring maximum ductility and formability. (A-general, Q-general; Ti-a)

439-A. Colhed (Cold Heading Tool Steel, Type W3). *Alloy Digest,* TS-83, July 1959, 2 p.

Composition, characteristics and properties of a carbon-vanadium steel that will harden with a tough core and have a suitable depth of hardened case. It is particularly recommended for cold heading dies. (A-general, Q-general, W24n; TS, *C, V*)

440-A.* Aluminum 5454 (Welding Grade Aluminum Alloy). *Alloy Digest,* Al-78, June 1959, 2 p.

New high-strength Al alloy designed especially for welded structures that must operate in the 150-300° F. range. Heat treatment, machinability, workability, weldability, corrosion resistance, finishing and applications. (A-general, Q-general, P-general; Al-b, 17-57, SGB-a)

441-A.* ALCAN 57S (Wrought Aluminum Alloy). *Alloy Digest,* Al-79, June 1959, 2 p.

Medium-strength alloy having resistance to corrosion, especially by salt water. It is not heat treatable. Machinability, workability, weldability, corrosion resistance and applications. (A-general, Q-general, R-general, P-general; Al-b, *Mg,* 17-57, 4)

442-A.* Riverside No. 4 (Nickel Silver Alloy). *Alloy Digest,* Cu-76, June 1959, 2 p.

Spring quality Ni-Ag alloy having high resistance to corrosion and tarnish, used primarily for springs and electrical resistances. Machinability, workability, weldability, corrosion resistance, pickling and applications given. (A-general, J-general, Q-general, R-general; Cu-b, *Ni, Mn,* 17-57, SGA-g, SGA-q, SGA-b)

443-A.* Magnesium HZ 32A (Magnesium Casting Alloy). *Alloy Digest,* Mg-42, June 1959, 2 p.

Alloy containing Th, Zr and Zn for elevated-temperature applications. Castability, heat treatment, machinability, weldability, corrosion resistance and applications. (A-general, E25p, Q-general, P-general, 17-57, 2-62; Mg-b, *Th, Zn, Zr*)

444-A.* AISI 4063 (Molybdenum Alloy Steel). *Alloy Digest,* Sa-84, June 1959, 2 p.

Low-Mo steel for heavy-duty applications requiring strength and toughness with decrease in temper brittleness. Mechanical properties, heat treatment, workability, machinability, weldability, and applications. (A-general, Q-general, 17-57; AY, *Mo*)

445-A.* Airsteel X-200 (Ultra-High-Strength Alloy Sheet Steel). *Alloy Digest,* Sa-85, June 1959, 2 p.

U. S. S. Airsteel X-200 is a high-strength, workable, air hardening steel. Mechanical properties, effect of annealing temperatures and times, effect of tempering temperature, machinability, workability, weldability and applications. (A-general, Q-general; SGB-a, AY, *Cr*)

446-A.* Hoskins 502 (Heat Resistant Alloy). *Alloy Digest,* SS-89, June 1959, 2 p.

Austenitic, nonmagnetic, high Ni-Cr alloy steel for use on mechanical applications requiring high resistance to heat, corrosion and oxidation. Mechanical properties, heat treatment, machinability, workability, weldability, corrosion resistance and applications. (A-general,

Q-general; SS-e, *Cr, Ni,* 17-57, SGA-g, SGA-h)

447-A.* Pyrocast (Heat Resistant Alloy). *Alloy Digest,* SS-90, June 1959, 2 p.

High-carbon high-chromium cast alloy having good oxidation and heat resistance at elevated temperatures. Mechanical properties, machinability, weldability and applications. (A-general, Q-general; SS, *Cr, Ni, Mo, C,* 17-57, SGA-h, SGB-a, 5)

448-A.* (French.) Indium and Its Applications. *Technique Moderne,* v. 51, May 1959, p. 251-254.

Properties and applications as pure metal or as an alloying component with Bi, Pb, Sn and Cd. Melting points of various alloys and solders containing In. 10 ref. (A-general, Q-general, P-general; In, *Bi, Pb, Sn, Cd,* 17-57)

449-A.* (Hungarian.) Production and Applications of Beryllium Bronze. F. Balazs and B. Paar. *Kohaszati Lapok,* v. 14, May 1959, p. 185-193.

Physical, mechanical and chemical properties, processing of semifinished beryllium-bronze products; soldering and welding of parts. Applications include use as spring materials. (A-general, Q-general, P-general; Cu-S, *Be,* 17-57)

450-A. Nuclear Fuel Resources and Fuel Utilization. *Power Reactor Technology,* v. 2, June 1959, p. 1-12.

Structure of U. S. energy consumption, fossil fuel resources, rate of growth of nuclear electric capacity, uranium demands for process and space heat, nuclear fuel reserves, degree of fuel utilization and consumption of uranium resources. 28 ref. (A11a, T11g, 16-62; U)

451-A. (German.) Documentation in the Field of Corrosion. W. Wiederholt. *Werkstoffe und Korrosion,* v. 10, June 1959, p. 363-372.

Historical survey of various systems; types of indexing and classification systems. (A14, R-general)

452-A.* The New 5XXX Aluminum Alloys--Strong and Weldable. R. T. Myer and D. R. Cheyney. *Materials in Design Engineering,* v. 50, July 1959, p. 91-95.

How and where to use a recently developed series of Al-Mg alloys containing 2.5 to 5.5% Mg and up to nearly 1% Mn. (A-general, K-general; Al-b, *Mg, Mn,* 17-57)

453-A.* Permanent Magnet Materials. Robert J. Fabian. *Materials in Design Engineering,* v. 50, July 1959, p. 108-114.

Comprehensive survey of composition, properties and magnetic characteristics of magnet steels, Alnicos and other magnetic alloys. (A-general, P16; SGA-n)

454-A. Early Radiophotographs. Clarence T. Patterson. *Metal Progress,* v. 76, July 1959, p. 91-92.

Early in 1915 the radioactivity of uranium was used to mark the position of its carbides in ferro-uranium. Intimate details of the microstructure could not be determined because these contact prints could not be magnified very highly; the "grain" of the photographic emulsion was too coarse. (A2, M23q; Fe, U, AD-n)

455-A. Safe Handling of Beryllium. Webster Hodge. Digest of "Some Notes on Safe Handling Practices for Beryllium". Battelle Memorial Institute, DMIC Memorandum 2, Sept. 22, 1958. *Metal Progress,* v. 76, July 1959, p. 142, 144, 147-A.

Air sampling; hygienic programs; collection systems; waste disposal. (A7r; Be)

456-A.* New High-Strength Aluminum Alloy. *Precision Metal Molding,* v. 17, July 1959, p. 27.

Composition, specifications and mechanical properties of X357 high purity Si-Mg-Ti-Al alloy. (A-general, Q-general; Al-b, *Si, Mg, Ti*)

457-A.* High-Temp, High-Strength Die Casting Alloy. *Precision Metal Molding,* v. 17, July 1959, p. 37.

Mechanical properties for new lightweight HM11XA alloy containing approximately 1% Th, 1% Mn, balance Mg. (A-general, Q-general; Mg-b, *Th, Mn,* 5-61, SGB-a)

458-A. (Book.) Year Book of the American Bureau of Metal Statistics, 38th Annual Issue for the Year 1958. 137 p. June 1959. American Bureau of Metal Statistics, 50 Broadway, New York. $4.

Statistical information for market analysis, research and industry surveys. (A4)

459-A. (Book.) Vacuum Metallurgy. Rointan F. Bunshah, Editor. 472 p. 1958. Reinhold Publishing Co., 430 Park Ave., New York 22, N. Y.

Lectures presented during a course on vacuum metallurgy sponsored by the De-

partment of Metallurgical Engineering in cooperation with the Office of Special Service to Business and Industry, New York University, New York, N. Y., June 10-14, 1957. Papers are abstracted separately. (A-general, 1-73)

460-A. (Book-German.) Metallurgy - Pt. 2, Sammlung Goschen Band 433/433a. Heinz Borchers. 179 p. 1959. Walter de Gruyter and Co., Berlin W35. DM 5.80.

Properties of metals and alloys. Preparation, sintering, casting, deformation, heat treatment, metal spraying, machining, welding, joining and assembling. (A-general)

461-A. Computer Holds Stainless Costs. D. C. Hilty, R. W. Taylor and R. H. Gillespie. *Iron Age*, v. 184, July 9, 1959, p. 100-101.

Use of computer to find methods of producing steel more economically. (A4s, X14k, D-general)

462-A.* Status and Future of Nickel-Base Alloys. F. L. Ver Snyder. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 3-15.

Mechanical properties, structure, role of precipitation of Ni_3Al, intergranular fracture in Ni alloys. Complexity of these alloys in relation to the large number of alloying elements is expected to decrease with increased understanding of factors that promote high-temperatures properties. (A-general, Q-general, 2-60; Ni-b, SGA-h)

463-A.* History, Status and Future of Cobalt Alloys. Glenn A. Fritzlen. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 56-80.

Microstructure, room and high-temperature mechanical properties of a number of Co alloys in cast, wrought, cold worked and aged conditions. Principal applications to date and potential industrial and military applications based on development trends. (A-general, A2, Q-general, M27, 2-62; Co-b, 17-57, SGA-h)

464-A.* Refractory Metals: Tungsten, Tantalum, Columbium and Rhenium. John W. Pugh. Paper from "High Temperature Materials". John Wiley & Sons, New York 16, 1959, p. 306-318.

Physical and mechanical properties; strain aging; oxidation behavior; comparison with properties and behavior of Mo. 35 ref. (A-general, P-general, Q-general, R1h; W, Ta, Co, Re, Mo, EG-d37)

465-A. Red X-8 (Aluminum Casting Alloy), *Alloy Digest*, Al-81, Aug. 1959, 2 p.

Heat treatable alloy retains its strength well at temperatures up to 400° F. It has excellent casting qualities and is leakproof and pressure-tight. (A-general, Q-general, 2-62, E25p; Al-b, 5-60)

466-A. Kumanic (Heat Treatable Copper Alloy). *Alloy Digest*, Cu-79, Aug. 1959, 2 p.

Cu-Mn-Ni alloy that responds to hardening by heat treatment has high tensile and fatigue strength along with excellent resistance to corrosion. It is particularly suitable for use in springs, diaphragms and other parts in which design requirements make it desirable first to shape the part and then heat treat it to attain desired hardness, tensile strength and fatigue strength. (A-general, Q-general, 2-64; Cu-b, *Mn, Ni*)

467-A. NILO K (Controlled Expansion Alloy). *Alloy Digest*, Fe-16, Aug. 1959, 2 p.

Nilo K matches very closely the expansion characteristics of medium hard glasses of borosilicate type, used for envelopes of special high-power valves, such as transmitters and rectifiers, and for glass-to-metal seals on X-ray tubes and numerous electronic components. (A-general, P11g; Fe-b, *Ni, Co*, SGA-s)

468-A. Magnesium AZ61A (Magnesium Extrusion Alloy). *Alloy Digest*, Mg-43, Aug. 1959, 2 p.

Not recommended to be used above 400° F. Its strength increases and ductility decreases with decrease in temperature. Does not respond to any age hardening heat treatment. Strength level is between that of AZ31B and ZK60A. (A-general, Q-general, 2-61; Mg-b, 4-58)

469-A. Impacto (Nickel-Molybdenum Case Hardening Steel). *Alloy Digest*, SA-88, Aug. 1959, 2 p.

Recommended for applications where high toughness and excellent wear resistance are required. Outstanding for its uniformity of case and response to heat treatment, relative freedom from distortion during quenching and excellent toughness at high hardness. Resistance to abnormal grain growth is of particular

advantage in forging. (A-general, Q-general, 2-64; AY, *Ni, Mo,* SGA-m, 14-69)

470-A. A. C. I. Type HC (Heat Resisting Casting Alloy). *Alloy Digest,* SS-92, Aug. 1959, 2 p.

Fe-Cr alloy containing about 28% Cr and up to 4% Ni, providing excellent resistance to oxidation and high-sulphur flue gases at temperatures as high as 2000° F. This grade is limited to applications where strength is not a consideration, or for moderate load-bearing service around 1200° F. (A-general, R1h, 2-62, R7k; Fe-b, *Cr, Ni,* SGA-h, SGA-g)

471-A. MST 5A1-2.5 Sn (High Strength Titanium Alloy). *Alloy Digest,* Ti-21, Aug. 1959, 2 p.

A single-phase all-alpha grade having excellent toughness, fatigue strength, creep strength at elevated temperatures, machinability and weldability. Combines good hot strength and good ductility, has good tension-tension fatigue properties, the typical unnotched fatigue strength being 85% of the ultimate strength. (A-general, Q-general, 2-62; Ti-b, *Al, Sn,* SGB-a)

472-A. Bethlehem 57HW (Tungsten Hot Work Tool Steel Type H21). *Alloy Digest,* TS-84, Aug. 1959, 2 p.

A 9% tungsten hot work toolsteel, having excellent red hardness and abrasion resistance combined with relatively good shock resistance for high operating temperatures. Corresponds to AISI Type H21 hot work toolsteel. (A-general, Q-general; TS-k)

473-A. Steelmaking Research in the USSR. John F. Elliott. *Journal of Metals,* v. 11, July 1959, p. 465-467.

Research trends include investigation of transformations in very-high purity iron, structure of liquid alloys, Fe-Ni-O system at 1600° C., slag metal distribution, vacuum purification of metals, flow characteristics of metallurgical systems, levitation melting, sintering, direct reduction, oxygen in steelmaking, continuous casting and vacuum degassing of steels. (A9, D-general; ST)

474-A.* Soviet Vacuum Metallurgy. A. M. Aksoy. *Journal of Metals,* v. 11, July 1959, p. 468-470.

Report on the second Moscow symposium on the application of vacuum to metallurgy. Papers covered vacuum induction melting, vacuum arc remelting, vacuum degassing, desulphurization in vacuum, vacuum reduction and vacuum rolling. (A-general, D-general, F23, E10, 1-73)

475-A. International Symposium on Physical Chemistry of Process Metallurgy. George R. St. Pierre. *Journal of Metals,* v. 11, July 1959, p. 454-455.

Brief review of papers presented an AIME convention at Pittsburgh, Apr. 27-May 1, 1959. (A-general)

476-A.* Castings of AM-355. J. E. Mosser. *Steel Horizons,* v. 21, no. 3, 3rd Quarter, 1959, 4 p.

Composition, specifications and properties for this precipitation hardening stainless steel. (A-general, Q-general; SS, 5)

477-A.* Materials Based on Intermetallic Compounds. Robert Steinitz. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York, 16, 1959, p. 182-189.

No intermetallic compound has been found that is, in general behavior, superior to standard carbide or boride cermets, although some materials, such as molybdenum disilicide, chromium silicide, nickel aluminide and titanium aluminide, have properties that make them potentially useful for high-temperature applications. (A-general, Q-general, R-general, 2-62; Mo, Cr, Ni, *Si, Al,* 14-68, SGA-h)

478-A. Cermets and Bonded Hard Metals. John T. Norton. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 119-124.

Problems of further development for high-temperature applications. (A-general; SGA-h, 6-70)

479-A. Make Exotic Metals Practical. J. S. Rodgers and E. A. Wright. *Iron Age,* v. 184, July 30, 1959, p. 109-111.

Problems in the development of Be, Cb, Hf, Mo, Re, Ta, Ti, W, V, Y and Zr. (A-general; EG-b)

480-A. Beryllium. T. H. H. Skeet. *Mine & Quarry Engineering,* v. 25, June 1959, p. 263-269.

Occurrence, output and reserves of beryl. (A11; Be)

481-A. Semi-Annual Summary Research Report in Metallurgy. Ames Laboratory Staff. Ames Laboratory. *U.S. Atomic*

Energy Commission, ISC-1050, Jan-June 1958, 94 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $2.25

Separation studies, preparation of pure compounds, metal preparation and purification studies, alloy research, solid state investigations. (A-general, A9h)

482-A. (Pamphlet.) Guide for Zirconium. *National Fire Protection Association*, no. 482M, June 1959, 12 p. $.40.

Guide for fire and explosion prevention in plants producing and handling Zr. (A7p, S22; Zr)

483-A. (Pamphlet.) Standard for Titanium. *National Fire Protection Association*, no. 481, June 1959, 32 p. $.50.

Fire and explosion prevention and protection in the production, processing, handling and storage of Ti. (A7p, S22; Ti)

484-A. (Pamphlet.) Standard for Magnesium. *National Fire Protection Association*, no. 48, June 1959, 22 p. $.50.

Fire and explosion prevention and protection in the production, processing, handling and storage of Mg. (A7p, S22; Mg)

485-A. (Pamphlet.) British Steel Castings Research Assoc. Sixth Annual Report, 1959. British Steel Castings Research Assoc., 5 E. Bank Rd. Sheffield 2, England.

Research on steelmaking, foundry processes and molding materials, metallurgy, plant engineering and industrial health. (A9, A9h, D-general, E-general; ST)

486-A. (Book.) Basic Engineering Metallurgy. 2nd Ed. Carl A. Keyser. 507 p. 1959. Prentice-Hall, Inc., Englewood Cliffs, N. J.

Structure of metals; the solid state—freezing, solutions, diffusion; mechanical properties and metal failure; equilibrium diagrams; hardening of metals; annealing—recovery, recrystallization and grain growth; iron and steel; heat treating equipment and operations; light metals; Cu and Zn; casting; powder metallurgy; electroplating and electroforming; methods of fabrication and mechanical working. (A-general)

487-A. (Book.) Progress in Metal Physics. v. 7. Bruce Chalmers and R. King, Editors. 408 p. 1958. Pergamon Press Inc., 122 E. 55th St., New York 22, N. Y.

Topics covered include imperfections in semiconductors, physical metallurgy of Ti alloys, thermodynamics and kinetics of martensitic transformations, stored energy of cold work and properties of metals at low temperatures. Papers are abstracted separately. (A-general, N8p, Q-general, 2-63; Ti-b, EG-j)

488-A. (Book.) High Temperature Materials. R. F. Hehemann and G. M. Ault. 544 p. 1959. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16.

Conference held in Cleveland, Ohio, Apr. 16-17, 1957, sponsored by the High-Temperature Alloys Committee, Institute of Metals Division, the Metallurgical Society, American Institute of Mining, Metallurgical and Petroleum Engineers. Papers are abstracted separately. (A-general; SGA-h)

489-A.* Lithium. . .The Lightest Metal. F. B. Litton. *Metal Progress*, v. 76, Aug 1959, p. 94-96.

Both the pure metal and its alloys, most of which are still in the laboratory stage, have unusual properties which can be useful. Its addition to other metals increases tensile strength and refines grain size. The metal's high reactivity makes it potentially a good scavenger in melts. (A-general; Li)

490-A. (Portuguese.) Beryllium, Metal of the Future. Paulo Dias Veloso. *Engenharia, Mineracao e Metalurgia*, v. 29, May 1959, p. 215-217.

(A-general; Be)

491-A. (Portuguese.) Metallurgical Research in Brazil. G. Soares de Moraes. *Engenharia, Mineracao e Metalurgia*, v. 29, May 1959, p. 237-239.

Shortage of research personnel; education, research programs. 6 ref. (A3g, A9)

492-A. Compilation of Available Information on the Ti-7Al-(3-4)Mo Alloy. R. W. Douglass and F. C. Holden. Titanium Metallurgical Laboratory. *U. S. Office of Technical Services*, PB 151322, July 1958, 104 p. $2.25.

New bar and forging, heat treatable alpha-beta alloy. Al additions increase the temperature limit of the alpha-beta field, thereby extending the hot working range, and strenghten the alpha phase both at room and high temperatures by solid-solution strengthening. Mo additions, in stabilizing the beta phase, render the alloy heat treatable, and strengthen the beta phase by solid-solution strengthening.

Data on physical, mechanical and high-temperature properties. (A-general, Q-general, P-general, N7; Ti-b, *Al, Mo*)

493-A. (German.) New Developments in Hard Metals and Hard Materials for Cutting Purposes. C. Agte and R. Kohlermann. *Technik*, v. 14, Apr. 1959, p. 287-291.

Developments in East Germany. (A-general; SGA-q, EG-d)

494-A. Bohnalite L-4. (Aluminum Casting Alloy). *Alloy Digest*, Al-82, Sept. 1959, 2 p.

Al-Si Cu-Mg-Ni permanent mold casting alloy having good wear resistance and high-temperature strength, good castability and excellent machinability. Its corrosion resistance is very high. Aging at 400° F. for 7-9 hr. improves tensile properties appreciably. (A-general, Q9n, 2-62, G17k, R-general, 2-64; Al-b, 5-63)

495-A. Meehanite SC. (Heat Resisting Casting Alloy). *Alloy Digest*, CI-27, Sept. 1959, 2 p.

Alloy is recommended for applications where fairly constant temperatures are involved and for exceptional resistance to growth and scaling. Maximum working temperature is 1650° F. (A-general, R2q, 2-62; CI, SGA-h)

496-A. Low Brass, 80%. (Copper-Zinc Alloy). *Alloy Digest*, Cu-80, Sept. 1959, 2 p.

Alloy has high ductility and malleability combined with good corrosion resistance and relative freedom from season cracking. (A-general, Q23p, R-general, R1d; Cu-n, SGA-g)

497-A. Revere No. 508. (Cupro-Nickel, 10%). *Alloy Digest*, Cu-81, Sept. 1959, 2 p.

Highly ductile, malleable and corrosion resistant Cu-Ni alloy suitable for condenser and heat exchanger tubes and many engineering applications such as salt water piping aboard ship, many components of salt water and fresh water stills, feed water heater tubes and marine coolers. (A-general, R-general, R4b; Cu-b, *Ni*, SGA-g)

498-A. Nicrotung. (High-Temperature Alloy). *Alloy Digest*, Ni-53, Sept. 1959, 2 p.

Ni-base alloy, designed for service up to 2000° F., has a combination of high heat resistance, high and low-temperature stress-rupture strength, and ductility. It is intended for production of parts by precision casting. The good high-temperature properties are combined with good room-temperature tensile strength, ductility, good castability and oxidation resistance. (A-general, Q-general, R1h, 2-62; Ni-b, 5-62, SGA-h)

499-A. USS Carilloy 1% Cr-1/2% Mo. (Moderate Corrosion, Oxidation and Graphitization Resistant Steel). *Alloy Digest*, SA-89, Sept. 1959, 2 p.

Although this grade was originally developed as a low-cost alloy having the high-temperature strength of the regular 1/2% Mo grade, with some measure of corrosion and oxidation resistance, it is principally used for steam service up to 1000° F. The higher Cr content is considered advantageous in obtaining less susceptibility to graphitization than is possible with 1/2% Mo grade. (A-general, R-general, 2-60; AY, *Cr, Mo*, SGA-g)

500-A. Allegheny Ludlum 440C. (High-Carbon Chromium Stainless Steel, Type 440C). *Alloy Digest*, SS-83, Sept. 1959, 2 p.

General purpose hardenable stainless steel, which upon quenching develops maximum hardness together with high strength and corrosion resistance. Besides the wear resistance imparted by heat treatment, it has intrinsically superior wear resistance due to its chemical composition. (A-general, Q9n, Q-general, R-general, 2-60, 2-64; SS)

501-A. Peerless-A. (Hot Work Steel, Type H21). *Alloy Digest*, TS-85, Sept. 1959, 2 p.

Low-carbon medium-tungsten hot work steel possesses excellent red hardness. It is used in those applications where the tool operates at a dull red heat. It conforms to AISI Type H21, SAE Type H21. (A-general, Q29n; TS)

502-A. Recent Developments in the Zinc Industry in Great Britain. S. W. K. Morgan. *Chemistry & Industry*, May 16, 1959, p. 614-620.

Advances in metallurgy of Zn during recent years at the Avonmouth Refining Co. (A-general; Zn)

503-A. Metallurgical Developments. H. M. Finniston and L. Grainger. *Journal of the British Nuclear Energy Conference*, v. 4, Apr. 1959, p. 115-130.

Review of some 250 papers covering topics relating to materials, fuel elements and irradiation effects presented at six sessions of the 2nd United Nations

Conference on the Peaceful Uses of Atomic Energy, Geneva 1958. (A-general, T11)

504-A.* The Availability, Recovery and Properties of Rhenium Metal. Ivor E. Campbell. *Journal of the Less-Common Metals*, v. 1, June 1959, p. 185-191.

Outline of physical and mechanical properties. Its extremely high melting point and good metal properties indicate a growing use where a relatively high cost can be tolerated. Uses in the electronics industry, as an electrical contact material, alloyed with W and Mo, and for high-temperature thermocouples, are among potential industrial applications. 12 ref. (A-general, P-general, Q-general, 17-57; Re)

505-A. Investigation of the Properties of Tantalum and Its Alloys. W. D. Klopp. Battelle Memorial Institute. (Wright Air Development Center.) *U.S. Office of Technical Services*, PB 151562, Nov. 1958, 85 p. $2.

Literature survey. Emphasis is placed on subjects which closely relate to the objectives of the WADC research program; vacuum purification, gas-metal reactions, physical properties, mechanical properties and alloying behavior. 205 ref. (A-general, 11-65; Ta)

506-A. Beryllium. J. C. Nixon. *Chemical Engineering and Mining Review*, v. 51, Apr. 15, 1959, p. 40-43.

Use of Be in the United Kingdom; recent developments in production and fabrication. 10 ref. (A-general; Be, 17-57)

507-A.* New Tungsten Know-How. P. Stambler. *Space Aeronautics*, v. 32, July 1959, p. 48-51.

Advances in fabrication prove tungsten one of the best metals for high-temperature design. To obtain workability tungsten can be heated to temperatures where superalloys would melt. For recrystallization tungsten must be heated to 2500° F. Data on forging, sintering, extruding, drawing and finishing. (A-general, F-general, G-general, N5, 2-62; W)

508-A. (Italian.) Current Applications of Some of the Rare Metals. Raoul Dupuis. *Fonderia Italiana*, v. 8, June 1959, p. 209-215.

Data on Be, Zr and Ti. (A-general; Be, Ti, Zr, 17-57)

509-A. (Translation—Brutcher no. 4364.) Some Theoretical Questions About Vacuum Metallurgy. D. S. Kamenetskaya. *Primenenie Vakuuma v Metallurgii*, Moscow 1958, p. 49-53.

(A-general, 1-73)

510-A. (Translation—Brutcher no. 4646.) Dust Removal at the Bochumer Verein LD Steelworks. R. Harr, K. Wagner and T. H. Willmer. *Berg-und Huttenmann Monatshefte*, v. 104, no. 2, 1959, p. 50-55.

(A8a, D-general)

511-A.* The Application of Low-Alloy High-Tensile Steel. I. M. Mackenzie. *West of Scotland Iron and Steel Institute*, v. 66, 1958-1959, p. 93-103.

Reasons suggested for the limited use of these steels are design stresses, fabrication problems, availability and cost. Design stresses have to be based on the yield stress to take full advantage of the alloy content of the steel. (A-general, Q25; AY, 17-51, 17-57; AY-n)

512-A.* Thorium. H. A. Wilhelm. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 50-55.

Survey of reports on preparations, alloys and fabrication that have been published or made available since the Conference on Peaceful Uses of Atomic Energy, Geneva, 1955. 27 ref. (A-general, C-general; Th)

513-A. HI Tensile. *Alloy Digest*, Al-83, Oct. 1959, 2 p.

Room tempering aging Al alloy capable of developing high tensile properties without the usual prior quench as with other heat treatable Al alloys. The high elongation and ductility before aging (within a few days after casting) qualifies the alloy for forming operations. It has dimensional stability and good corrosion resistance, excellent ductility, high impact and shock resistance and good machinability rating. (A-general, J27d, Q-general, Q27a; Al-b)

514-A. Aluminum 7079 (Age-Hardenable Aluminum Alloy). *Alloy Digest*, Al-84. Oct. 1959, 2 p.

High-strength forging alloy providing higher and more uniform properties in thick sections (over 3 in.) and greater ductility in cross-grained directions. Tests indicate fatigue strength similar to

7075-T6 for both smooth and notched specimens in longitudinal and transverse directions. This alloy is at least equal to and probably superior to 7075-T6 from the standpoint of stress-corrosion cracking in salt water atmospheres. (A-general, Q7a, Q23p, R1d; Al-b)

515-A. Jalcase No. 8. (Free-Cutting Carbon Steel). *Alloy Digest*, CS-10, Oct. 1959, 2 p.

Free-machining carbon-manganese steel recommended for high production machining in automatic screw machines. (A-general; CN, *Mn*, SGA-k)

516-A. Nionel (Corrosion Resistant Nickel Alloy). *Alloy Digest*, Ni-54, Oct. 1959, 2 p.

Nionel was developed primarily to provide an alloy more resistant to both oxidizing and reducing chemical environments, or combinations of both, than other Ni-base alloys available. Its relatively high Ni content plus Mo and Cu make the alloy considerably more resistant to reducing conditions, such as hot sulphuric acid, sulphurous and phosphoric acid solutions, than any of the common stainless steels. (A-general, R-general; Ni-b, *Mo*, *Cu*, SGA-g)

517-A. Hy-Ten "MC" (Tough Alloy Steel). *Alloy Digest*, SA-90, Oct. 1959, 2 p.

Tough oil-hardening toolsteel having high strength, good wear resistance and desirable shock resistance. It is fine-grained, deep-hardening, and has non-deforming characteristics in hardening. (A-general, Q-general; TS)

518-A. AISI-Type 403. (Corrosion Resisting Steel). *Alloy Digest*, SS-94, Oct. 1959, 2 p.

Straight Cr, martensitic-type stainless steel recommended for applications requiring moderate corrosion resistance and high mechanical properties developed by heat treatment possesses good corrosion resisting properties, fair resistance to heat and is not appreciably affected by exposure to subzero temperatures. (A-general, R-general, Q-general; SS-c, SGA-g)

519-A. Misco Ms. (Heat and Corrosion Resistant Steel, Type HU). *Alloy Digest*, SS-95, Oct. 1959, 2 p.

Alloy endures high heat, and is most useful at operating temperatures between 1500 and 2100° F. It will withstand prolonged heating in air at temperatures up to 1900° F. without excessive scaling. In reducing or neutral atmospheres that are free of sulphur it is safe up to 2150° F. It has good resistance to thermal shock where air, oil, or salt quench cycles are involved. (A-general, R2q, 2-62; SGA-h, ST, SGA-g)

520-A.* Solid Lubricants. A. J. Stock. Digest of "Solid Lubricants". Paper Presented Before the American Society of Lubrication Engineers, Buffalo, N. Y., Apr. 21, 1959. *Metal Progress*, v. 76, Sept. 1959, p. 147-A-150.

Particle size, temperature, load and speed affect use of graphite, Mo disulphide, nylon and tetrafluorethylene resin. Examples of uses. (A-general; NM-h, NM-k36, 17-57)

521-A.* (French.) High-Conductivity Copper Alloys. *Cuivre, Laitons, Alliages*, no. 50, July-Aug. 1959, p. 3-6.

Manufacture, mechanical working, joining, physical and mechanical properties and applications of 0.7-1.0% Cd-Cu alloys. (To be continued.) (A-general, Q-general, P-general; Cu-b, *Cd*)

522-A. Historical Background. H. D. Carus. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 1-8.

Development of Zn technology from 500 B.C. to present. Early smelting and distilling processes; furnace evolution. 7 ref. (A2, C-general; Zn)

523-A. Economics and Statistics. Richard H. Mote. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 9-34.

7 ref. (A4; Zn)

524-A. Geology of Zinc Deposits. Alan M. Bateman. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142, Reinhold Publishing Corp., New York 22, 1959, p. 35-64.

12 ref. (A11a; Zn)

525-A. (French.) Copper Through the Ages: 16th Century Artillery. R. Vaultier. *Cuivre, Laitons, Alliages*, July-Aug. 1959, p. 28-31.

(To be continued.) (A2, T2m; Cu)

526-A.* Properties of Ti-4Al-3Mo-IV. *Titanium Engineering Bulletin no, 8,* 1959, 24 p.

Principal characteristics include high strength, low density, exceptional creep strength and stability up to 900° F. and good formability. Physical and mechanical properties in relation to design, forming, fabrication and heat treatment. (A-general, Q-general, P-general, G-general, J-general; Ti-b, *Al, Mo, V,* 17-51)

527-A. (Dutch.) Documentation on Metallurgy and Related Fields. Pt. 1. A. H. M. ten Have and K. Verstraate. *Metalen,* v. 14, Aug. 31, 1959, p. 246-248.

Review of abstracting services and punch card techniques. 9 ref. (To be continued.) (A14d)

528-A. (Dutch.) Documentation in Metallurgy and Related Fields. A. H. M. ten Have and K. Verstraate. *Metalen,* v. 14, Sept. 12, 1959, p. 261-263.

Use of universal decimal classification system. (Conclusion.) 5 ref. (A14)

529-A. (Dutch.) Co-Operation Between Centers for Industrial Documentation. A. van Kleef. *Metalen,* v. 14, Sept. 12, 1959, p. 266-267.

Dutch documentation centers and their activities. (A14d)

530-A. Selection and Evaluation of Rare or Unusual Metals. Pt. 2. The Metallurgy of Yttrium and the Rare Earth Metals. B. Love. Research Chemicals, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151825, Mar. 1959, 188 p. $3.

Metallographic, oxidation and corrosion resistance studies, mechanical property determination and studies of alloys of Ti and Be with rare earth additions. Improved methods for production of the pure metals; metallographic procedure. (A-general, R-general, 2-60; Ti-b, Be-b, EG-g45)

531-A. Current Status of Cemented Carbide Technology. W. O. Woods. Watertown Arsenal. *U. S. Office of Technical Services,* PB 151302, June 1958, 40 p. $1.

Influence of chemical composition and processing conditions with the resulting physical and mechanical properties of tungsten carbide-based materials. (A-general, P-general, Q-general; 6-69)

532-A.* (Pamphlet.) High-Temperature Metals—Their Role in the Technological Future. Clyde Williams. 16 p. 1958. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

History and production, consumption and reserves of Cr, Ni, Mo, W, Co and Cb alloys with present and future alloy applications. (A-general; Cr, Ni, Mo, W, Co, Sb, 17-57, SGA-h)

533-A. (Pamphlet.) Titanium Metals Handbook for the Chemical Processor. 36 p. 1959. Titanium Metals Corp. of America, 233 Broadway, New York 7, N. Y.

Physical, mechanical properties, corrosion resistance, applications and design. (A-general, Q-general, P-general, R-general; Ti, 17-51, 17-57)

534-A. (Book.) Zinc. The Science and Technology of the Metal, Its Alloys and Compounds. ACS Monograph no. 142. C. H. Mathewson, Editor. 721 p. 1959. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

History and statistics; geology of ore; metallurgical extraction and refining; manufacture of Zn oxide; uses of metallic Zn and Zn-base alloys; production of Zn coatings; biological significance. Papers abstracted separately. (A-general, C-general, L16; Zn)

535-A. (Book.) The Physical Metallurgy of Magnesium and Its Alloys. G. V. Raynor. 531 p. 1959. Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y. $12.50

Fundamental nature of Mg electronic constitution, effects of alloying, and alloy systems formed by Mg. (A-general; Mg)

536-A. (Book-Translation.) The Geology of Uranium. 128 p. 1958. Consultants Bureau, Inc., 227 W. 17th St., New York 11, N. Y. $6.

(A-general; U, RM-n)

537-A.* (Swedish.) Bronze Cannons From the Ships "Riksnyckel" and "Wasa". Elinar Mattsson. *Metallen,* v. 15, no. 3, 1959, p. 99-108.

Composition, structure and corrosion resistance of gun bronzes from the 17th century. 15 ref. (A2, T2m, M26, R4b; Cu-s)

538-A. Collection and Filtration of Toxic Particles. *Australasian Manufacturer,* v. 44, Aug. 29, 1959, p. 62, 64-66.

Conditions designed to safeguard health while working with Be. (A7; Be)

539-A.* Tantalum. *Metal Treatment and Drop Forging*, v. 26, July-Aug. 1959, p. 273-274, 283.

Extraction processes, methods of working, applications in chemical industry and medicine. (A-general, C-general, F-general, T10e, T29; Ta, 17-57)

540-A.* A Brief Survey of the Influence of Alloying Elements in Stainless Steels. K. Bee. *Murex Review*, v. 1, no. 19, 1958, p. 545-570.

Effects of Cr, Ni, Mn, Si, Mo, W, Ti and Cb in martensitic alloys, ferritic and austenitic steels, and on corrosion, oxidation, embrittlement and intergranular corrosion. 16 ref. (A-general, R1h, R2h, Q26, 2-60; SS, *Cr, Ni, Mn, Si, Mo, W, Ti, Cb*)

541-A.* Copper-Base Alloys. *Metal Progress*, v. 76, Oct. 1959, p. 129-131.

Use in radar tubes, boat trailer bushings, water pumps, rings for lawn sprinkler systems and printed circuits. (A-general; Cu-b, 17-57)

542-A.* Stainless Steels. Richard E. Paret. *Metal Progress*, v. 76, Oct. 1959, p. 131-134.

Development of a modified Type 316, termed alloy D-319; improvements in fabrication; hot extrusion; welding of a number of stainless alloys. (A-general, G-general, K-general; SS)

543-A.* Magnesium Alloys. T. E. Leontis. *Metal Progress*, v. 76, Oct. 1959, p. 134-136.

Use of ZE 10A, AZ91A, AZ91B and AZ31B in luggage, structures and tooling plate. (A-general; Mg-b, 17-57)

544-A.* Wrought Aluminum Alloys. E. P. White, R. C. Kasser and L. M. Dunn. *Metal Progress*, v. 76, Oct. 1959, p. 136-140.

Use of 5154 and 5086 alloys in tank trailers; typical properties of weldable Al-Mg alloys; use in structures. (A-general, Q-general; Al-b, *Mg*, 4, 17-57)

545-A. Coalbrookdale 1709 to 1959. A. Raistrick. *Foundry Trade Journal*, v. 107, Oct, 1, 1959, p. 239-247.

History and development of processes at the Coalbrookdale Co., Wellington, Shropshire, England. (A2, E-general; Fe)

546-A. British Steel Castings Research Assoc. *Foundry Trade Journal*, v. 107, Oct. 8, 1959, p. 275-285.

Current research activities. (A9h, E-general)

547-A. Metals Research at the N.P.L. *Metal Treatment and Drop Forging*, v. 26, Sept. 1959, p. 328-330.

Research activity at National Physics Laboratory, Teddington, England, relating to the constitution, structure and physical and mechanical properties of metals and alloys. (A9, A9h)

548-A.* Special Applications of the Carbides. E. H. Sanders and Robert M. Pozzo. *Carbide Engineering*, v. 11, Oct. 1959, p. 13-16.

Structural applications of W, Ti, Cr, and Ta carbides and their mixtures. (A-general; 6-69, 17-57, W, Ti, Cr, Ta)

549-A. Titanium! Metal With an Exciting Future. J. M. Wentzell. *Design Engineering*, v. 5, Oct. 1959, p. 52-55.

Reviews properties and processing of Ti and Ti alloys. (A-general; Ti, 17-57)

550-A.* Nitrogen in Early Steelmaking. H. R. Schubert. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 383.

A short history of use of nitrogen in steelmaking. 10 ref. (A2, J28k; ST, *N*)

551-A. Report of the Annual General Meeting, 1959. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 325-329.

Proceedings and research activities of the Iron and Steel Institute during 1959 including presentations, announcements and future programs. (A9, D-general)

552-A. Metal Selector. *Steel*, v. 145, Oct. 26, 1959, p. S1-S32.

Chart listing 1050 alloys, their composition, properties and typical uses and suppliers. (A-general, S22)

553-A. (Italian.) Metallurgy of Iron and Steel in the Area Around Leczyca (Central Poland) in the 12th and 13th Centuries. J. Piaskowski. *Fonderia Italiana*, v. 8, July-Aug. 1959, p. 269-281.

25 ref. (A2; Fe, ST)

554-A. Birmabright B.B.5 (Aluminum Cast and Wrought Alloy). *Alloy Digest*, Al-85, Nov. 1959, 2 p.

Corrosion resistant, medium-strength Mg-Al alloy has high resistance to corrosion under the influence of the atmosphere and a variety of conditions existing in industrial and marine usage. In contact

with sea water it exhibits a greater tendency than other Al alloys to form an even, protective film of oxide. (A-general, R3, R4b; Al-b, *Mg*)

555-A. Red X-11 (Aluminum Casting Alloy). *Alloy Digest*, Al-86, Nov. 1959, 2 p.

Heat treatable Al alloy of the Si-Cu-Mg type has excellent castability and can be used for thin-walled intricate castings. It is pressure tight and has good strength at elevated temperatures. The alloy can also be forged and hot impact-extruded. (A-general, E25p, J-general; Al-b, *Si*, *Cu*, *Mg*)

556-A. GE Alloy P-6 (Magnetic Alloy). *Alloy Digest*, Co-18, Nov. 1959, 2 p.

Carbon-free permanent magnet material which, when properly heat treated, exhibits a high residual induction, high permeability and high hysteresis loss characteristics. (A-general, P16; Fe-b, *Co*, SGA-n)

557-A. Tuf-Stuf 224H (Aluminum Bronze). *Alloy Digest*, Cu-83, Nov. 1959, 2 p.

Heat treatable Al bronze forging alloy has high hardness and high compressive strength and good bearing characteristics, combined with unusual resistance to wear. It is tough and does not squash or pound out in service. A good proportion of its strength is retained at elevated temperatures as high as 1000° F. (A-general, Q29n, Q28g; Cu-s, *Al*, 4-51)

558-A. AISI 5150 (Chromium Alloy Steel). *Alloy Digest*, SA-91, Nov. 1959, 2 p.

Deep hardening steel exhibits a combination of high strength and fair ductility. When hardened it does not decarburize at the surface of the part unlike other alloys containing no chromium. The high surface hardness which this alloy attains in an oil quench produces excellent wear resistance. (A-general, Q29n, Q23p, Q9; AY, *Cr*)

559-A. HS-220 (Ultra-Strength Steel). *Alloy Digest*, SA-92, Nov. 1959, 2 p.

High-strength steel, designed for minimum tensile strength level of 220,000 psi. in the heat treated condition, exhibits good ductility and impact values consistent with the high hardness. (A-general, Q27a, Q23p; ST, SGB-a)

560-A. MicroMach (Ductile Stainless Steel). *Alloy Digest*, SS-96, Nov. 1959, 2 p.

New, nitrogen-containing austenitic stainless steel with higher ductility than standard AISI Type 301 combines strength and ductility in the extra-full-hardened condition. It work-hardens readily. Stress relieving in the range of 600-900° F improves the tensile and yield strengths about 10% with no significant effect on ductility. (A-general, Q23p, J1; SS-e, *N*)

561-A. Carpenter No. 883 (Red-Tough Tool Steel, Type H13). *Alloy Digest*, TS-86, Nov. 1959, 2 p.

A 5% Cr hot work steel with extreme toughness combined with good red hardness will give an extra margin of safety in tools subject to heavy hammer blows and tools containing deep recesses or sharp corners. Because it will harden in either oil or air, it holds size and shape exceptionally well. (A-general, Q29n; TS-k, SGA-j)

562-A. (Russian.) Utilization of Waste Products of the Titanium Industry. B. S. Gulyanitskii. *Tsvetnye Metally*, no. 5, 1959, p. 91-95.

Review of foreign literature. 77 ref. (A8; Ti)

563-A. Predicting Minimum Materials Cost for Stainless Steel. D. C. Hilty, R. W. Taylor and R. H. Gillespie. *Blast Furnace and Steel Plant*, v. 47, Sept. 1959, p. 962-964.

How to obtain maximum cost efficiency in production of stainless steel by considering sources and costs of raw materials, conservation in variables of processing such as bath temperature and condition, blowing rate, slag basicity, alloy blending, materials handling, maintenance of stocks, scrap usage, etc. Conclusions based on study of linear program model for a 70-ton furnace process for Type 430 stainless steel. (A4s, D-general)

564-A. (German.) New High-Magnesium Casting Alloy X250, From Alcoa. *Aluminium*, v. 35, Oct. 1959, p. 568.

4 ref. (A-general; Al-b, *Mg*)

565-A. Commercial Production of Rhenium Metal. *Chemistry and Industry*, no. 38, Sept. 19, 1959, p. 1189.

(A-general; Re)

566-A. Condensed Review of Some Recently Developed Materials. *Machinery*, v. 66, Nov. 1959, p. 131-142.

Tabulation of 120 alloys, processing materials and equipment according to properties, applications and manufacturers. (A-general, 17-57)

567-A. (Polish.) Air Dust Pollution Produced in Iron and Steel Plants. Ladyslaw Tarnowski. *Hutnik*, v. 26, no. 9, 1959, p. 337-342.

(A8a; ST)

568-A. Ruthenium. L. Sanderson. *Canadian Mining Journal*, v. 80, Oct. 1959, p. 106-108.

Properties, extraction and refining, applications. (A-general; Ru)

569-A. Metals Documentation. A Fast New Problem-Solving Service. Marjorie R. Hyslop. *Metal Progress*, v. 76, Nov. 1959, p. 123-128.

Literature searching by machine is fast, thorough and prompt. The new American Society for Metals Documentation Service will provide, at two-week intervals, abstracts of all current publications pertaining exactly to the subscriber's problems. Ultimately, bibliographic searches of all metallurgical documents published in preceding years will be provided overnight. (A14e)

570-A.* Beryllium—The Metal and Its Design Potential. F. M. Yans and N. R. Gardner. *Electrical Manufacturing*, v. 64, Nov. 1959, p. 181-187.

Advantageous physical, thermal, electrical, optical and nuclear properties make Be useful for many applications. (A-general, Q-general, P-general; Be, 17-57)

571-A.* New Steel Alloy. Jack H. Schaum. *Modern Castings*, v. 36, Sept. 1959, p. 43.

New alloy uses approximately 3% Cu and 6.5% Ni to develop an austenitic matrix, instead of the 11-15% Mn contained in conventional austenitic Mn steel. The finely dispersed hard carbides are formed by the 2-5% Cr, Mo V, W, Cb or Ti present in the alloy. (A-general, Q-general; SS, *Cr, Mo, V, W, Cb, Ti*)

572-A. (Pamphlet.) Allegheny Ludlum Potomac, a Hot Die and High Strength Structural Steel. 22 p. 1959. Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.

Cr-Mo-V hot work steel for tool and die applications requiring strength at elevated temperatures. Data on short and long-time properties, fabrication techniques and heat treatments. (A-general, Q-general, J-general, 2-62; TS-k)

573-A. (Pamphlet.) Pocket Guide to Steel Analyses. 20 p. 1959. Jones & Laughlin Steel Corp., Stainless and Strip Div., Box 4606, Detroit 34, Mich.

Tables of composition of a large number of alloys, carbon and stainless steels. (A-general; ST)

574-A. (Book.) Proceedings of the Florida Conference on High-Speed Aerodynamics and Structures. v. 1. 190 p. 1959. U. S. Office of Technical Services, PB 151538, Washington 25, D. C.

Held at the University of Florida, Gainesville, Jan. 21-24, 1957. Papers abstracted separately. (A-general, T24; SGB-s)

575-A. (Book.) Kinetics of High-Temperature Processes. W. D. Kingery, Editor. 326 p. 1959. Technology Press of Massachusetts Institute of Technology and John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

Conference held at M.I.T.'s Endicott House, June 23-27, 1958. Relevant papers abstracted separately. (A-general, 2-62)

576-A. (Book.) ASM Review of Metal Literature. v. 15. Marjorie R. Hyslop, Editor. 1289 p. 1958. American Society for Metals, Metals Park, Novelty, Ohio. $20.

A cumulative edition of some 12,000 abstracts appearing in the monthly sections of the *ASM Review of Metal Literature*. Author index, subject index, addresses of publications. (A14d)

577-A. (Book.) Reading German for Scientists. Hans Eichner and Hans Hein. 207 p. 1959. John Wiley & Sons, Inc., 440 Fourth Ave., New York.

Practical grammar and reading exercises chosen from chemical, physical and metallurgical literature. (A14b, 12-68)

578-A. (Book-Russian.) Ferrous Metallurgy. Isay Viktorovich Abramov. 156 p. 1958. Gospolitizdat, Moscow. (Available from Library of Congress, Washington, D. C.).

Summary of metallurgical process developments in U.S.S.R. blast furnaces, steel foundries and rolling mills. Production and efficiency data. (A4p, A2, D-general, F23; ST)

579-A. (Book.) Fifth National Symposium on Vacuum Technology Transactions—1958. (American Vacuum Society, Inc.). 282 p. 1959. Pergamon Press Inc., 122 E. 55th St., New York 22, N. Y. $15.

Papers relate to fundamental basis of vacuum techniques; vacuum systems and components; vacuum instrumentation and controls; ultra-high vacuum; vacuum deposited magnetic and thin films. Relevant papers abstracted separately. (A-general, 1-73)

580-A. (Book.) Progress in Vacuum Science and Technology. A. S. D. Barrett, Editor. 160 p. 1959. Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y. $10.

Covers vacuum problems in the manufacture of electronic valves, vacuum metallurgy and other nonmetallurgical vacuum processes. Papers abstracted separately. 27 ref. (A-general, C5, 1-73, D8m, D5, T1)

581-A.* (Translation.) Zirconium. *Metal Treatment and Drop Forging*, v. 26. Sept. 1959, p. 314-316. (From *Metallurgie*, Jan. 1959)

Survey of history, mining, future development, metallurgy and properties of Zr. (A-general, B-general, C-general, Q-general; Zr)

582-A. (Translation—ATS.) Current Uses of Metals of the Platinum Group. O. B. Zvyagintsev. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 1889-1899.

Use in petroleum refining, catalytic dehydrogenation, electrical and radio engineering, machine and instrument construction, medicine and jewelry. 28 ref. (A-general; EG-c, 17-57)

583-A. (Translation—Brutcher no. 4497.) Rating of Iron Ores From the Metallurgical Standpoint. W. Zimmer. *Neue Hutte*, v. 3, no. 4, 1958, p. 233-235.

(A-general, Fe, RM-n)

584-A. (Translation—Brutcher no. 4513.) Regeneration of Electroiytes for Electropolishing of Carbon Steel. T. Zak. *Metalloberflache*, v. 12, Dec. 1958, p. 361-363.

See item 100-A, 1959. (A11d, L13p; CN)

SECTION B

RAW MATERIALS and ORE PREPARATION

1-B.* Ups Lithium Concentrate Recovery 11%. Ted F. Meinhold and J. W. Walker. *Chemical Processing*, v. 21, Nov. 1958, p. 33, 104-105.

Li extracted from burkeite by a compact, prefabricated, flotation separator. The unit operates on principle of aspirating air into influent at suction side of the feed pump and compressing the mixture in the pump. (B14h; Li, 1-52)

2-B. Assessment of Ladle Firebrick Quality and Performance. G. M. Workman. *British Ceramic Society, Transactions*, v. 57, Sept. 1958, p. 551-572.

(B19d; W19b)

3-B.* Research in the Development of a Metallurgical Fuel From Brown Coal. G. L. Kennedy and D. G. Evans. *Australian Institute of Metals, Journal*, v. 3, May 1958, p. 61-75.

Improved carbonization techniques which yield a hard lump char equal in strength to hard coke from black coal. Char was applied to melting of iron in a cold blast cupola; development of the process to semi-commercial scale of operation is imminent. 9 ref. (B17h, E10a; CI)

4-B.* Application of Table Flotation to the Removal of Sulphides From a Scheelite Concentrate. M. H. Buckenham and F. L. Sanderson. *New Zealand Journal of Science*, v. 1, Sept. 1958, p. 425-435.

Upgrading and elimination of arsenic from a scheelite concentrate containing a large amount of sulphides. Test results, test condition covering the table floating of sulphides and the table floating of the sheelite. 6 ref. (B14h; W, As, Se)

5-B.* (French-German.) Zinc. Wilhelm F. Kaiser. *Pro-Metal*, no. 64, Aug. 1958, p. 11-23.

Characteristics, ores, mines, statistics. Refining by roasting, used for rich ores, including suspension roasting, resulting in zinc oxide, then further reduction using carbon monoxide or coal in muffle or electric furnaces. Raw Zn is refined by melting or distillation, removing Pb, Fe, Cu, Sn and Cd. Wet proceses and electrolysis used for poor or complex ores. Manufacture of Zn oxides: Zn white for paint, raw Zn oxide for varnishes by rotating oven, vat-oven or Walz oven. Waste products are remelted but unsatisfactory for alloys. Brass alloys can be reclaimed and waste oxides can be reduced and distilled satisfactorily. (B15, C21, C22, C23; Zn)

6-B.* (French.) Corrosion Tests Currently Used in Research on Electromelted Refractories. P. Bortaud. *Silicates Industriels*, v. 22, Sept. 1958, p. 443-446.

Furnace developed for testing electromelted refractories for resistance to corrosion by molten glass is adapted to testing of resistance of such refractories to slag attack. (B19d; RM-h, RM-q)

7-B.* (Rumanian.) Concentration of Poor Chromites of the Banat. Gh. Vanci. *Studii si Cercetari de Metalurgie*, v. 1, July-Dec. 1956, p. 349-352.

The ratio Cr_2O_3:FeO in the concentrates obtained remains below 2 because of crusts of chromites richer in FeO which

enclose the chromospinels. By regrinding the concentrates to particle size below 0.15 mm., separation is obtained of the two kinds of chromites and the separation of the chromite which is richer in FeO can be realized by magnetic methods. 3 ref. (B13c, B14j; Cr)

8-B. Magnetic Concentration of a Uranium Table Concentrate From E1 Sherana, Northern Territory, Australia. S. B. Hudson. *Australian Scientific and Industrial Research Organization, Ore-Dressing Investigations,* Report no. 554, Apr. 1958, 18 p.

Contains U_3O_8, hematite, limonite and pyrite. Sizing was not necessary if a reduction roast preceded magnetic separation. 8 ref. (B14j; U)

9-B. Flotation Tests on an Oxidized Copper Ore From Marble Bar, W. A. A. T. Miles, E. Tasker and R. A. Hobson. *Australian Scientific and Industrial Research Organization, Ore-Dressing Investigations,* Report no. 694, Feb. 1958, 11 p.

(B14h; Cu)

10-B. Development of a Foamed Alumina Castable Cement. W. F. Zimmerman. *Industrial Heating,* v. 25, Nov. 1958, p. 2330, 2332, 2334.

Because of the large amount of fine, uniform pores, it possesses extremely light weight, low thermal conductivity and significant strength. For use in hot gas propulsion systems and in other insulating applications at temperatures above 3000° F. (B19; Al-b, RM-h40)

11-B.* (Swedish.) Some Chemical Reactions Involved in Pelletizing and Iron Ore Reduction. John Olof Edstrom. *Jernkontorets Annaler,* v. 142, no. 7, 1958, p. 401-466.

Gaseous diffusion and flow through porous materials. Reaction between gas and solid oxide phases; reaction between solid oxide phases, solid state diffusion and equilibrium diagrams. Investigation of pelletizing dealing with oxidation of magnetite and reactions between lime and hematite. Quantitative expression for rate of reaction when oxidizing ore pellets in pure oxygen gas and in mixtures of oxygen and inert gases. Observations of processes occurring during reduction of pure ore grains, with emphasis on changes in microstructure and the mechanisms of reactions in the solid state. Reduction studies including calcium ferrites and ore pellets containing lime. 40 ref. (B15n, B16b, D11, N1a, Fe)

12-B. (German.) Water Economy in Iron and Steel Works. Friedrich Wesemann. *Jernkontorets Annaler,* v. 142, no. 6, 1958, p. 271-288.

15 ref. (B24, W10h, 17-53)

13-B. (Translation—SLA, ASLIB-GB152.) Determination of Optimum Moisture and Fuel Contents in Fine Ore Mixtures Intended for Sintering. H. Kosmider and E. Bertram. *Stahl und Eisen,* v. 76, no. 14, 1956, p. 858-879.

(B16)

14-B.* (Russian.) Calcination of Iron Ores for Their Magnetic Conversion in Rotary Kiln. P. A. Tatsienko and A. G. Gerasimov. *Stal',* v. 18, Oct. 1958, p. 877-882.

Experience in operation of rotary kiln for magnetic conversion of iron ores has suggested new ideas for design improvement. Most effective method for raising output and design simplification of kiln is the substitution of a gaseous for solid reducing agent. Furnaces 30 m. long and 2.2 m. diameter which can rotate with speed of 0.64:0.46, and 0.33 rpm. recommended. 10 ref. (B15p; Fe)

15-B.* (Spanish.) Influence of Different Types of Basic Additions on the Physical Properties of a Sinter of Siliceous Iron Ore. J. A. Boned. *Instituto del Hierro y del Acero,* v. 11, July-Sept. 1958, p. 155-167.

Additions of lime, flux, crude and roasted dolomite, and magnesia, separately and in mixtures of varying proportions, were tried and particle size of sinter and amount of fines was measured. Particle size is independent of percentage of coke dust and in many cases depends not only on nature of addition but on amount. Ore alone gives sinter product slightly larger than ore plus additions. Degree of oxidation can be used as indirect index of physical properties. 3 ref. (B16a, 2-60; Fe)

16-B.* Screening of Blast Furnace Burden Materials. H. N. Wilkinson and E. E. Farmer. *Iron and Steel Institute, Journal,* v. 190, Sept. 1958, p. 55-71.

Burden material sized to increase furnace output. Different types of screening

equipment and screening surfaces. Construction, principles of operation and material handled. 7 ref. (B13d, W15p)

17-B.* (Czech.) Roasting With $CaCl_2$ Additions. Jiri Hruby and Bohuslav Hadacek. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 706-708.

Enthalpy of fundamental reactions in slag after $CaCl_2$ addition. Oxidizing roasting with $CaCl_2$ addition to remove nonferfous metals and reduce iron loss. Treatment of lead smelting slag to obtain pig iron. 6 ref. (B15n, A11d, P12r; Fe, Pb)

18-B.* (Russian.) Preheating of Sintering Mixture in Pug Mills. D. A. Kissin, V. E. Ioffe, B. A. Stanishevskii and N. S. Karpushinskii. *Stal'*, v. 18, Oct. 1958, p. 867-869.

Preheating of sintering mixture by coke oven gas in pug mills from 28-33° to 48-49° has resulted in 3.5% increase in productivity of sintering machines. By increasing the comparatively low heat efficiency (40%) through improvement in burner construction and use of cheaper gas fuel, even greater economies are anticipated. By reduction of initial sintering temperature it is possible to prevent super-humidification of charge, thereby increasing its gas penetrability. 3 ref. (B16; Fe)

19-B. How High Tension Electrostatic Separation Recovers Iron Ore. R. E. Barthelemy. *Engineering and Mining Journal*, v. 159, Dec. 1958, p. 86-91.

In one single operation, requiring no alternative heat treatment, method can successfully beneficiate complex iron ores containing magnetite in any proportion. (B14n; RM-n, Fe)

20-B. Fluidization Techniques in Producing Refined Uranium From Ore Concentrates. A. A. Jonke, N. M. Levitz, Albin Litty and Stephen Lawroski. *Industrial and Engineering Chemistry* v. 50, Dec. 1958, p. 1739-1743.

6 ref. (B15q; U)

21-B. Fluidized-Bed Techniques in Producing Uranium Hexafluoride From Ore Concentrates. G. J. Vogel, Oscar Sandus, R. K. Steunenberg and W. J. Mecham. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 1744-1747.

(B15q; U)

22-B. (German.) Flotation and Settling in the Preconcentration of Complex Sulphide Ores. Cornel Pandelescu. *Revue de Métallurgie (Bucharest)*, v. 3, no. 2, 1958, p. 85-111.

10 ref. (B14g, B14h; Pb, Zn)

23-B.* Advances in Magnetic Separation of Ores. L. A. Roe. *Mining Engineering*, v. 10, Dec. 1958, p. 1261-1265.

Survey of methods and equipment, both U.S. and foreign. (B14j)

24-B.* Magnetic Separation for Mesabi Magnetite Taconite. J. E. Forciea, L. G. Hendrickson and O. E. Palasvirta. *Mining Engineering*, v. 10, Dec. 1958, p. 1269-1276.

All pilot and commercial plants working with Mesabi Range taconite employ wet magnetic separation. Progress is being made with a dry magnetic process, but this has not yet been applied to taconite except in the laboratory and pilot plants. 11 ref. (B14j; Fe)

25-B.* Comments on the Equilibrium Diagram. G. Tromel. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 77-78.

Liquidus line, melting point and composition range of mullite. 5 ref. (B19d, P12)

26-B.* Fission Product Ruthenium Volatility at High Temperatures. K. L. Rohde, C. E. May, B. J. Newby and B. D. Withers. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 68-70.

Volatile ruthenium tetraoxide is relatively stable to thermal or redox decomposition in a vapor phase of air and nitrogen oxides at 400 °C. Process studied was the fluidized-bed calcination of the first cycle aqueous raffinate from solvent extraction of spent Al-U fuel elements. 6 ref. (B15q, T11g; Al, U, Ru)

27-B. Absorption Kinetics Applied to Flotation. Hubert Marchandise. *Institution of Mining and Metallurgy, Bulletin*, no. 625, Dec. 1958, p. 57-66.

Selective flotation of manganese oxide; beneficiation of semi-oxidized Cu ores. 5 ref. (B14h; Cu, Mn, RM-n)

28-B. (German.) Systematics of Ore Crushing and Milling Previous to Flotation. W. K. Zachwatkin. *Neue Hutte*, v. 3, Nov. 1958, p. 643-650.

(B13; EG-a38)

29-B. (Russian.) Flotation Reagents for Copper Pyrites and Tetrahidrites. M. Doleshil, N. K. Konopleva and I. N. Plaksin. *Izvestiya Akademii Nauk SSSR*, Sept. 1958, p. 3-8.

Flotation yields 95% Cu, 60% Hg and Sb. 4 ref. (B14h; Cu)

30-B.* (German.) Chlorination of Ore Fines During Sintering. Herbert Neuhaus and Hermann Schenck. *Stahl und Eisen*, v. 78, Nov. 13, 1958, p. 1662-1668.

Experiments aiming at elimination of undesirable impurities by means of chlorination during the sintering process, applicable particularly to ores with high Zn content. 13 ref. (B16a, 2-66; Fe)

31-B. (Translation - B1S1, 688.) Experiences With Automatic Speed Control of Sintering Machines for Ensuring the Completion of the Process. D. G. Khokhlov. *Stal'*, v. 17, June 1957, p. 481-488.

See item 112-B, 1957. (B16a, S18n, 1-2; Fe)

32-B. (Translation - Brutcher, 4411.) Flash Roasting of Nonferrous Sulphide to Sulphate Ores. G. Ya. Leizerovich. *Tsvetnye Metally*, v. 13, no. 9, 1957, p. 19-25.

Design details of pilot plant constructed at a Russian research institute. Effect of excess air, roasting temperature and bed depth on results. Flash roasting of Cu-Zn concentrate (9% Cu, 9.5% Zn, 25% Fe, 39% S) and potentialities of process. (B15; Cu, Zn)

33-B. (Translation - Brutcher, 4422.) Disintegration of Ores by High-Frequency Electromagnetic Fields. M. A. Gintsberg. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, Oct. 1957, p. 93-95.

Large ore lumps broken up in seconds without use of mechanical force. (B13; Fe, RM-n)

34-B. (Translation - ConBur.) Investigation of Organic Compounds Which Retard the Oxidation of Sulphide Ores at Elevated Temperatures. F. N. Pavlov, V. G. Plusnin and E. F. Iordan. *Journal of Applied Chemistry of the USSR*, v. 30, 1957, p. 997-1000.

Tar water from peat gas producer stations and technical xylenol from peat tars, used at low concentrations, protect sulphide ores against oxidation by atmospheric oxygen both at low and elevated temperatures. (B15)

35-B.* (Japanese.) Characteristics of Agolmatrite Brick. T. Hayashi. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 816-823.

Brick used as a refractory in iron and steel foundries. Relation between heat resistivity and alumina content; softening temperature, swelling and porosity; corrosion and erosion; slag. 4 ref. (B19d)

36-B. The Service of High Alumina Bricks in the Regenerator Checkers of Open-Hearth Furnaces. V. A. Rybnikov, E. A. Volynskii and G. V. Vodop'yanov. *Refractories Journal*, v. 34, Dec. 1958, p. 552-554.

Russian practice. (B19d, W18r; RM-h, Al)

37-B. (Hungarian.) Laboratory Pre-Roasting and Sintering Experiments With Lead Concentrates Originating From "Gyongyosoroszi". Istvan Riedl. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 149-156.

8 ref. (B14; Pb)

38-B. (Russian.) Electrostatic Separation of Apatite and Zircon. I. A. Kokobskii and V. I. Revnivtsev. *Izvestiya Akademii Nauk SSSR*, Sept. 1958, p. 9-16.

16 ref. (B14n; Zr)

39-B. (Russian.) Effect of Oxygen and Nitrogen in Selective Flotation of Titanium and Zirconium Minerals. V. V. Bakakin, I. N. Plaksin and E. M. Chaplygina. *Izvestiya Akademii Nauk SSSR*, no. 6, 1958, p. 84-90.

Laboratory study of flotation by preliminary treatment of the mineral pulp with gases such as oxygen and nitrogen. (B14; Ti, Zr)

40-B. (Russian.) Extracting Valuable Components From Pyrite Flotations by Calcining Sulphates (FeS_2). V. V. Pechkovskii, S. A. Amipova and V. V. Parkacheva. *Zhurnal Prikladnoi Khimii*, v. 31, no. 10, 1958, p. 1466-1471.

(B15; Fe)

41-B* Steel Plant Refractories in Russia. Kenneth Shaw. *Iron and Steel*, v. 31, Dec. 1958, p. 593.

Developments in furnace roof-life and ladle brick performance. Silica-chromite in checkers produced promising results. (B19d, D-general; RM-h)

42-B.* (Ukrainian.) Investigation of Iron Ore Sintering Process by Differential Magnetic Susceptibility. Z. I. Nekrasov, N. A. Gladkov and V. V. Chekin. *Dopovidi Akademii Nauk Ukrain'skoi RSR*, no. 8, 1958, p. 826-830.

Method of continuous testing of sintering process throughout the entire mass of the charge by difference in the magnetic susceptibility of the ore and the agglomerate. (B16a, S13h)

43-B.* (French). Beneficiation of Iron Ores in the United States. F. W. Bowdish. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 15-22.

Characteristics of Mesabi Range and Lake Superior ores; treatment details. History of use of magnetic taconites. Principal methods used on ores found in other areas of U.S. 13 ref. (B-general; Fe)

44-B.* (French.) Beneficiation of Iron Ores in U.S.S.R. M. Kunicki. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 23-50.

Deposits and reserves. Principal techniques used are magnetic and gravity concentration, flotation and magnetizing roasting. Process details, flow sheets, equipment, chemical analyses of ores and their concentrates from Kertch and Ural Districts, Krivoi-Rog and Koursk Basins. (B-general, W15; Fe)

45-B.* (French.) Beneficiation of Iron Ores in Scandinavia. M.Febve. Paper from "Symposium on the Beneficiation of Iron Ores." Editions Brun, Paris, France, Aug. 1958, p. 51-54.

Scandinavia has two large ore districts lying partly in Sweden, partly in Norway. Magnetite containing apatite is principal type of ore. Because of high cost of coke, which must be imported, Scandinavian furnaces are charged with concentrates containing highest possible percentage of Fe. Improvement of techniques and equipment is constantly studied to permit supply of increasingly rich products to domestic and export markets. Iron and steel production facilities. (B-general; Fe)

46-B.* (French.) History of Beneficiation of Iron Ores in Western Germany. M. Pasquet. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 55-64.

Types of ores and deposits. Characteristics of German ores present numerous difficulties and much effort has gone into developing specially adapted concentration techniques. At present, efforts in field of beneficiation are concentrated on improvement of existing plant and research on nonexploited deposits. 7 ref. (B-general; Fe)

47-B.* (French.) New Tendencies in Iron Ore Beneficiation Techniques as Reported at the Stockholm Congress (September 1957). P. Javel. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 65-70.

Highlights of developments in various countries; physical processes only. (B-general; Fe)

48-B.* (French.) Beneficiation of Lorraine Ores. Research Conducted From 1931 to 1939. L. Boileau. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 75-90.

Composition; classification of Lorraine ores on basis of susceptibility to beneficiation; review of experimental work during period covered. (B-general; Fe)

49-B.* (French.) Work of IRSID on the Beneficiation of Lorraine Ores. P. Emery. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 91-105.

Properties of ores; results of experimental dressing, preconcentration, magnetic concentration, flotation, magnetizing roasting. 15 ref. (B-general; Fe)

50-B.* (French.) High-Intensity Dry Magnetic Concentration. Principles and Equipment. J. de Robert. Papre from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 107-112.

Theory of magnetization and magnetic concentrators; types of concentrators and rotors; procedure and products. (B14j, W15h; Fe)

51-B.* (French.) Beneficiation of Lorraine Ores by High-Intensity Magnetic Concentration. Recommended Plant. L. Forichon, P. Javelle, M. Pasquet and J. de Robert. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 113-124.

Problems of pretreatment to provide material suitable for magnetic concentration. Equipment and its efficiency in handling different types of ores. Flow sheets for pretreatment lines designed to handle clogging and nonclogging ores. Estimated investment, operating costs, labor and electric power requirements for a complete plant capable of processing 2000 tons per day of run-of-mine ore, starting with breaking and ending with magnetic concentration. (B-general, B14j; Fe)

52-B.* (Hungarian.) Complex Extraction Process for High-Silica Bauxites. Adam Juhasz. *Kohaszati Lapok*, v. 13, No. 8, 1958, p. 349-357.

Purification by sodium calcium sintering and combined Bayer and electrolytic process. (B16a, B14, C23n; Al, *Si*)

53-B. Automatic Processes in the Production of Steel. W. H. Dauberman. *Blast Furnace and Steel Plant*, v. 47, Jan. 1959, p. 72-78.

Automatic systems now in use in sinter plant, blast furnace skip hoist, slabbing mill and tandem cold strip mill. (B16a, D-general, F23; 18-74)

54-B. (French.) Special Problem of the Beneficiation of Lorraine Iron Ores. P. Guinard. Paper from "Symposium on the Beneficiation of Iron Ores". Editions Brun, Paris, France, Aug. 1958, p. 71-74.

Reasons for late entry of France into beneficiation field. Structure and composition of Lorraine ores. Brief description of deposit. (B14; Fe)

55-B. (German.) Refractory Furnace Materials. Pt. 1. Rudolf R. Domanowski. *Giesserei-Praxis*, Dec. 10, 1958, p. 458-462.

Natural and artificial refractories, silica bricks and chamot bricks. Outline of production. Advantages and disadvantages of materials due to shrinking and growing in volume, influence of silicic acid. (B19)

56-B. (German.) Refractory Construction Materials for Furnaces. Rudolf R. Domanowski. *Giesserei-Praxis*, Dec. 24, 1958, p. 474-481.

Manufacture, properties, testing and uses of fibrolite, corundum, magnesite and chromite and carbon. Testing refractory materials. (B19)

57-B. (Portuguese.) Completion of Another Stage in Belgo Mineira's Second Expansion Plan. *Engenharia, Mineracao e Metalurgia*, v. 28, Dec. 1958, p. 366.

Iron ore crushing, sizing and storage facilities, which will ultimately be part of new sintering plant at Monlevade works, began operation in November 1958. (B13; Fe)

58-B. (Slovenian.) Sintering of Iron Oxides. Bogomir Dobovisek and Niaz Smajic. *Rudarsko-Metalurski Zbornik*, no. 3, 1958, p. 241-262.

Sintering mechanism. 5 ref. (B16a; Fe)

59-B.* (German.) Scheelite Recovery From a Tungsten Ore Deposit in the Erzgebirge. Edelhard Topfer. *Neue Hutte*, v. 3, Oct. 1958, p. 586-593.

Mine produces a W ore containing about 9% scheelite and 2% wolframite. Starting process is crushing, followed by sifting and removal of sulphide by flotation. Experiments in scheelite enrichment by electrostatic concentration. 4 ref. (B14; W)

60-B.* (German.) Large-Scale Production and Smelting of Ore-Lime-Coke Briquettes. Kurt Sauberlich and Walter Zwade. *Neue Hutte*, v. 3, Oct. 1958, p. 594-602.

Small-scale tests and large-scale production of briquettes compacted from iron ore-lime-coke mixture in roll presses. Hardening of green briquettes by piling in cascades, canals, bunkers and top furnaces. Large-scale smelting of briquettes. 4 ref. (B16d, D8n)

61-B. (Book—French.) Symposium on the Beneficiation of Iron Ores. 124 p. Aug. 1958. Editions Brun, Paris, France.

Papers presented at symposium arranged by Institut de Recherches de la Siderurgie and Association Technique de la Siderurgie, Oct. 8, 1957. Developments in U.S.A., U.S.S.R., Scandinavian countries, Western Germany, France. Special problems of beneficiation of Lorraine ores. Papers abstracted separately. (B-general; Fe)

62-B. (Russian.) Acid Dispersion and Activation During Flotation Process of Oxides of Minerals. F.I. Belash. *Izvestiya Akademii Nauk, Otdelenie Teknicheskikh Nauk*, no. 11, 1958, p. 131-135.

9 ref. (B14h; RM-n, NM-a34)

63-B. (German.) Production Control Methods in West German Ore Preparation. Eugen von Szantho. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 12, Jan. 1959, p. 7-11.

Particle size, pH number, temperature, moisture, control. (B-general)

64-B.* (Japanese.) Flotation Characteristics of Sphalerite in Relation to Its Chemical Composition. Heikichi Saito, Hiromu Fushimi, Taneomi Harada and Jaehyun Oh. *Waseda University, Bulletin of Science and Engineering Research Laboratory*, v. 33, Dec. 1958, pg. 39-47.

Natural flotability, effect of pH of potassium ethyl xanthate solution, effect of activation by Cu sulphate. 16 ref. (B14h, 2-60; Fe, Zn)

65-B. Concentration Tests Upon Heavy Mineral Sands From Capel, W. A. H. R.

Dunstan, E. Tasker and R. A. Robson. *Commonwealth of Australia, Ore-Dressing Investigations, Report,* no. 692, June 1958, 5 p.

Zircon, rutile-leucoxene and monazite products produced by electrostatic and magnetic concentration. (B14; Th, Ti, Zr)

66-B. Recovering Mercury From Cinnabar-Stibnite Ore by Flotation and Fluidized-Bed Roasting. R. R. Wells, M. M. Johnson and F. T. Sterling. *U. S. Bureau of Mines, Report of Investigations,* no. 5433, 1958, 19 p. (B14h, B15q; Hg)

67-B.* Investigation of the Action of Modifying Agents in Flotation by the Use of Radioactive Tracers. O. S. Bogdanov, B. Y. Hainman, N. A. Yanis and A. K. Podnek. Paper from "Radioisotopes in Scientific Research", v. 1, Pergamon Press, New York, 1958, p. 441-452.

Results obtained using radioactive tracer method to study interaction between various flotation reagents with sulphide and non-sulphide minerals. 7 ref. (B14h, 1-59)

68-B.* Fluidized Beds for Metal Production. J. H. Oxley and I. E. Campbell. *Journal of Metals,* v. 11, Feb. 1959, p. 135-137.

Metal production by vapor deposition in a fluidized bed has been the result of applying the chemistry of vapor plating to the engineering involved in handling fluidized solids. Commercial possibilities depend on availability of low-cost feeds. 31 ref. (B15q; Fe, Mo, Ni, 6-70)

69-B. Basic Brick in Copper Converters. Their Mineralogical Changes. C. Burton Clark and J. Spotts McDowell. *Journal of Metals,* v. 11, Feb. 1959, p. 119-124.

Plant experience has shown that burned chrome-magnesite and burned magnesite brick give excellent service in Cu converters. This study confirms that experience, but it also notes certain differences between the two. 4 ref. (B19d, C21b, W18p; Cu; RM-h38)

70-B. (German.) Improvements in the Processing of Furnace Gas. Walter Kurtz. *Neue Hutte,* v. 3, Dec. 1958, p. 711-720. (B18q, A8a)

71-B. (Translation--Brutcher no. 4380.) Economies Made Possible by Flash Roasting of Zinc Concentrates. S. I. Azos and R. L. Veller. *Tsvetnye Metally,* v. 30, no. 4, 1957, p. 7-9. (B15; Zn)

72-B. (Translation--Brutcher no. 4386.) Properties of Fluxed Sinter. N. L. Gol'dshtein and N. S. Khromenko. *Stal',* v. 18, July 1958, p. 586-593.

See item 206-B, 1958. (B16a, D1, Fe)

73-B. (Translation--Brutcher no. 4465.) Interaction of Iron Ores With Methane in a Fluidized Bed. K. P. Lavrovskii. *Doklady Adademii Nauk SSSR,* v. 112, no. 4, 1957, p. 724-727.

Applicability of advances in fluidizing reactor technology to production of sponge iron. Conditions under which a fluidized bed for reduction of various ores can be maintained at 850-900° C. (1560-1650° F.) without the solid particles sticking together. Possibility of obtaining the hydrogen needed for the reduction process from methane-containing reducing gases. (B15q, Fe, RM-n)

74-B.* Iron Ore Sintering Practice in France: Results Obtained With Lorraine Ores in Small Blast Furnaces. M. J. Astier. *Iron & Coal Trades Review,* v. 178, Feb. 20, 1959, p. 437-441.

Comparisons between blast furnaces using high-sinter burdens in various parts of the world. 4 ref. (B16a, D1a; Fe)

75-B.* Review of Self-Fluxing Sinter Applications. Thomas E. Ban. *Blast Furnace and Steel Plant,* v. 47, Mar. 1959, p. 294-302.

Advantages of sintering iron ore with limestone. Sintering operation and blast furnace performance. 42 ref. (B16, D1; Fe)

76-B. Recovery of Semi-Heavy Minerals in Jigs. F. A. Williams. *Institution of Mining and Metallurgy, Bulletin,* v. 68, Pt. 5, Feb. 1959, p. 161-175.

Specific gravity and grain size data for zircon, anatese and topaz. Screening performance of jigs. 7 ref. (B13d; Sn, Cb, Ti, Zr)

77-B. Preliminary Ore Treatment. F. M. Stephens, Jr., and O. F. Tangle. Paper from "Uranium Ore Processing", Addison Wesley Publishing Co., Inc., Reading, Mass., 1958, p. 103-114.

Salt roasting, concentration and flotation of U ores. (B14, B15; U)

78-B. (Polish.) Agglomeration of Iron Ore in Poland. Zygmunt Krotkiewski. *Hutnik,* v. 25, Nov-Dec. 1958, p. 467-470. (B16; Fe)

79-B.* (French.) Importance of Heat Transfer and Combustion Phenomena in Down-Draft Sintering. E. W. Voice and R. Wild. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 11-30.

Data compiled from an iron ore charge containing combustible materials. Heat transfer and combustion are affected by the quality and heating capacity of the solid fuel, specific heat of charge, exothermic and endothermic reactions, temperature of the charge and combustion gas. (B16; Fe)

80-B.* (Hungarian.) Suction-Type Sintering of Iron Ore Fines and Ore Mud. Laszlo Visnyovszky and Tiborne Hollo. *Kohaszati Lapok*, v. 91, Oct-Nov. 1958, p. 477-481.

Agglomerating experiments with ores containing large proportion of fines. Influence of pelletization on analysis of mixtures; screen analysis of ore samples used for sintering experiments. (B16; Fe)

81-B. Mineral Dressing. Louis J. Erck. *Mining Congress Journal*, v. 45, Feb. 1959, p. 58-61.

New developments in iron ore preparation. (B-general; Fe)

82-B. (French.) Physical Properties of Sintered Ore. J. Michard and A. Matraski. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Sinderurgie (IRSID), Paris, France, 1957, p. 103-130.

Grain distribution and chemical composition of various sintered ores. (B16a, D1a; Fe)

83-B. (French.) Effect of Additions on Physical Properties of a Sintered Siliceous Ore. J. A. Boned Sopena. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Sinderurgie (IRSID), Paris, France, 1957, p. 131-152.

Effects of lime, limestone flux, dolomite and Mg limestone. (B16a, 2-60; Fe, RM-q)

84-B. (French.) Effect of a Varied Suction in Ore Sintering. B. Menuet-Guilbaud and M. Auxenfans. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 244-277. (B16; Fe)

85-B. (French.) Plant Tests During Ore Sintering. J. M. Ridgion and H. Bates. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 280-292.

Effects of raw material properties, air flow and suction temperatures. 6 ref. (B16; Fe)

86-B. (French.) Effect of Pretreatment on Ore Sintering Output. Bernhard Weilandt. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 340-365.

Pretreatment by adding water, combustibles, limestone and dolomite and by pelletizing. 16 ref. (B16; Fe)

87-B. (French.) New Sintering Method for Ores With a High Fire Loss. R. F. Jennings. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 431-445.

Of two layers on a traveling grate one is sintered and the other is roasted simultaneously by employing hot fumes produced in sintering. (B16; Fe)

88-B. (French.) Solid Fuels in the Sintering of Iron Ores. J. Michard. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 477-484.

Fuels with a low content of volatile matter are preferable. (B16; Fe, RM-j)

89-B. (French.) Iron Ore Sintering Plants in the USSR. A. Parfenov. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 491-496.

Design of Russian ore sintering plants. (B16; Fe, 18-67)

90-B. (French.) Sintering Practice at the Djerzinski Plant. A. K. Rudkov. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 497-502.

Two types of sintered ore for both the bessemer and openhearth process of various compositions and flux additions are produced. (B16; Fe)

91-B. (French.) Sintering of Haematite Fines at the ISCOR Works, Pretoria, South Africa. E. Klein. Paper from "International

Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 551-561.

Improvements achieved by better selection of mesh sizes and additions of CaO; crushing of coke to 3 mm.; addition of limestone. Pretreatment by moistening and pelletizing. (B16; Fe)

92-B. (German.) Motion of Particles in the Hydraulic Cyclone and Its Application in Heavy-Liquid Separation. Gustav Tarjan. *Neue Hutte*, v. 4, Feb. 1959, p. 65-73.

Velocity distribution of the flowing agent in the cyclone; behavior of particles of different grain size; pressure drop in the cyclone; influence of opening angle and nozzle sizes; behavior of heavy liquids in the cyclone; importance of specific gravity of liquid and of deterioration of viscosity. 4 ref. (B24, B14)

93-B.* Studies in the Sintering Permeability and Pellet Strength of Australian Hematite Ores. W. Callender. *NML Technical Journal*, v. 1, Feb. 1959, p. 47-58.

Resistance to gas flow in various zones in the sinter bed. Effect of drying and heating on the compressive strength of unsintered ore pellets containing various additives. Relationship between sintering rate and pellet strength. 6 ref. (B16a; Fe)

94-B. (Book.) Educational Program: Calculations, Operational Instructions and Abstracts of Various Magazine Articles for the Fluidizing Reactor as Used in the Mineral Industry. Sigmund L. Smith and Frederick L. Stubbs. 104 p. Feb. 1959. University of Arizona, College of Mines, Tucson, Ariz. $5.

Manual of basic data, including abstracts of recent articles. (B15q)

95-B. (Book-French.) International Symposium on the Sintering of Iron Ores. v. 1 and 2. May 1957. 644 p. l'Institut de Recherches de la Siderurgie (IRSID), St. Germain-En-Laye, Paris, France.

Mechanism of sintering, sintering methods and processing of sinter charges in the blast furnace. Papers separately abstracted. (B16a; Fe)

96-B. By-Product Oxygen as a Stimulant in Zinc Concentrate Roasting. J. A. B. Forster and R. J. Cooper. *Australasian Institute of Mining and Metallurgy, Proceedings*, no. 188, Dec. 1958, p. 1-10.

5 ref. (B15n; Zn, *O*, 17-57)

97-B.* Pyrrhotite Refining. J. A. Edwards. *Iron & Steel*, v. 32, Apr. 1959, p. 154-156.

Preparation of hematite from sulphide ores containing Ni and Cu. (B-general, C19n; Fe)

98-B.* Sulphatizing Copper Sulphides Edward S. Howell. (Paper no. 3 from Symposium on Fluid Bed Reactors, University of Arizona, p. 25-33.) *Mining World*, v. 21, Apr. 1959, p. 31-32.

Roasting with fluid bed reactor. (B15q; Cu)

99-B.* Fluosolids Processing for Selective Roasting. Donald MacAskill. (Paper no. 4 from Symposium on Fluid Bed Reactors, University of Arizona, p. 25-33.) *Mining World*, v. 21, Apr. 1959, p. 32-33.

Two-stage roasting. (B15q; Cu, Fe)

100-B.* Magnetic Roasting of Iron Ore. R. K. Sinnott. *Ramsay Society of Chemical Engineers, Journal*, 1959-1959, p. 48-54.

Roasting of low-grade ores prior to magnetic separation. 9 ref. (B15p; Fe)

101-B.* Pyrite Treated in Kennecott Reactor. Henry W. Franz. (Paper no. 2 from Symposium on Fluid Bed Reactors, University of Arizona, p. 25-33.) *Mining World*, v. 21, Apr. 1959, p. 30-31.

Use of fluidizing reactor in the production of sponge iron from pyrite and for strong sulphur dioxide gas for sulphuric acid manufacture. (B15q; Fe, 6-74)

102-B. New Ore Sintering Plants and Associated Problems. *Industrial Heating*, v. 26, Mar. 1959, p. 526, 528, 530, 566.

Details of the new Inland, Armco, Weirton and Jones and Laughlin plants. (B16; Fe)

103-B. Applications of Fluid Bed Reactors. (Introduction to Symposium, University of Arizona, p. 25-33.) *Mining World*, v. 21, Apr. 1959, p. 25-26.

Report on University of Arizona symposium. Other papers abstracted separately. (B15q)

104-B.* Sinter—a Versatile Process. Howard C. Renken. *Battelle Technical Review*, v. 8, May 1959, p. 3-7.

Mechanism of process, equipment. (B16, W15)

105-B.* (Hungarian.) Theoretical Calculation of Heat Requirements in Bauxite Di-

gestion. Mihaly Mariassy and Laszlo Horvath. *Kohaszati Lapok*, v. 91, Dec. 1958, p. 529-534.

Digestion of bauxite in the Bayer process by using low-concentration caustic soda. (B14; Al)

106-B.* (Hungarian.) Sintering Iron Ore Fines and Muds in Suction-Type Agglomerating Plants. Laszlo Visnyovszky and Tiborne Hollo. *Kohaszati Lapok*, v. 91, Dec. 1958, p. 544-548.

Influence of bond-material and humidity content on pellet formation. 5 ref. (B16; Fe)

107-B. McLouth Steel Puts Self-Fluxing Sinter Line Into Operation. *Iron and Steel Engineer*, v. 36, Apr. 1959, p. 144-146. (B16a, 1-52)

108-B. Froth Flotation. P. F. Whelan. *Research Applied in Industry*, v. 12, Apr. 1959, p. 133-140.

64 ref. (B14h)

109-B.* (Hungarian.) Energy Requirements of Alumina Production. Adam Juhasz. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 1-8.

Preparation and digestion by the Bayer process. (B14; Al)

110-B.* (Hungarian.) Production of Oxygen for Metallurgical Applications. Geza Radanyi. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 29-33.

Use of oxygen in blast furnaces, open-hearth and electric furnaces with special reference to the production of stainless steels. Processes for producing oxygen. 9 ref. (B25, D-general; O)

111-B.* (Russian.) Obtaining Powdered Iron From Pyritic Cinders. I. G. Lesokhin. *Zhurnal Prikladnoi Khimii*, v. 32, Jan. 1959, p. 60-65.

The extent of Fe reduction of pyritic cinder at constant temperature, time and rate depends on the chemical composition of the cinder. Preliminary removing of sulphur increases the reduction rate. 14 ref. (B15; Fe)

112-B. (Russian.) Continuous Calcination of Limestone Prior to the Addition of Lime to the Sintering Charge. G. G. Oreshkin, N. Z. Plotkin and A. K. Rudkov. *Stal'*, Mar. 1959, p. 197-203. (B15, D1a; NM-e)

113-B. A Process for Controlling Insoluble Uranium in Ore Concentrates. G. P. Lang, E. N. Nelson and C. W. Kuhlman. Mallinckrodt Chemical Works, Uranium Division. *U. S. Atomic Energy Commission*, MCW-1420, Feb. 2, 1959, 35 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Techniques for converting nitric acid insoluble uranium in ore concentrates into soluble form. Ore concentrates are treated with a reducing agent such as carbon monoxide or hydrogen at temperatures of 670-730° C. Retention times required to reach a given level of insoluble uranium vary inversely with the concentration of the reducing agent. (B15; U)

114-B. (Japanese.) Steel Scrap. Takashi Kosuge and Takashi Akiyoshi. *Metals*, v. 29, Feb. 1959, p. 90-93.

Processing and utilization. (B23; ST)

115-B. (Japanese.) Utilization and Processing of Scrap. T. Nakamura, S. Nakajima and K. Ozaki. *Metals*, v. 29, Feb. 1959, p. 94-102.

Cu, Al and Pb scrap. (B23; Cu, Al, Pb)

116-B.* (German.) Sintering of Iron Ores. Wilhelm vor dem Esche and Otto Stinhauer. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 187-198.

Sintering temperature of ores, the tailings of which are composed primarily of silica, is reduced by slag forming components from 1560 to approximately 1400° C. In the case of a high Ca content, the formation of calcium silicates or calcium ferrites with a low melting point lowers the sintering temperature to the range 1220-1250° C. 24 ref. (B16a; Fe)

117-B. (Czech.) Theory of Flotation. Bohuslav Dobias and Jiri Spurny. *Chemicke Listy*, v. 53, no. 2, 1959, p. 209-243.

Surface properties of particles; physics and kinetics of flotation. 201 ref. (B14h)

118-B. (Book.) Progress in Mineral Dressing. 754 p. 1958. Almquist & Wiksell, Stockholm, Sweden.

Transactions of the International Mineral Dressing Congress, Stockholm, 1957. (B-general)

119-B. (Translation.) Magnetizing Iron Ores by Roasting. Use of Tubular Furnace in Russia. P. A. Tatsienko and A. G. Gerasimov. *Iron & Coal Trades Review*, v. 178, May 15, 1959, p. 1121-1125. (From *Stal'*, no. 10, 1958.)

10 ref. (B15p, W18b; Fe)

120-B. (Russian.) Blending of Iron Ores at Iron and Steel Mills. Kh. P. Zaitsev, I. A. Volokh and Z. N. Vorogushina. *Stal'*, May 1959, p. 385-389.

Sinter products of uniform composition were attained by blending Fe ores at the ore stockyards and sintering plants located at the steel mills. (B16a; Fe)

121-B. (Russian.) Burning of Pellets on Fire Grates. I. I. Rovenskii. *Stal'*, May 1959, p. 389-393.

Pellets made of magnetite (Fe_3O_4) concentrate and fluxed with chalk produce a better quality product when burned with gaseous fuel rather than solid fuel. 6 ref. (B16b; Fe)

122-B. Extrusion-Agglomeration of Iron Fines. Ira A. Stark. *Mining Engineering*, v. 11, June 1959, p. 601.

(B16d; Fe)

123-B.* (Ukrainian.) Various Methods of Activated Sintering of Reduced Ore. R. A. Andrievskii and I. M. Fedorchenko. *Dopovidi Academii Nauk Ukrain'skoi R.S.R.* v. 4, no. 4, 1959, p. 392-395.

Changes in magnetic properties of porous iron bodies sintered at 2000° C. for 2 hr. in a moist atmosphere under conditions containing HCl or sintered in the presence of NH_4Cl and NH_4F. Best results are obtained when HCl is used, because of the intense spheroidization of pores. (B16a, P16; Fe)

124-B. Symposium on Sinter Plants. K. S. Loofboro, George W. Watson, William O. Bishop, Charles P. Frame, Richard W. Adams. *Iron and Steel Engineer*, v. 36, June 1959, p. 101-122.

Data on Jones and Laughlin's Cleveland Works sinter plant, Weirton No. 2 sinter plant, screening and sinter facilities at Inland Steel Co., and layout and design of Ashland Sintering Plant. (B16a; Fe)

125-B.* (German) Smelting Properties of Iron Ores and Sinter. Peter Dickens and Jakob Willems. *Stahl und Eisen*, v. 79, June 1959, p. 905-917.

Reduction tests with city gas, with a mixture of 65% nitrogen and 35% carbon monoxide; microscopic tests. (B15p, B16a; Fe)

126-B.* (German.) Reduction of Iron Ore and Sinter With Special Emphasis on Dissociated Carbon and Expulsion of Carbonic Acid and Chemically Combined Water. Eberhard Schurmann, Gerhard Heynert and Hans Beer. *Stahl und Eisen*, v. 79, June 1959, p. 917-926.

A bed of Fe ore or sinter 100 mm. thick is reduced at temperatures of 100-1100° C. by a CO-H-N gas mixture. Results given as function of time and temperature. (B15p, 3-67, 2-61; Fe)

127-B. The New Hayden Smelter Prepares to Take Ore From an Expanded Ray Pit. John B. Huttl. *Engineering and Mining Journal*, v. 160, June 1959, p. 97-103.

Expansion program at the Ray Division of Kennecott Copper Corp. is increasing pit production by 50% and blister Cu production by 40%. (B-general; Cu)

128-B.* (German.) The Fluidization Process With Gases Containing Hydrogen and CO for the Reduction of Iron-Containing Ores. Jacob Willems and Gunter Quade. *Stahl und Eisen*. v. 79, July 23, 1959, p. 1058-1064.

Roasting of sulphide-containing ores. Theoretical aspects of gas reduction with oxygen, carbon monoxide and mixtures of both gases are compared. Advantage of the thermal process with use of carbon monoxide and with emphasis on the exothermic Boudouard reaction. Reduction velocities in the H-iron process; influence of temperature on the reduction velocity with hydrogen and CO reduction of hematite and magnetite with CO at 1000° C. (B15q, D8j; Fe)

129-B.* (German.) Processing of Lead Scrap From Storage Batteries. Erich Liebscher. *Neue Hutte*, v. 4, July 1959, p. 417-419.

Melting and refining in reverberatory, rotary and shaft furnaces. (B23, C28; Alld; Pb, *Sb*, RM-p)

130-B.* Magnetism and the Rare Earth Metals. J. M. Lock. *IRE Transactions on Component Parts*, v. CP-6, June 1959, p. 93-105.

Separation methods. Theory of paramagnetism and its application to rare earth elements. (B14j; EG-g)

131-B.* Symposium on Aluminum Industry Refractories. Pt. 2. *Industrial Heating*, v. 26, Aug. 1959, p. 1607-1608, 1610, 1612.

Behavior of refractories in contact with molten Al. Refractories suitable for Al melting. (B19d, R6m, C5, 1-52; RM-h, Al)

132-B.* The Treatment of Ore or Concentrate for Subsequent Processing by

Leaching or Pyrometallurgical Methods. The Concentration of Zinc Ores. Rollin A. Pallanch. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 103-136.

Factors affecting beneficiation of sulphide ores; historical development of flotation technology; present grinding classification and flotation practices. 22 ref. (B13, B14; Zn)

133-B.* The Treatment of Ore or Concentrate for Subsequent Processing by Leaching or Pyrometallurgical Methods. Roasting, Sintering, Calcining and Briquetting. K. D. McBean. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 136-173.

Suspension, multiple-hearth and fluidization systems of roasting Zn concentrates. Sintering Zn concentrate, partially roasted concentrate or dead-roasted calcine. Calcining and briquetting methods. 43 ref. (B15, B16a, B16d; Zn)

134-B.* Metallurgical Extraction. The Waelz Process. C. W. Morrison. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 298-306.

Zn ores and secondaries beneficiated by reacting with carbon in rotary kiln, oxidizing the vapor and collecting the fume produced. Equipment and operating practice. 9 ref. (B14r; Zn)

135-B.* Metallurgical Extraction. Sources and Recovery of Scrap Zinc. J. N. Pomeroy and J. E. Crowley. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 314-321.

Recovery of metallic Zn and Zn compounds from galvanizers dross, die castings, skimmings, chemical residues, flue dust and engravers plates. (B23, C22, C21; Zn)

136-B.* (German.) Electric Smelting Furnace for Iron Ore Reduction by the Fluid Bed Process. Werner Wenzel. *Stahl und Eisen*, v. 79, Aug. 20, 1959, p. 1183-1186.

With resistance heating of the coal fluid bed, efficiency losses encountered at the pilot furnace are lower than those existing in an electric reduction furnace. Advantages include primary reduction of ores achieved by the furnace gases. (B15q, W18s; Fe)

137-B.* Agglomeration Tests Made in New Pilot Plant. *Blast Furnace and Steel Plant*, v. 47, Oct. 1959, p. 1071-1072.

Agglomeration, heat treating and processing of ores and raw materials at Allis-Chalmers. (B16)

138-B.* (German.) Sintering and Roasting of Lead Ores With the Pressure Sintering Process. Wolfgang Massion and Manfred Peucker. *Freiberger Forschungshefte*, v. B34, May 1959, p. 17-37.

Comparison between suction and pressure-type sintering processes. The pressure-type process compares favorably with the suction type. Advantages are a non-sticking sinter cake at the sinter grate; higher SO_2 concentration in the gas; higher efficiency per surface unit and lower power cost. (B15, B16; Pb)

139-B. Oxidation of Sphalerite by Sulfur Trioxide. A. W. Sommer and H. H. Kellogg. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 742-744.

SO_3-O_2 mixture reacts with sphalerite at an appreciable rate in the temperature range of 361 to 527° C. to form $ZnSO_4$. The rate of reaction follows a parabolic law. 4 ref. (B15n; Zn)

140-B. (Russian.) Roasting of Enriched Zinc Ore by the Fluidized Bed Process Accompanied by Distillation of Lead and Cadmium and Coarsening of Remaining Solids. I. V. Babina, A. D. Besser, E. I. Alyushin, A. N. Lukin and S. S. Edziev. *Tsvetnye Metally*, no. 6, 1959, p. 27-32.

(B15q, C22g; Pb, Cd, *Zn*)

141-B.* (German.) The Physics of the Sintering Process of Carbonyl Iron. H. D. Dietze. *Technische Mitteilungen Krupp*, v. 17, Sept. 1959, p. 103-110.

Sintering experiments on alpha and gamma irons. A linear relationship exists between the porosity before sintering and after pressing. Energy of activation for the increase in density for various phases. 18 ref. (B16; Fe-a)

142-B. (Russian.) Behavior and Extraction of Rhenium in the Heating of Enriched Molybdenum Ores in a Fluid Bed Furnace. A. N. Zelikman, V. I. Bibikova, V. M. Petrov, S. V. Postnikova, G. I. Abashin, V. F. Pritulo and

L. N. Nikitina. *Tsvetnye Metally*, no. 11, 1958, p. 47-52.
(B15q, C22; *Mo*, Re)

143-B. (Book.) Extractive Metallurgy. Joseph Newton. 532 p. Oct. 30, 1959. John Wiley & Sons, Inc., 4440 Fourth Ave., New York 16, N. Y. $9.75.

Sources of metals; ore dressing; chemical principles; structure of metals and alloys; fuels and refractories; pyrometallurgy; hydrometallurgy; electrometallurgy. (B-general, C-general)

144-B. (Translation—Brutcher no. 4414.) Sinter Mixes Preheated in Mixing Drums. D. A. Kissin. *Stal'*, v. 18, Oct. 1958, p. 867-869.
See item 18-B, 1959. (B16; Fe)

145-B. (Translation—Brutcher no. 4559.) Reactions in Pelletizing and Iron Ore Reduction. Pt. 1. J. O. Edstrom. *Jernkontorets Annaler*, v. 142, no. 7, p. 401-428.
See item 11-B, 1959. (B15n, B16b, D11, N1a; Fe)

146-B. (Translation—Brutcher no. 4640.) Redistribution of Moisture During the Sintering of Iron Ores. A. A. Sigov. *Izvestiya Vuz, Chernaya Metallurgiya*, Aug. 1958, p. 7-12.
(B16a; Fe)

147-B. (Translation—Brutcher no. 4661.) Use of the Fluid-Bed Process With Hydrogen and Carbon Monoxide Containing Gases for the Reduction of Iron Ores. J. Willems and G. Quade. *Stahl und Eisen*, v. 79, no. 15, 1959, p. 1058-1064.
See item 128-B, 1959. (B15q, D8j; Fe)

SECTION C

NONFERROUS EXTRACTION and REFINING

1-C.* (Japanese.) Industrial Degassification Treatment for Molten Aluminum. Pt. 1. Takashi Ikeno, Kizo Shibata and Yasumasa Yokoyama. *Light Metals*, no. 31, July 1958, p. 51-54.

The amount of chlorine gas passed through the molten metal per unit of time influences total amount of chlorine and total time needed for degassification. Relationship expressed by equation. Chlorination time decreased with increasing metal temperature. Activation energy for degassification by chlorine was about 50,000 cal. per mol. Relationship between blisters and fine fractures on sheet surface. 12 ref. (C5m, E25s; Al-b)

2-C.* (Russian.) Reduction of Oxides From Nonferrous Heavy Metals and of Mixtures of Metallic Oxide and Carbon Monoxide. G. G. Gvelesiani, T. E. Konyshkova, Yu. V. Tsvetkov and D. M. Chizhikov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskich Nauk*, Aug. 1958, p. 19-25.

Reduction of Cu, Pb and Zn oxides using carbon monoxide as a reducing agent. Kinetics and mechanism of reduction studied for various steady pressures of CO and temperatures. 8 ref. (C26, 2-61, 3-74; Cu, Pb, Zn)

3-C.* Development of Beryllium for Nuclear Reactor Applications. G. C. Ellis. *Metallurgia*, v. 58, Oct. 1958, p. 173-176.

American, Soviet and French methods of reduction compared. American thermal reduction process (conversion of the oxide to ammonium beryllium fluoride, thermal reduction of the double fluoride at 900° C. in a graphite crucible), is contrasted with the French electrolytic reduction process. Both methods are used in the Soviet Union. 10 ref. (C-general; Be)

4-C. Preparation of Dense, Metal Grade Uranium Tetrafluoride From Uraniferous Ores. R. J. Allen, H. G. Petrow and A. Whitman. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/503, 1958, 8 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Optimum methods of preparation of a pure concentrated U solution from sulphuric acid leach liquors; development of a means of reducing U and precipitating UF_4; drying techniques capable of dehydrating UF_4 without materially affecting its physical and chemical properties. 10 ref. (C19r; U)

5-C. Selection of Uranium From Aqueous Solutions by Liquid-Liquid Extraction. E. H. Crabtree and C. J. Lewis. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF. 15/P/507, 1958, 17 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Liquid-liquid extraction may be considered as an ion-exchanging process. Organic reagents used may be chosen on the basis of their selectivity toward ions and cations. Since U in its sulphuric acid leach solutions exists in an equilibrium involving the U in both anions and cations, U may be recovered by either cation exchanging or anion exchanging liquid-liquid systems. (C19s; U)

6-C. Design and Operation of a Uranium Processing Mill Using Liquid Ion Exchange (Solvent Extraction). K. M. Black, J. Koslov and J. D. Moore. Second United Nations

International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/511, 1958, 13 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Substantially higher-grade feed liquor can be processed by increasing the solvent concentration to achieve higher saturation loadings. U recoveries on the order of 99.5% from the feed solution have been recorded. (C19s; U)

7-C. Continuous Process for the Direct Reduction of Uranium Hexafluoride to Uranium Tetrafluoride of High Purity and Density. S. H. Smiley and D. C. Brater. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/523, 1958, 11 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

In the basic hydrogen method uranium hexafluoride and about 100% excess H, both preheated to about 500° F., are charged into the top of a vertical pipe reactor which is preheated to about 1000° F., and complete reduction to uranium tetrafluoride is realized almost instantaneously. Reduction of uranium hexafluoride with gaseous trichloroethylene has also been developed but the product was low in density and highly contaminated. 15 ref. (C1p; U)

8-C. Development of a High-Capacity, Continuous Process for the Preparation of Uranium Hexafluoride From Uranium Oxides or Ore Concentrates. S. H. Smiley and D. C. Brater. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/525, 1958, 11 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Process involves a series of three highly exothermic reactions in which uranium trioxide is converted to dioxide with hydrogen, to tetrafluoride with anhydrous hydrogen fluoride, and finally, to hexafluoride with fluorine. The hexafluoride can be recovered by solid condensation, liquefation, stripping by an organic solvent, or absorption-desorption employing solids such as uranium tetrafluoride or sodium fluoride as carriers. (C19r; U)

9-C. Zirconium Alloy Fuel Reprocessing. D. G. Reid, C. E. Stevenson, R. B. Lemon and F. K. Wrigley. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/526, 1958, 20 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Processing facility was designed to recover enriched U from Zr fuel elements containing up to about 2% U using an aqueous process. Three solvent-extraction cycles are used to separate the U from the Zr, fission products and transuranic elements with which it is associated in the fuel elements. The first cycle employs pulse column contactors and a tributyl phosphate solvent, while packed columns with hexone as the extractant are used in the second and third cycles. (C19a, A11d, T11g; U, Zr-b)

10-C. Americium and Neptunium Recovery Processes. W. H. Lewis. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/537, 1958, 13 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Chemical processes for recovering Np-237 from irradiated natural U, irradiated enriched U, and fluorination ash produced in the conversion of recovered UO_3 to UF_6, and for recovering Am-241 from a waste containing large amounts of La and Ce. 5 ref. (C19, C6; Am, Np, U, La, Ce)

11-C. Preparation and Properties of Zirconium-Uranium-Hydrogen Alloys. Ulrich Merten, L. J. Dijkstra, Frederick D. Carpenter, Allen P. Hatcher and Lee D. La Grange. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/789, 1958, 15 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Zr-enriched U alloys are prepared by conventional melting techniques and by adding H at elevated temperatures in a gas-handling system. All necessary forming operations are performed on the Zr-U alloy before the H is added, so that the relatively brittle final alloys are ready for cladding without further handling. 7 ref. (C5, Q26s; *Zr*, U, *H*)

12-C. Recovery of Uranium From Highly Irradiated Reactor Fuel by a Fused Salt-Fluoride Volatility Process. G. I. Cathers, W. H. Carr, R. B. Lindauer, R. P. Milford and M. E. Whatley. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/535, 1958, 14 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Volatility processing is a promising new nonaqueous method for recovering U from heterogeneous reactor fuels containing Zr and from molten fluoride fuels. It is potentially applicable to other types of reactor fuels not amenable to aqueous dissolution and subsequent solvent extraction processing. 7 ref. (C19r, A11d, T11g; U)

13-C. Development and Application of Ion Exchange in Columns for the Recovery of Uranium From Ores. W. D. Charles. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/2353, 1958, 15 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Recovery of U from solutions resulting from acid leaching and liquid-solid separation of U-bearing ores. System involves the hydrolic movement of the resin from adsorption columns to the elution section, which are arranged in series so that a countercurrent flow is effected. (C19s; U)

14-C. Fluoride Volatility Processes for Spent Reactor Fuels. R. K. Steunenberg and R. C. Vogel. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/2388, 1958, 29 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

Fluoride volatility separation processes for the recovery and decontamination of reactor fuels depend on differences in volatilities of the pertinent fluorides. All constituents of the fuel are converted to the fluorides. The uranium hexafluoride is then recovered by distillation from the fission product and diluting material fluorides. 36 ref. (C19r, A11d, T11g; U)

15-C. Continuous-Casting of Tough Pitch Copper Slabs. *Machinery (London)*, v. 93, Sept. 17, 1958, p. 659-660.

Slabs up to 25 ft. long by 36 in. wide can be cast at rate of 20 in. per min. (C5q; Cu)

16-C. The Shrouded Mixer Impeller in Solvent Extraction of Uranium. L. D. Lash. *Mining Engineering*, v. 10, Nov. 1958, p. 1161-1164.

Acid leaching and counter-current decantation combined with liquid-liquid extraction to produce a refined U. (C19a; U)

17-C. Solvent Extraction at Gunnison, Colo. H. L. Hazen. *Mining Engineering*, v. 10, Nov. 1958, p. 1164-1165.

Acid leaching, counter-current decantation, solvent extraction for production of U. (C19; U)

18-C.* (German.) Chemical Regeneration of Fission Materials. P. Baertsch. *Chimia*, v. 12, Sept. 1958, p. 270-273.

Reasons for the degeneration of reactor bars: "poisoning" by byproducts; occasional unfavorable metallurgical properties of alpha-uranium causing deformation; formation of Pu^{240} and Pu^{242}. In regeneration, U is purified after dissolution in nitric acid. (C19; U)

19-C. Technique of Zone Melting. G. R. Whalley. *Laboratory Practice*, v. 7, Aug. 1958, p. 462-464.

General summary applied to both organic and inorganic materials. 8 ref. (C28k)

20-C. Entrainment Studies on Solvent Extraction. D. A. Ellis, R. S. Long and J. B. Byrne. *South African Mining and Engineering Journal*, v. 69, Sept. 26, 1958, p. 623, 625, 627.

Application of solvent extraction to slurry systems. (C19a; U)

21-C. Aqueous Processes for Separation and Decontamination of Irradiated Fuels. V. R. Cooper and M. T. Walling. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/2409. 1958, 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Aqueous solvent extraction processes are ideally suited for installation in central processing plants which are designed to handle fuels from a number of power

reactors generating a total of several thousand megawatts or more. 5 ref. (C19a, T11g; 14-70)

22-C.* Production of Hafnium. *Mining Magazine*, v. 99, Oct. 1958, p. 210-218.

HB metal may be produced in Zr-plant equipment without modification. Greater sensitivity of Hf tetrachloride to atmospheric moisture and higher stability of hafnyl chloride requires some additional care and effort in chloride purification. Byproduct Mg chloride and excess Mg were removed by vacuum distillation. Sponge metal was somewhat reactive in air. Metal ingots had hardness but could be hot forged and rolled to sheet. (C29p; Hf)

23-C.* (Japanese.) Separation of Zirconium and Hafnium by Solvent Extraction. Pt. 1. Extraction of High Concentrated Zirconium Aqueous Solution With Methylisobutylketone. Kin'ya Sono, Kazuhiko Hori and Yoshihiro Hirabayashi. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Sept. 1958, p. 59-65.

Ratios of both Hf and Zr extracted were diminished by increasing the concentration of crude Zr (Hf content 2.9%) in the feed solution. Increasing acidity resulted in a decrease in the degree of extraction but an increase in the separation factor. 7 ref. (C19a; Hf, Zr)

24-C.* (Rumanian.) Extraction of Columbium and Tantalum From the Minerals of the R.P.R. Al. Lupu and L. Grigoriu. *Studii şi Cercetări de Metalurgie*, v. 1, July-Dec. 1956, p. 297-303.

The best yield (98%) was obtained by using a quantity of potassium hydroxide four times larger than theoretically required. The two metals were separated as fluorides. The attempts at direct extraction with sulphuric acid gave poor yields, and potassium carbonate even poorer (40%) Separation also was tried, with very small yield. 14 ref. (C-general; Cb, Ta)

25-C. Columbium and Tantalum. C. H. Chilton. *Chemical Engineering*, v. 65, Nov. 3, 1958, p. 103-107.

Liquid-liquid extraction carried out in a cascade of mixers and settlers leads to pure metals. Process flowsheet. (C19a; Cb, Ta)

26-C. Production of Pure Metals by Hydrogen Reduction of Their Salt Solutions. Pt. 2. Tuhin K. Roy. *Indian Institute of Chemical Engineers, Transactions*, v. 8, 1955-1956, p. 83-95.

Equilibrium and kinetic data obtained on the precipitation of Cu, Ni and Co metal from their salt solutions by reduction with compressed H at high temperatures and pressures. 13 ref. (C27, Cu, Ni, Co)

27-C. Uranium Recovery From Slag by Fluoride Volatilization. A Process Proposal. R. M. Edwards, J. A. Kennelley and E. F. Sanders. Mallinckrodt Chemical Works. U.S. Atomic Energy Commission MCW-1418, Sept. 15, 1958, 30 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.

Two possible process routes studied: direct fluorination of slag and pretreatment of the slag by roasting, reduction and hydrofluorination prior to fluorination. Residual U contents were in the range 0.14-0.20% with a feed rate of 100 lb. per hr., slag retention time at 1 hr. and temperature at 435-545° C. 20 ref. (C19r; U)

28-C. Research and Development in the Field of Thorium Chemistry and Metallurgy. Vol. II. Pilot Scale Production of Thorium Metal by Fused Salt Electrolysis. Lothar Abraham, Edward L. Thellman and James L. Wyatt. Horizons Inc. United States Atomic Energy Commission SRO-12, June 20, 1956, 248 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $6.

Design and operation of an electrolytic cell rated for the semicontinuous operation at a level of 7500 amp. Outline of the metal recovery process; operating data and suggested modifications for large-scale production facilities; physical properties of electrolytically produced granular Th metal. (C23; Th)

29-C.* (French.) Extraction of Uranium From Its Ores. M. P. Sugier. *Echo des Mines et de la Metallurgie*, Sept. 1958, p. 545-548.

Three principal phases in production of metallic U; procedures that can be used, advantages of each. 16 ref. (C-general; U)

30-C.* (Italian.) Electrothermal Reduction of Sardinian Iron Ores. G. Zuliani. *Metallurgia Italiana*, v. 50, July 1958, p. 273-279.

Quantity and characteristics of ores; availability of electrical energy; production of hematite pig from heterogeneous ores, with low specific consumption of energy and using Sardinian vegetable coal; possibilities of complete use of Sardinian ores for electrothermal production of low-cost converter pig from poor ores and of higher priced hematite pig from selected ores. 9 ref. (C23n; Fe)

31-C.* (German.) Segregation Occurring in Pigs of Cast Alloys, Especially of the Type G-AlMg and G-AlSiCu. A. Buckeley. *Metall*, v. 12, Oct. 1958, p. 918-921.

Composition of cast pigs at different levels and depths. Alloying elements are present in higher concentration near the mold wall, lower in the interior and porosity zones. 8 ref. (C5, 9-69; Al-b)

32-C.* (French.) How to Make Molds for Cruciform Specimens of Tin Bronze. *Fonderie*, no. 153, Oct. 1958, p. 486-488.

Analysis based on 41 ingots comprising 17 different molding patterns shows varying results in tensile strength. (C5, W19c, S22; Cu-s, *Sn*)

33-C.* (German.) Importance of Speed in Continuous Casting of Copper. H. Klatte. *Metall*, v. 12, Nov. 1958, p. 992-995.

With increasing casting speed, the cone-shaped liquid portion grows in length. The angle at the vertex becomes more and more acute which causes accumulation of impurities in this location and susceptibility to cracking near the longitudinal axis of castings. (C5q, 9-51; Cu)

34-C.* (Russian.) Obtaining Metals by Amalgamation Process. M. T. Kozlovskii. *Khimicheskaya Nauka i Promyshlenost*, v. 3, no. 4, 1958, p. 439-443.

Metals can be obtained by directly processing natural materials containing metals or metallurgical waste and scrap with mercury or electrolytic solution of metal salts using Hg as a cathode or by displacing the metal from its salt solution with the aid of an amalgam having a stronger electro-penetration than the metal sought. Some of the metals that lend themselves to such separations are Fe, Zr, As, Sb, Cr and W. (C29)

35-C.* (Russian.) Anodic Dissolution of Metals in Molten Salts. Beryllium. M. V. Smirnov and N. Ya. Chukreev. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 2165-2173.

Anodic efficiency determined in the electrolysis of molten alkaline metal chlorides (LiCl + KCL eutectics), lithium and potassium chlorides with a beryllium anode. (C23; EG-e)

36-C. Solvent Extraction Bypasses Process Snag. *Chemical Week*, v. 83, Nov. 8, 1958, p. 67-68, 70.

New combined-extractant technique consisting of an aliphatic amine combined with an alkyl phosphate in a solution of kerosene containing tributyl phosphate has eliminated carbonate neutralization and filtration operations. Now solvent extracts U and V directly from the acid solution resulting in a simple operation with better recovery at lower cost. (C19n; U, V)

37-C. Boron Isotope Enrichment: Pilot Plant Proposal for the Anisole-Bf_3 System. Kenneth O. Hambrock and George T. Miller. Hooker Electrical Co. U. S. Atomic Energy Commission, HEC-82, Dec. 23, 1957, 59 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Pilot plant for separating B isotopes 10 and 11. (C6; B)

38-C. (German.) Vacuum Arc Melting With a Consumable Electrode. H. Gruber. *Metall*, v. 12, Oct. 1958, p. 901-912.

Furnace, process, technology and applications. 37 ref. (C25, W18s, 1-73)

39-C. (Russian.) Kinetics of Chlorination of Titanium Dioxide and Columbium Pentoxide. I. S. Morozov and S. L. Stefaniuk. *Zhurnal Neorganischeskoi Khimii*, v. 3, no. 10, 1958, p. 2367-2374.

Chlorination speed depends on temperature, size of briquette, linear velocity and partial pressure of chlorine. (C19r; Cb, Ti)

40-C. (Translation—SLA, ASLIB-GB39.) Use of Oxygen-Enriched Blast in Nonferrous Metallurgy. A. Lange. *Neue Hutte*, v. 1, no. 9, 1956, p. 545-554.

(C21, C5r)

41-C.* The Continuous Casting of Aluminum Alloys. Norman Goss. *Precision Metal Molding*, v. 16, Dec. 1958, p. 61-65, 70

Problems include overcoming mold wall friction, mold design, pouring methods and chill rates. Control of continuous casting is secured by metal temperature, pouring rate and amount of lubricant. (C5q; Al-b)

42-C. Processing of Monazite Sands. John J. Barghusen and M. Smutz. Ames Laboratory. *U. S. Atomic Energy Commission*, ISC-947, Dec. 1957, 105 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.50.

Recovery of Th, rare earths and U from monazite sands. Process whereby the oxalate ions used to precipitate the mixed Th and rare earth oxalates can be recycled. Possibility of recovering U from the oxalate filtrate by anion exchange also investigated. 39 ref. (C19; Th, EG-g)

43-C. Developments in Pyrometallurgical Processing. J. H. Schraidt and M. Levenson. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1795, 1958, 14 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Melt refining, extraction by fused salts or liquid metals, fractional crystallization from low-melting metal solvents and electrorefining methods of fuel reprocessing. Status of extraction processes is presented for blanket processing by liquid Mg extraction of Pu and for U-Bi fuel purification by fused salt extraction. (C-general, T11g; U, *Bi*, Pu)

44-C.* (German.) Preparation of High-Purity Selenium. F. Eckart and H. Berg. *Naturwissenschaften*, v. 45, no. 14, 1958, p. 335-336.

Melting in a "Supremax" flask at 460° C. Air is led through the melt for 90 min. Spectrum purity can be reached by one or two vacuum distillations. (C5, C22h; Se)

45-C.* Investigation on the Chlorination of Indian Ilmenite. D. P. Kharkar and C. C. Patel. *Journal of Scientific and Industrial Research*, v. 17B, Sept. 1958, p. 367-371.

Effects of temperature, carbon, reaction period, grain size, catalyst and binders on chlorination of ilmenite. Control of temperature and carbon resulted in preferential chlorination of the iron and upgrading of the titania content. 11 ref. (C19r, B15r, 2-59, 2-62; Ti)

46-C.* Continuous Casting of Solder. *Tin and Its Uses*, no. 44, Autumn 1958, p. 6-7.

Metal temperatures and pouring rate for 40-60 Sn-Pb solder varied over wide limits without detriment to billet quality. (C5q; Pb, Sn, SGA-f)

47-C. The Oxide-Drossing Furnace for the Processing Refabrication Experiment. J. L. Ballif. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-2852, Sept. 1958, 56 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Equipment and techniques for oxide drossing designed to remove gaseous fission products and more volatile elements, Ce, I and gases like Kr and Xe; and to reconstitute irradiated fuel slugs from many small cylindrical slugs to a large single ingot designed as feed for the vacuum casting operation. 19 ref. (C28j, T11g; U, *Ce, I, Kr, Xe*)

48-C. The Carbothermic Reduction of Uranium Oxide. R. M. Powers, O. J. Blaber, C. I. Whitman and R. B. Holden. Sylvania-Corning Nuclear Corp. *U. S. Atomic Energy Commission*, SCNC-241, June 27, 1957, 139 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $3.75.

Uranium oxide reduced by C under vacuum at 2250° C. to yield a product consisting of dendritic uranium carbide in a matrix of U. U sponge is obtained from this cermet by hydrolyzing the interconnected UC. This is followed by pickling in dilute nitric acid to remove the residual hydrolysis product. 12 ref. (C22g; 6-74, U)

49-C.* (Japanese.) Recent Developments in Vacuum Refining. E. Fujita. *Metals*, v. 28, Nov. 1958, p. 801-806.

Halide decomposition and Kroll process for Ti and Zr. 10 ref. (C1p, C25, C26; Ti, Zr)

50-C.* (Japanese.) Vacuum Arc Melting of Refractory Metals. K. Tsuya. *Metals*, v. 28, Nov. 1958, p. 807-812.

Refining Ti, Zr, Be, Mo and Cb. 10 ref. (C5h, 1-73; Cb, Be, Mo, Ti, Zr)

51-C.* (Japanese.) High-Purity Magnesium. A. Suzuki. *Metals*, v. 28, Nov. 1958, p. 821-827.

Distillation from binary alloys is more useful than from simple substances; 99.99% pure Mg may be produced from Mg-Al alloy. 5 ref. (C22; Mg-a)

52-C.* (Japanese.) Production of Uranium Metals. Pt. 2. S. Tarara. *Metals*, v. 28, Nov. 1958, p. 843-846.

Solvent extraction of $U(NO_2)_4$, conversion to U_2O_5, fluoridation, reduction of UF_4 with Mg. (C1p, C26; U)

53-C. Aluminum Billet Casting. H. Henry Sinason. *Light Metal Age*, v. 16, Dec. 1958, p. 12-17.

Various processes for casting with general conditions for quality billets. 10 ref. (C5; Al)

54-C.* (German.) Contributions of Pressure Reduction Processes to the Extraction of Metals. G. Bauch, F. Pawlek and K. Plieth. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 11, Nov. 1958, p. 520-527.

Influence of hydrogen-ion concentration on equilibrium concentration is stronger than influence of partial pressure of CO_2. Silver sulphate and copper sulphate solutions reveal kinetic reactions of a secondary order when carbon monoxide is used as pressure reducing agent. Activating energy for buffered Ag solution is 9.3 kcal. per mol. and for Cu solution 33.5 kcal. per mol. Half-life period of pressure reduction process is 0.05 mol. per l. for Ag and 0.8 mol. per l. for Cu. Hydrogen-carbon monoxide gas mixtures are not economical. 14 ref. (C26, 3-74; Ag, Cu)

55-C. Preparation of Plutonium Alloys in the Reduction Process. A. N. Morgan. Los Alomos Scientific Laboratory. *U. S. Atomic Energy Commission*, LA-2231, Oct. 10, 1958, 6 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Homogeneous binary alloys of Pu with Al, Fe, Co, Ni, Cu, Zr, U and Ce can be prepared in the plutonium tetrafluoride process. Methods used are the direct addition of the element, either as a fluoride compound or as metallic powder or chips into the Ca and I before mixing with the plutonium tetrafluoride, and by the loading of metallic powder or chips into the ceramic crucible before the premixed reduction charge is introduced. 5 ref. (C1p; Pu-b, *Al, Fe, Co, Ni, Cu, Zr, U, Ce*)

56-C.* Redistribution of Solute During Freezing. W. G. Pfann. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 218-242.

Influence of freezing rate, turbulence, and other conditions on effective distribution coefficients for several solutes in various melts. Over-all segregation for solute distribution resulting from solidification in normal freezing process or under zone melting conditions. Zone refining, zone leveling, perturbing the distribution by changing composition of melt, dimensions of melt or growth conditions. 13 ref. (C28k, N12)

57-C. Fifty Years in the Port Pirie Lead Smelting Industry. Frank A. Green. *Chemical Engineering and Mining Review*, v. 51, Oct. 15, 1958, p. 71-80.

Processes and equipment at Port Pirie, South Australia. (C21; Pb)

58-C. Solvent Extraction in the Mining Industry. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 53A-55A.

Economics and processing details by liquid-liquid extraction. (C19n)

59-C. Precipitation of Uranium Tetrafluoride From Aqueous Solution by Catalytic Reduction. R. J. Allen, H. G. Petrow and P. J. Magno. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 1748-1749. (C27; U)

60-C. Solvent Extraction With Alkyl Phosphoric Compounds. Charles A. Blake, Jr., Charles F. Baes, Jr., and Keith B. Brown. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 1763-1767.

New solvent extraction reagents, unlike tributyl phosphate, have advantage of recovering U from nearly any solution. 17 ref. (C19n; U)

61-C.* Recovery of Enriched Uranium From Uranium Dioxide-Stainless Steel Fuel Elements by Solvent Extraction. J. R. Flanary and J. H. Goode. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 23-26.

Darex head-on process uses dilute aqua regia in Ti equipment to dissolve the stainless steel-clad or alloyed fuel elements; the chloride is then removed by oxidative distillation. The product from this dissolution-distillation procedure is suitable for extraction with tributyl phosphate and the aqua regia can be recovered for recycle. 36 ref. (C19n, A11d, T11g; SS, U)

62-C.* Plutonium Peroxide Precipitation. J. A. Leary, A. N. Morgan and W. J. Maraman. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 27-31.

Precipitation of the hexagonal structure of plutonium peroxide is an excellent con-

centration and purification step in Pu metal preparation. Impurities such as alkali and alkaline earth elements, Al, Si, Cr, Fe, Ni, Cu and many fission product elements are effectively removed. 12 ref. (C27; Pu, *Al, Si, Cr, Fe, Ni, Cu,* EG-f43)

63-C.* Trialkyl Phosphates and Dialkyl Alkyl Phosphonates in Uranium and Thorium Extraction. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 41-44.

Phosphonates are strikingly superior to phosphates in extracting U and Th and separating them from Zr. 4 ref. (C19; U, Th, Zr)

64-C.* Concentrated Nitric and Dilute Hydrofluoric Acid Mixtures in Dissolution of Zirconium Metal. E. M. Vander Wall and E. M. Whitener. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 51-54.

These acid mixtures hold promise for an aqueous recovery process for Zr-U alloys of variable composition. Rate constants are given for the dissolution rate of Zr at various temperatures. (C19; Zr, U)

65-C.* Recovery of Neptunium-237 From Process Residues by Solvent Extraction. J. R. Flanary and J. H. Goode. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 55-57.

Tributyl phosphate process for recovery and separation of Np isotopes from U process residues. Material containing the Np is dissolved in nitric acid and aluminum nitrate. Np and U are extracted with tributyl phosphate solvent, with aluminum nitrate as the primary salting agent, scrubbed free of ionic contaminants, and finally separated and recovered by selective stripping with nitric acid. 21 ref. (C19n, A11d, Np, 14-63)

66-C.* Recovery and Purification of Plutonium by Anion Exchange. J. L. Ryan and E. J. Wheelright. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 60-67.

Absorption and elution rates up to 100 mg. of Pu per min. are possible with anion exchange in nitric acid. Purity is very high, with product concentration in excess of 50 g. per liter. Effects of audity, nitrate concentration, temperature and metallic and nonmetallic impurities on resin capacity and absorption kinetics. (C19s; Pu)

67-C.* Preparation of Rhenium From Iodo Compounds. A. A. Woolf. *Journal of Inorganic & Nuclear Chemistry*, v. 7, Oct. 1958, p. 291-292.

Potassium hexaiodorhenate decomposes in vacuo at 500° mainly to potassium iodide, rhenium and iodine. Ammonium hexaiodorhenate prepared quantitatively from rhenium heptoxide decomposes quantitatively to Re at 700° in vacuo. The hexaiodorhenates can be prepared quantitatively from the corresponding chlorides. (C1n; Re)

68-C.* Processing—Refabrication of Metallic Uranium Fuel. D. I. Sinizer, K. L. Mattren, J. R. Folz and E. G. Kendall. *Nucleonics*, v. 17, Jan. 1959, p. 50-53.

Oxide drossing process for partial removal of fission products. When irradiated U is melted in a zirconia or magnesia crucible, some of the metallic fission products, notably the rare earths, are oxidized to their respective oxides and separated from the melt in the form of a dross, or crust, which adheres to the crucible after the molten metal is poured. Other fission products, such as Mo, Zr, Cb and Pu, remain as alloying constituents in the cast ingot. (C28j, A11d, T11g, 14-70; U)

69-C.* (Hungarian.) Thermodynamic Examinations of Reactions Occurring During the Oxidizing Period of Copper Refining. Drzoltan Horvath. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 99-110

Refining converter Cu of a given composition by pyrometallurgical process and assuming a homogeneous, consistently ideal solution of the Cu bath, calculations conducted for different elements to determine affinity for oxygen in the process, as well as actual concentration at the beginning of co-oxidation and points of theoretical curves representing the changes in bath composition in dependence of time. 5 ref. (C21b, P12; Cu, *O*)

70-C.* (Hungarian.) Reduction of Metallic Oxides by Means of Carbon Monoxide. Jozsef Weber. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 122-130.

Mathematical functions expressing the changes in thermodynamic potentials in relation to time are used to investigate the reducibility of metallic oxides and the equilibrium relations of the reducing processes. 6 ref. (C26)

71-C.* (Hungarian.) Sulphuric Acid Leaching of the Carbonate Manganese Ore of "Urkut". Lajos Burnoczky. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 143-145.

Method based on the use of dilute sulphuric acid (15-20%), followed by a neutralizing process to attain final pH value of 7. 9 ref. (C19a; Mn)

72-C.* (Hungarian.) Titanium-Dioxide Suitable for Producing Titanium Iron Obtained From Domestic Bauxite. Ballane and Marta Achs. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 157-158.

Ti content of bauxite and bauxite sludges may be recovered from its sulphuric acid solution in the presence of any bivalent metal or metallic sulphate, and with a yield approximating 100%. (C19n; Ti)

73-C. (Book.) Research and Development in the Field of Thorium Chemistry and Metallurgy. v. 1. Preparation of Electrolytic Cell Feed for Production of Thorium Metal. Charles E. Fisher and James L. Wyatt. Horizons Inc. *U.S. Atomic Energy Commission*, SRO-11, 135 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $2.75.

System for cell feed preparation converts thorium nitrate to a basic carbonate via the reaction between the nitrate and sodium carbonate. Following suitable filtration and drying, the thorium oxycarbonate is converted directly to the chloride by reaction with carbon and chlorine, forming a cell feed containing 40 and 45% Th in a molten matrix of sodium and potassium chlorides. Product is suitable for conversion to AEC grade Th metal by electrolytic techniques. (C23; Th)

74-C. (Translation - ConBur.) Problem of the Iodine Method of Purification of Zirconium. K. D. Sinel'nikov, F. I. Busol and G. I. Stepanova. *Soviet Journal of Atomic Energy*, v. 4, Feb. 1958, p. 221-227.

(C28h; Zr)

75-C*. (Italian.) Practicality, From a Heat Balance Standpoint, of Old and New Methods of Extracting Matte From Copper Ores. G. Porro. *Metallurgia Italiana*, v. 50, Oct. 1958, p. 453-460.

Types of ores adaptable to pyritic and semi-pyritic smelting, "oxygen flash smelting process" and methods using insufflation of preheated air and recuperated heat. Processes, heat balances, composition of typical mattes. 8 ref. (C21; Cu)

76-C.* (Russian.) Effect of Aluminum Upon Anode During Electrolysis of Cryolite-Alumina. A. I. Belyaev and Firsanova. *Zhurnal Prikladnoi Khimii*, v. 31, no. 9, 1958, p. 1361-1366.

Al in bath has no appreciable effect on the anodes. (C23n; Al)

77-C. Preliminary Studies in Chlorinating Titaniferous Slags From Idaho Ilmenite. M. M. Barr, H. L. Gilbert and D. D. Harper. *U.S. Bureau of Mines Report of Investigations 5431*, 1958, 14 p.

(C19r; Ti, RM-q, RM-h)

78-C. Determination of Kerosene Entrainment Losses in the Solvent Extraction of a Leach Liquor. Christian M. Lapointe. *Dept. of Mines and Technical Surveys, Ottawa, Canada, Mines Branch Research Report, R25*, Sept. 23, 1958, 16 p. $.25.

Entrainment losses during solvent extraction of U. 6 ref. (C19n; U)

79-C. A Method for the Purification of Selenium. S. Nielson and R. J. Hirtage. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 39-43.

Method is based on formation and decomposition of hydrogen selenide. Apparatus used is capable of producing about 10 g. per hr. of extremely high purity. 7 ref. (C1; Se)

80-C. Uranium Production in South Africa. Philip Rabone. *G. E. C. Journal*, v. 25, Oct. 1958, p. 193-200.

Extraction of U ore by acid leaching, separation of U by ion exchange and calcination to U_3O_8 for shipment. (C19n, C19s, U)

81-C. Continuous Casting, Impact Extrusion Spark Revolution in Aluminum Partmaking. *Steel*, V. 144, Jan. 12, 1959, p. 70-73.

Two-in-one production line processes Al pig into cans. Key to process is casting wheel that delivers 1/2-in. thick strip to rolling mill.

(C5q, G5, T10g; Al-b, 17-57)

82-C. (Russian.) Theory of Separation of Isotopes and Alloy Components by Passing Electric Current Through Liquid Metal. S. E. Blessler and G. E. Pikus. *Zhurnal Tekhnicheskoi Fiziki*, v. 28, Oct. 1958, p. 2282-2288.

(C6c, 14-60)

83-C.* High-Purity Metals in Commercial Quantities. R. A. King. *Metal Progress*, v. 75, Jan. 1959, p. 127-130.

The Consolidated Mining and Smelting Co. of Canada Ltd., long a producer of Pb

and Zn of 99.9% purity, has extended its operations to include the production of high-purity Sb, Cd, Ag, Bi, Sn and In. (C-general, S11; Pb-a, Zn-a, Sb-a, Cd-a, Ag-a, Bi-a, Sn-a, In-a)

84-C.* (French.) Behavior of Nitrogen in the Vacuum Sublimation of Calcium. Claude Decroly and Claude Den Tandt. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1009-1022.

Canadian calcium was purified by repeated sublimation in a vacuum at a constant temperature of 750° C. and at different condensation temperatures to study influence on nitrogen content of the purified metal. With optimum condensation temperature of 250 to 300° C., the final nitrogen content was less than 10 ppm 26 ref. (C27h, 2-61; Ca, *N*)

85-C.* Molybdenum and Tungsten Alloys. E. J. Sandford. *Alloy Metal Review*, v. 9, Dec. 1958, p. 2-8.

Cutting speed, transverse strength, casting, sintering, applications of sintered W alloys and hard metals. 18 ref. (C5, H15; Mo-b, W-b, *Co*, 6-70)

86-C.* Electrodeposition of High-Purity Chromium. F. E. Block, P. C. Good and G. Asai. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 43-47.

Thick Cr deposits prepared by the electrolysis of aqueous chromic acid baths. Metal containing 0.0005% O, less than 0.002% N, and only traces of metallic impurities was obtained upon electrolysis of purified solutions at elevated temperatures. After melting and working into shape electrolytic Cr has tensile properties comparable to Cr prepared by refining commercial grade material by H treatment. 11 ref. (C23p; Cr-a)

87-C. Preparation of Magnesium Metal—a Literature Search. Earl W. Mautz. National Lead Co. of Ohio. *U.S. Atomic Energy Commission*, NLCO-754, Nov. 26, 1958, 41 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.25.

Approximately 250 literature references relating to reduction of Mg compounds, other than MgF_2, to produce Mg metal. References for the Mg-U system. (C-general, M24b; Mg, *U*)

88-C.* Tungsten Zone Melting by Electron Bombardment. R. G. Carlson. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 49-52.

Refining of W in vacuum by floating zone method. Spectrographic analyses along the length of a purified W rod indicate that Mo may not be removed by zone refining, but rather by volatilization. X-ray diffraction studies indicate that W rods purified in this manner are single crystals and have a larger amount of ductility than that obtained in an equivalent sized polycrystalline material. 9 ref. (C28k, 1-73; W, *Mo*)

89-C. Recovery of Magnesium and HF From Magnesium Fluoride—a Literature Search. Earl W. Mautz. National Lead Co. of Ohio. Nov. 26, 1958. *U.S. Atomic Energy Commission*, NLCO-747, 30 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.

Some 200 literature references relating to the recovery of HF and Mg from MgF_2 as reported in AEC, patent and journal publications. Mg ores are treated with HF, reduced with CaC_2 to form Mg metal, with regeneration of the fluoride by H_2SO_4 for HF recycle. (C1p; Mg)

90-C.* (French.) Large-Scale Separation of Rare Earths. Bellevue Laboratory's Pilot Plant. Jean Loriers. *Nature*, Oct. 1958, p. 399-405.

Method based on ion exchange with multi-columnar plant. Process details, equipment. Examples of extraction of scandium, yttrium, lanthanum, neodymium and praseodymium oxides. (C19s, EG-g)

91-C.* (German.) Effect of Boundary Surface Active Materials Used as Additives in the Precipitation of Cadmium and Thallium. Wilhelm Roever. *Zeitschrift fur Erzbergbau and Metallhuttenwesen*, v. 11, Dec. 1958, p. 586-593.

New method for precipitation of Cd and Tl from an impure Zn lye, using small amounts, 10 to 30 mg. per liter, of surface active materials, sometimes together with organic protective colloids, for stabilizing the precipitated metals. 10 ref. (C27; Cd, Tl, AD)

92-C. (Russian.) Preparation of Hafnium Tetra-Chloride Double Phosphate. A. Sheka and B. A. Vostovitch. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 8, 1958, p. 1973-1976.

(C19r; Hf)

93-C.* The Preparation of Uranium Metal by the Electrolytic Reduction of Its Oxides. L. W. Niedrach and B. E. Dearing. *Electrochemical Society, Journal*, v. 105, June 1958, p. 353-358.

A bath containing MgF_2, BaF_2 and UF_4 is satisfactory as the solvent electrolyte. Any of the major U oxides, UO_3, U_3O_8, or UO_2, can be used as feed, but UO_3 is the most desirable for a production process. 10 ref. (C23; U)

94-C. Amalgam Process Regenerates Spent Pickling Solutions. H. Holn, E. Fitzer and G. Jangg. *Industrial Finishing (London)*, v. 11, Jan. 1959.

Removes powdered iron suitable for pressing and sintering in mercury electrolytic cells. (C29, A11d; Fe, 6)

95-C. Defining Uranium Concentrate Specifications. J. R. Nelli, W. C. Manser and D. S. Arnold. *Journal of Metals*, v. 11, Jan. 1959, p. 33-35.

Analysis of U purity, showing impurity concentrations and thermal neutron cross-sections of these concentrations. 15 ref. (C-general, P18j; U)

96-C. Problems in the Processing of Zirconium and Its Compounds. William A. DuPraw. Columbia National Corp. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U.S. Atomic Energy Commission, TID-7555*, 1958, p. 138-140.

Before Zr sponge is acceptable for fabrication into usable forms for nuclear application, residual impurity elements having high neutron-capture cross sections, such as Hf, B and Cd, or those residual impurity elements that would contribute to possible corrosion failure must be removed from the process stream prior to the reduction of metal to reactor-grade sponge. Process involves the reduction of zirconium tetrachloride with Mg metal. (C28, C26; *Zr*, 6-74, *Hf, B, Cd*)

97-C. Solvent Extraction. J. C. White. Oak Ridge National Laboratory. Paper from "First Conference on Analytical Chemistry in Nuclear Technology". *U.S. Atomic Energy Commission, TID-7555*, 1958, p. 240-255.

Organo-nitrogen and organo-phosphorus compounds used as analytical reagents. Data show utility of amines in extracting mineral acids, organic acids, Po, PuO_2, Zr, Pa, Th, U, rare earths and fission products. (C19n, Po, Pu, Zr, Th, Pa, U, EG-g)

98-C. (Russian.) Reduction of Copper Oxide by Carbon. M. S. Kurchatov. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 11, 1958, p. 2586-2593.

Graphite and carbon black used in high vacuum, with accumulation of gaseous reaction products. 10 ref. (C26, 1-73; Cu-b, C, NM-a34)

99-C.* (German.) Electrolytic Precipitation of Manganese on Mercury. G. Jangg, G. Zwerenz and H. Hohn. *Metall*, v. 13, Jan. 1959, p. 31-36.

Reduced power requirements attained high concentration of Mn salt, addition of ammonium sulphate and elevated temperature. 18 ref. (C23n; Mn)

100-C. Problems in the Processing of Raw Materials for Uranium. C. F. Coleman and K. B. Brown. Oak Ridge National Laboratory. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U.S. Atomic Energy Commission, TID-7555*, 1958, p. 43-56.

Processes for the separation of U from ores and for the subsequent purification, concentration and conversion of U to U_3O_8 or other compounds. Types of reagents used in the solvent extraction procedure to remove U from acid leach solutions; anion exchange processing of clarified liquors. (C19n; U)

101-C. Problems in the Processing of Titanium and Its Compounds. W. E. Few. Cramet Inc. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Technology". *U.S. Atomic Energy Commission, TID-7555*, 1958, p. 141-157.

Industrial methods used in the production of Ti sponge, formation of Ti and alloy ingots from the sponge, and fabrication of mill products. Sampling procedures, tolerance limits for the principal impurities (O, H, N and C), methods of chemical analysis which are used to estimate impurities, and the deleterious effects caused by each impurity. 7 ref. (C-general, S11; Ti, 5-59, 6-74, 3-69)

102-C. (Translation—BISI, no. 1051.) Continuous Casting and Its Problems. G. Wilz and M. Petitdidier. *Revue de Metallurgie*, v. 55, May 1958, p. 486-494.

See item 284-C, 1958. (C5q, D9q)

103-C. (Translation—Brutcher, no. 4377.) Production of Carbon-Free Ferrochromium by Decarburization of High-Carbon Ferrochromium in Vacuum. S. V. Bezobrazov. Paper from "Problems of the Use of Vacuum in Metallurgy". Moscow, 1958, p. 155-162.

Production of carbon-free ferrochromium by oxidizing the carbon in high-carbon ferrochromium with the oxygen in chromium sesquioxide, chrome ore, quartzite,

and nickelous oxide. (C21, 1-73, 2-60, 2-61, 3-74, Fe, Cr, AD-n)

104-C. (Translation.) Influence of the Nature of the Gas Phase on the Anode Effect in the Electrolysis of Cryolite-Alumina Melts. A. I. Belyaev, E. A. Zhemchuzhina and A. D. Gerasimov. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 147-151.

Effect of composition of melt and nature of gas phase on wetting as determined by measuring contact angles of cryolite-alumina and AlF_3 -NaF systems on carbon plate in atmospheres of argon, nitrogen, carbon dioxide and air. Mechanism of anode effect. (C23n; 2-60; Al)

105-C. (Translation.) Investigation of the Anode Process in Aluminum Bath. L. N. Antipin and A. N. Khudyakov. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 161-166.

See item 276-L, 1957. (C23n; Al)

106-C. (Translation.) Variation of Current Efficiency With Current Density in the Electrolysis of Cryolite-Alumina Melts. L. N. Antipin and I. Nikerkorn. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 167-172.

Compares experimental determinations with results from formulas relating current efficiency to various factors. 8 ref. (C23n; Al)

107-C. (Translation.) Solubility of Water and Magnesium Oxide in Fused Carnallite. Ya. E. Vilnyansky and N. P. Bakina. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 173-177.

MgO insoluble in fused carnallite. Hydrogen present in molten carnallite was combined with oxygen in hydroxyl and not water molecules. 8 ref. (C23n, P12e; Mg)

108-C. (Translation.) Cathode Processes Occurring in the Electrodeposition of Thorium From Fused Electrolytes. M. V. Smirnov and L. D. Yushina. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 193-200.

See item 59-C, 1957. (C23p; Th)

109-C. (Translation.) Dezincing of Sulfide-Oxide Melts by Blowing With a Carbon-Air Mixture. A. I. Okunev and V. A. Aglitsky. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 260-263.

Blowing of sulphide oxide mattes under pilot plant conditions. Kinetics of process, air consumption, carbon consumption; rate of Zn removal. 8 ref. (C22g, C21, A11c, 1-66; Cu, *Zn*)

110-C.* Vacuum Metallurgy in Europe. A.M. Aksoy. *Metal Progress*, v. 75, Feb. 1959, p. 87-89.

Melting techniques, particularly vacuum degassing, have progressed rapidly since World War II. Though vacuum induction and arc melting have not developed as they have here, their potential is beginning to interest fabricators who need better and more dependable alloys. (C25, D8m, J-general, 1-73)

111-C.* (Rumanian.) Electrolytic Refining of Lead. A. Lupu and I. Crisan. *Revista de Chimie*, Sept. 1958, p. 490-495.

Laboratory study of possibilities of electrolytic "debismuthization" of a 2.6% Bi, 0.2% Cu lead using a solution of amidosulphonic acid as electrolyte. Under optimum conditions, compact, dense, adherent cathodic deposit of 99.999% Pb was obtained. 13 ref. (C23p; Pb, *Bi*)

112-C.* (German.) Selenium Preparation From Anode Mud Following Electrolytic Refinement and Purification of Copper. S. Loschau. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 12, Jan. 1959, p. 21-27.

Roasting of anode mud, crushing and subsequent extraction with soda lye; neutralization of the extract with H_2SO_4 and cadmium precipitation from the extract by the addition of hydrochloric acid and passing through of SO_2. By dry distillation under N following removal of 0.1-0.2% As, a 99.99% pure Se was obtained. (C19n; Se, *Cu*)

113-C.* (German.) The Oxidation Maximum of Antimony in the Refining of Lead. Joachim Barthel. *Freiberger Forchungshefte*, v. B29, Oct. 1958, p. 5-66.

Oxidation behavior of Sb in Pb. Thermal analysis and equilibria of the systems $5PbO{\cdot}Sb_2O_3$ and oxides metallic phase. 28 ref. (C28j, M24c; Pb-a, *Sb*)

114-C.* (German.) Heterogeneous Equilibria in the System Zn-S-O and Their Significance for the Levitation Melting Process of A. Lange and J. Barthel. Gerhard Fischer. *Freiberger Forschungshefte*, v. B29, Oct. 1958, p. 69-149.

Thermodynamic evaluation of vapor pressure measurements at various temperatures provides an explanation of the volatilization of ZnS. Volatilization of Zn after oxidation

of the S together with thermal dissociation of ZnS are assumed. 31 ref. (C28, M24c, P12c; Zn, S, O, RM-n)

115-C.* (German.) Precipitation of Cadmium From Solutions of Zinc Sulphate. Klaus Hein. *Freiberger Forschungshefte*, v. B29, Oct. 1958, p. 151-214.

Cd precipitation with metallic Zn as a precipitant. Effects of stirring, temperature, ionic activity of H, increased surface area of precipitant, ionic concentration of Cd, Zn and Cu. 29 ref. (C27; Cd, *Zn, Cu*)

116-C.* (Polish.) Continuous Method of Alumina Extraction by Leaching Alumina Slag With Soda Solution. Karol Akerman, Bronislaw Zmudzinski, Seweryn Dietze and Bronislaw Sakala. *Archiwum Hutnictwa*, v. 3, no. 4, 1958, p. 287-304.

Extraction of alumina from slag obtained in process of melting and sintering. Leaching process recovered up to 75-90% of alumina. (C19n; Al)

117-C.* (Polish.) Method of Obtaining Aluminum Oxide by Leaching Alumina Slags With Soda Solution. Karol Akerman, Bronislaw Zmudzinski and Robert Godula. *Archiwum Hutnictwa*, v. 3, no. 4, 1958, p. 225-285.

Optimal conditions for leaching slag obtained by melting raw materials containing alumina with calcium sulphate or calcium carbonate in a shaft furnace or by sintering them in a rotary furnace. 12 ref. (C19n; Al)

118-C. Liquid-Solid Separation Factors in Hydrometallurgical Leach Circuit Design. R.C. Emmett and D.A. Dahlstrom. *Canadian Journal of Chemical Engineering*, v. 37, Feb. 1959, p. 3-8.

(C19n, 17-51)

119-C. (Russian.) Extraction of Sulphide Inclusions From Molten Slags by Means of an Electric Field. V.V. Khlynov and O.A. Esin. *Doklady Akademii Nauk, SSSR*, v. 123, Nov. 1958, p. 320-321.

Electro-capillary movements of liquid metallic drops used to extract sulphide inclusions from molten slags. At 1400° C., slag composition is CaO 15%; Al_2O_3 10%; SiO 43%; Fe 20%; Mg 10%; Ni 0.1-0.2%; Co 0.02%; S 0.15-0.02%. 8 ref. (C21, D11n; 9-69, RM-q, Fe, Mg, Ni, Co, S, Ca, O, Al, Si, NM-a34)

120-C. (Russian.) Precipitation of Metals During Electrolysis of Alloys in Presence of Concentrated Polarization. B.F. Markman and E.B. Gitman. *Ukrainskii Khimicheskii Journal*, v. 24, no. 5, 1958, p. 581-584.

Experiences with separation of Pb and Cd during electrolysis of their melted chlorides. (C23; Pb, Cd)

121-C.* Electrolytic Preparation of Titanium From Fused Salts. Pt. 2. Design of Laboratory Cells. Marshall B. Alpert, James A. Hamilton, Frank J. Schultz and William F. Sullivan. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 142-144.

Design and function of externally heated laboratory cells, including single and double diaphragm types operating continuously. 7 ref. (C23p, 1-52; Ti)

122-C.* (German.) Distillatory Separation of Metals Under Reduced Pressure. Ludwig Muller. *Freiberger Forschungshefte*, v. B33, Dec. 1958, p. 3-159.

Data for the binary systems Sn-Zn, Pb-Zn, Sn-Bi, Pb-Sb. Distillation time and yield of refined metal depend on the method of distillation. 141 ref. (C22h; Sn, Pb, *Zn, Bi, Sb*)

123-C.* Studies on the Separation of the Rare Earths From Thorium in Sulphate Solutions, Using Cation Exchange Resins. D. C. Lewis and J. C. Ingles. *Canadian Dept. of Mines and Technical Surveys, Mines Branch*, R31, Oct. 6, 1958, 40 p.

Variables investigated were: sulphate concentration, nature of the counter-ion (i.e., the cation whose sulphate salt supplies the sulphate for complexing) and resin type. Separation was not quantitative but it was found possible to obtain reasonable recoveries of Th free of rare earths. 16 ref. (C19s; Th, *EG-g*)

124-C.* Reactive Metal Melting Furnace Eliminates Water Cooling Hazard. M. L. Torti and John L. Ham. *Steel*, v. 144, Mar. 9, 1959, p. 64-66.

Heavy skull maintained in the crucible acts as a heat sink to handle heat generated during melting and eliminates costly and complicated cooling systems. (C5h, W18s; Ti)

125-C. Trap for Removing Ferric Chloride From Titanium Tetrachloride. E. C. Perkins, H. Dolezal and R. S. Land. *U. S. Bureau of Mines, Report of Investigations* no. 5428, 1958, 4 p.

Rock-salt column is self-cleaning and will remove ferric chloride, other impurity chlorides and dust from gaseous Ti tetrachloride. Losses of Ti are low and the molten mixture is easy to handle. 8 ref. (C19r; Ti, *Fe, Cl*)

126-C. Gold Recovery Tests on Ore From the Blue Spec Gold Mine, Nullagine, W. A. H. R. Dunstan, E. Tasker and R. A. Hobson. *Australian Commonwealth Scientific and Industrial Research Organization, Ore-Dressing Investigations, Report,* no. 702, June 1958, 8 p.

Satisfactory recovery by amalgamation and cyanidation after grinding to -100 mesh. (C19p, C29; Au)

127-C. Process for Electrolytic Extraction of Titanium Metal From Titanium Carbide Anodes. Guy Ervin, Jr., Herbert F. G. Ueltz and Malcolm E. Washburn. *Electrochemical Society, Journal,* v. 106, Feb. 1959, p. 144-146.

High-purity Ti extracted electrolytically in fused halide baths and deposited as dendritic Ti metal. 15 ref. (C23p; Ti)

128-C. Large Scale Preparation of Ultra-Pure Germanium. J. M. Wilson. *Research Applied in Industry,* v. 12, Feb. 1959, p. 47-53.

12 ref. (C19r, C28k; Ge-a)

129-C. (German.) Electrolytic Refining of Lead by the Betts Process. Werner Bisert. *Neue Hutte,* v. 4, Jan. 1959, p. 29-35.

Factors influencing purity of end product. (C23p; Pb)

130-C.* (German.) Reduction of Iron Ore (FeO_3) by Carbon Monoxide in Two Stages. Edward Wicke, Kurt Hedden and Gero Lueth. *Stahl und Eisen,* v. 79, Feb. 5, 1959, p. 129-134.

The first stage consists of C separation. In the second stage the product is reduced to Fe by means of the C deposited by the decomposition of CO. 8 ref. (C26; Fe, RM-n)

131-C.* Production of Ferro-Manganese. E. J. Hancock. *Iron and Coal Trades Review,* v. 178, Jan. 23, 1959, p. 197-200.

Problems of smelting ferromanganese under Indian conditions. (C21; Fe, Mn, AD-n31)

132-C.* Techniques and Results of Zone Refining Some Metals. J. H. Wernick, D. Dorsi and J. J. Byrnes. *Electrochemical Society, Journal,* v. 106, Mar. 1959, p. 245-248.

Purification by floating zone refining of Ni, Ti and V with volatilization and for boat zone refining of Al and Au. 7 ref. (C28k; Ni, Ti, V, Al, Au)

133-C.* Effect and Control of Impurities in the Electrowinning of Zinc. G. T. Wever. *Journal of Metals,* v. 11, Feb. 1959, p. 130-134.

Control of Fe, Co, Ni, Cu, As, An, Ge, Sb, Se, Te, Cd, Pb, Cl, Fl and Mn which appear as impurities and cause trouble in electrolytic Zn plants. (C23n, 3-69; Zn, *Fe, Co, Ni, Cu, As, An, Ge, Sb, Se, Te, Cd, Pb, Mn*)

134-C.* Electron Bombardment Melting. Hugh R. Smith, Charles D'A. Hunt, and Charles W. Hanks. *Journal of Metals,* v. 11, Feb. 1959, p. 112-117.

The melt surface is exposed to high vacuum; the melt is cast in a noncontaminating water-cooled mold; it may be constantly observed visually and precisely controlled with regard to residence time, material addition and withdrawal; the melt can be held at any desired temperature—high superheats can be utilized to achieve reactions otherwise not possible. 9 ref. (C5k, 1-73; Al, Cb, Mo, Ta, Ti, Zr, EG-d)

135-C.* Zone Refining. Norman L. Parr. *New Scientist,* v. 5, Feb. 3, 1959, p. 290-292.

Zone refined Cu can be produced with only 100 parts of impurities per million; zone refined Sn with 10 parts of impurities per million; Fe 2000 parts per million; Ge less than 0.1 part per million; Al 20 parts per million and Si 1 part per million. (C28k; Cu, Sn, Ge, Fe, Al, Si)

136-C. (Translation—Brutcher no. 4436.) Reduction of Titanium and Silicon Dioxides With Magnesium at Normal Pressure. W. Rutkowski. *Prace Instytutow Ministerstwa Hutnictwa,* v. 8, no. 2, 1956, p. 85-88.

Possibility of producing Ti and Si powders of sufficient purity from Ti white and from silica by magnesio-thermal reduction. (C26; Ti, Si, *Mg*)

137-C. Ion-Exchange Separation of Metals by a Single-Pass Method. Richard T. Oliver and J. S. Fritz. Iowa State College. *U. S. Atomic Energy Commission ISC-1056,* 41 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Method consists of complexing each of the components in a mixture with a separate complexing agent at a pH sufficient to insure maximum co-ordination of the metals. The mixture is then passed through an ion-exchange resin which absorbs one species completely, allowing the other to be collected in the effluent. 109 ref. (C19s)

138-C.* (Hungarian.) Production of Super-Purity Aluminum by Volatilization of Its Sub-

fluoride. A. I. Gjeljajev. *Kohaszati Lapok*, v. 91, Sept. 1958, p. 420-422.

Process based on interaction of Al and its halides (AlF_3 and $AlCl_3$) taking place at elevated temperatures, resulting in creation of low-valence volatile compounds (AlF, AlCl). These dissociate at lower temperature into Al and its normal valence halides. (C1p; Al)

139-C.* (Polish.) Production of Metallic Manganese From Pharmaceutical Byproducts. Z. Kulinski, B. Paczula and K. Radzwicki. *Hutnik*, v. 25, Nov-Dec. 1958, p. 471-477.

Byproducts obtained in production of chloromycetin, Vitamin-C and nicotinic acid as raw materials for metallic Mn production. (C22, A11c; Mn)

140-C.* (Polish.) Dissociation of Iron Oxide. Wladyslaw Kuczewski. *Hutnik*, v. 25, Nov-Dec. 1958, p. 498-500.

Properties and behavior of iron ore between 1190 and 1420° C. (C22g; Fe)

141-C.* Vacuum Casting of Uranium. J. Stephenson. *Institute of Metals, Journal*, v. 87, Feb. 1959, p. 174-180.

Design of a furnace for melting and casting uranium under vacuum. Procedures used in the production of castings. (C5j; E12, W18a, 1-73)

142-C.* Experiences in Vacuum Melting Some Special Alloys. W. F. Randall and H. H. Scholefield. *Institute of Metals, Journal*, v. 87, Feb. 1959, p. 181-186.

Equipment, practical difficulties and benefits in vacuum melting alloys of Ni-Fe, Ni-Cr, Cu-Be and other types. (C5j, W18a, 1-73; Ni-b, Cu-b, *Be, Fe, Cr*)

143-C.* Heat-Resistant Aluminum. New Melt Saturation Process Results in "Ceramic Alloys". *Light Metal Age*, v. 17, Feb. 1959, p. 17.

"Melt-saturation" process produces Al filled with thorium silicate. (C5r, Q-general, 2-62; Al, *Si, Th*, SGA-h)

144-C. Acid Leaching of Uranium Ores. R. J. Woody and D. R. George. Paper from "Uranium Ore Processing". Addison-Wesley Publishing Co., Inc., Reading, Mass. 1958, p. 115-152.

Rate and degree of U extraction by acid leaching depends on acid concentration, degree of oxidation, leaching temperature and particle size. Aqueous leaching with agitation is preferred method. 27 ref. (C19n; U)

145-C. Carbonate Leaching of Uranium Dres. L. A. McClaine. Paper from "Uranium Ore Processing". Addison-Wesley Publishing Co., Inc., Reading, Mass. 1958, p. 153-171.

Carbonate leach solutions have several important advantages over acid leach solutions, including noncorrosive properties and relatively specific solvent ability for U and V. 33 ref. (C19n; U)

146-C. Liquid-Solids Separations. J. B. Rosenbaum and J. B. Clemmer. Paper from "Uranium Ore Processing". Addison-Wesley Publishing Co., Inc., Reading, Mass. 1958, p. 172-190.

Criteria for evaluating various flocculants used with uranium plant leach pulps. Practice in percolation leaching, countercurrent decantation washing in classifiers and thickeners and filtration are reviewed separately for alkaline and acid systems. 10 ref. (C19n; U)

147-C. Uranium Recovery by Ion Exchange. Albert F. Preuss and Robert Kunin. Paper from "Uranium Ore Processing". Addison-Wesley Publishing Co., Inc., Reading, Mass. 1958, p. 191-236.

Ion-exchange process is based on the ability of anion-exchange resins to extract U selectively from sulphuric acid or carbonate leach solutions. After the U is concentrated in the resin, it is displaced by a suitable salt solution to obtain a more highly concentrated, relatively pure, U liquor. This liquor is then treated with alkaline precipitants to yield a high-grade U cake. 55 ref. (C19s; U)

148-C. Uranium Recovery By Solvent Extraction. David A. Ellis. Paper from "Uranium Ore Processing". Addison-Wesley Publishing Co., Inc., Reading, Mass. 1958, p. 237-271.

Solvent extraction process involves two steps—extraction and stripping. The organic solvent is contacted with the liquor to be treated, and the U is transferred to the solvent. During stripping the loaded solvent is brought in contact with a suitable aqueous solution and the U is transferred from the organic solvent back to an aqueous phase. 68 ref. (C19a; U)

149-C. Examples of Uranium Milling Operations. R. P. Ehrlich. Paper from "Uranium Ore Processing". Addison-Wesley Publishing Co., Inc., Reading, Mass., 1958, p. 272-371.

Current practices in treating ores of all sorts, together with flowsheets and operating experience. (C-general; U)

150-C. Development of the Excer Process. Pt 4. Chloride System. I. R. Higgins, W. J. Neill and L. E. McNeese. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission, ORNL-2490,* 51 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Recovery of U from a chloride system by anion exchange. Ore concentrate is dissolved in HCl, purified by anion exchange, electrolytically reduced to uranium tetrachloride and then precipitated as hydrated uranium tetrafluoride by the addition of HF. (C19s; U)

151-C.* The Practical Casting of Molybdenum. George H. Thuston. *Western Machinery and Steel World,* v. 50, Mar. 1959, p. 63-65.

Consumable electrode melting and centrifugal casting in a vacuum with pressure maintained in the range of 10-100 microns. Freedom from flaws and anisotropy resulting from purification during melting and controlled solidification. (C5h, E14, 1-73; Mo)

152-C.* (French.) Purification of Zirconium by Zone Melting. Jean-Paul Langeron, Pierre Lehr, Philippe Albert and Georges Chaudron. *Comptes Rendus,* v. 248, Jan. 5, 1959, p. 35-40.

In a vacuum or an inert gas atmosphere, a molten zone is produced in a Zr bar by electrical induction and moved along the whole bar. Impurities either evaporate or sublimate. 11 ref. C28k; Zr)

153-C.* Extraction of Thorium. J. H. Buddery, W. D. Jamrack and R. A. Wells. *Chemistry & Industry,* Feb. 21, 1959, p. 235-244.

Minerals, ore preparation, removal of rare earths and extraction. 13 ref. (C-general, A11a, B-general; Th)

154-C. Comparing Fixed and Moving Bed Ion Exchange Techniques. C. W. Hancher. *Engineering and Mining Journal,* v. 160, Mar. 1959, p. 80-83.

(C19s)

155-C. Large-Scale Preparation of Ultra-Pure Silicon. J. M. Wilson. *Research Applied in Industry,* v. 12, Mar. 1959, p. 91-96.

Extraction and refining processes. 16 ref. (C-general; Si-a)

156-C.* (German.) Chemical Treatment of Aluminum and Aluminum Alloy Melts. H. Eisenreich and M. G. Neu. *Aluminum,* v. 35, Mar. 1959, p. 131-135.

Factors determining properties of Al melts. Effects and chemistry of degassing, purification, grain refining and elimination of dross. 18 ref. (C5r; Al-b)

157-C.* (German.) Production of Titanium Sponge From $TiCl_4$ by Magnesium. Rudolf Holst and Rudolf Proft. *Neue Hutte,* v. 4, Feb. 1959, p. 106-109.

Reaction is $TiCl_4 + 2Mg \rightarrow 2MgCl_2$ as in the Kroll process. The vacuum or low-pressure method was developed because of the scarcity of inert gas. Distillation of the $MgCl_2$ is achieved in the same retort. 6 ref. (C26, C25, 1-73; Ti, 6-74)

158-C.* Direct-Chill Casting of Copper and Copper-Base Alloys. *Australasian Manufacturer,* v. 43, Feb. 21, 1959, p. 70-73.

Cost reduction by continuous casting brought about by new equipment and new techniques. (C5q; Cu, Cu-n, Cu-s)

159-C.* (French.) Preparation of Zirconium and Zirconium Alloys by Bomb Reductions. Claude Decroly, Jean Gerard and Denis Tytgat. *Revue de Metallurgie,* v. 56, Feb. 1959, p. 143-162.

Production of Zircaloy in the massive form by the reduction of zirconium tetrafluoride with Ca and Mg in the presence of alloying metals. (C26; Zr)

160-C. Nonferrous Extractive Metallurgy in Japan. Yoshiki Ogawa. *Journal of Metals,* v. 11, Mar. 1959, p. 175-177.

Processes, production and research. (C-general; EG-a38)

161-C. Anion-Exchange Studies With Actinium and Lanthanides in Nitrate Solutions. J. Danon. *Notas de Fisica,* v. 4, no. 15, 1958, p. 1-5.

12 ref. (C19s; Ac, EG-g)

162-C. (Russian.) Resistance Heaters for Zone Melting. N. F. Shvartsenau. *Zavodskaya Laboratoriya,* v. 25, no. 2, 1959, p. 232.

(C28k, 1-52)

163-C.* Shortcut to Sheet. F. L. Church. *Modern Metals,* v. 15, Mar. 1959, p. 30-36.

Molten Al continuously cast directly into $\frac{1}{4}$-in. thick reroll sheets. (C5q, F23; Al-b)

164-C.* Studies on the Extraction of Titanium Dioxide From Ilmenite. Sarju Prasad and Jai Beni Prasad Tripathi. *Indian Journal of Applied Chemistry*, v. 21, no. 4, 1958, p. 162-164.

Extraction by addition of sodium sulphate, carbon or calcium oxide to ilmenite and heating. 8 ref. (C19a; Ti)

165-C. (Book.) Uranium Ore Processing. John W. Clegg and Dennis D. Foley. 1958. 436 p. Addison-Wesley Publishing Co., Inc., Reading, Mass., $7.50.

Roasting and physical concentrations; separation of the pregnant leach liquor from the unwanted solid gangue; recovery of U from the solution by ion exchange and solvent extraction; U milling operations. Papers are abstracted separately. (C19, B-general; U)

166-C. (Book.) Process Chemistry. v. 2, Series 3. Progress in Nuclear Energy. F. R. Bruce, J. M. Fletcher and H. H. Hyman, Editors. 579 p. 1958. Pergamon Press Inc., 122 East 55th St., New York 22, N. Y. $17.50.

Uranium, Th, Ac, Ra extraction and refining; nuclear reactor fuel reprocessing; waste processing. (C-general, C19n, T11g; Ac, Ra, Th, U)

167-C.* Cathode Headbar for Zinc Electrolysis: Developments at Risdon, 1917-1957. John E. Charlesworth and John H. Bain. *Australasian Institute of Mining and Metallurgy, Proceedings*, no. 188, Dec. 1958, p. 27-54.

An assemble which, with the aid of argon arc welding and use of minimum additional Al, permits comparable headbar and sheet lives, combined with good electrical conduction throughout the life of the cathode. 7 ref. (C23n, Kld, 1-52; Zn, Al, 17-57)

168-C.* High Temperature Chlorination in a Fluidized Bed. Kermit B. Bengtson and L. N. Johanson. *Chemical Engineering Progress*, v. 55, Mar. 1959, p. 49-58.

Mg from olivine ore. 13 ref. (C19r, B15q, Mg)

169-C.* (Japanese.) Study of Vacuum Evaporation of Metals in Large Quantities: Aluminum Metals. Saburo Tabata and Minoru Iwata. *Osaka Industrial Research Institute, Bulletin*, v. 9, July 1958, p. 151-154.

New method of vacuum deposition of metals by using a TiC heater. (C22, 1-73)

170-C.* Equipment and Practice for Continuous Casting and Rolling by the Properzi Process. James B. Russell and Frank R. Nichols. *Institute of Metals, Journal*, v. 87, Mar. 1959, p. 209-219.

Construction and operation of the Properzi machine. Quality and economics of production of redraw rod from which Al electrical conductor wire is drawn. Physical and mechanical metallurgy of Properzi-made casting and rod and of wire drawn from it. 8 ref. (C5q, 1-52, F23; Al)

171-C.* Hazelett and Rotary Strip-Casting Machines for the Continuous Casting of Aluminum. R. D. Hamer. *Institute of Metals, Journal*, v. 87, Mar. 1959, p. 219-226.

Both machines are capable of producing metallurgically sound cast slab of commercial-purity Al, but the casting of Al alloys requires further investigation. The Hazelett machine has certain advantages for the production of large tonnages of wide sheet, while the RSC technique is suitable for smaller tonnages of narrow strip. 7 ref. (C5q, 1-52; Al, 4-53)

172-C. Bibliography on Extractive Metallurgy of Nickel and Cobalt, 1900-1928. Curtis A. Jones. *U. S. Bureau of Mines, Information Circular*, 7883, 1959, 33 p.

(C-general; Co, Ni)

173-C. (English.) Fundamental Researches on Smelting of Sulphide Ores. Pt. 14. Molten Copper Sulphide. Kingo Sudo. *Tohoku University, Science Reports of the Research Institutes*, v. 10A, no. 6, 1958, p. 435-452.

Behavior of molten copper sulphide at high temperature studied by measuring the equilibria of H_2S/H_2 gas mixtures. 36 ref. (C21b, P12; Cu)

174-C.* Liquid-Liquid Extraction Equilibrium Data of Cobalt Nitrate-Nickel Nitrate-Nitric Acid Solutions. E. J. Scharf and C. J. Geankoplis. *A.I.Ch.E. Journal*, v. 5, Mar. 1959, p. 76-79.

Normal butanol was found to be the best solvent for solvent extraction of Co and Ni from aqueous solutions. 12 ref. (C19n; Co, Ni)

175-C.* Zinc Blast-Furnace Operation. S. W. K. Morgan and J. Lumsden. *Journal of Metals*, v. 11, Apr. 1959, p. 270-275.

Treatment of complex Zn-Pb ores using the lead splash condenser. (C21a; Pb, Zn)

176-C.* (French.) Purity of Metals and Progress in Modern Metallurgy. G. Chaudron. *Aluminio*, v. 28, Mar. 1959, p. 109-114.

Production of high-purity Al by zone melting. Purity tests with radioactive tracers and by measurement of electrical conductivity at low temperatures. Changes in properties in high-purity metals are attributed to foreign atoms in the crystal lattice. 45 ref. (C28k, M26n; Al-a)

177-C. (German.) Methods for Separating Columbium and Tantalum. Harold Schaefer. *Nachrichten aus Chemie und Technik*, v. 7, Feb. 2, 1959, p. 153-160.
134 ref. (C28; Cb, Ta)

178-C. (German.) Separation of the Rare Earth Metals by Fractionized Crystallization. O. Smetana. *Osterreichische Chemiker-Zeitung*, v. 60, Feb. 1959, p. 44-52.
11 ref. (C28; EG-g)

179-C. (Japanese.) Fundamental Study on Chlorination of Titanium Slag. Sakae Yagi, Daizo Kunii, Takashi Yoshioka and Hidemi Umeyama. *University of Tokyo, Faculty of Engineering*, v. 17, Mar. 1959, p. 92-98.
(C19r)

180-C.* Vacuum-Melting of Metals. *Engineer*, v. 207, Apr. 17, 1959, p. 607-608.
Arc melting and induction melting furnaces now in operation at the Sheffield works of Jessop-Saville, Ltd., are used particularly for Ti and Zr, but also for improving characteristics of existing steels and developing new alloys. (C5h, C5j, D9s, 1-73; Ti, Zr)

181-C. New Methods of Preparing Polonium Metal. K. W. Bagnall, P. S. Robinson and M. A. A. Stewart. *United Kingdom Atomic Energy Authority*, AERE C/R 2517, Apr. 1958, 4 p.
Methods based on the action of aqueous ammonia on polonium hydroxide, and of anhydrous liquid ammonia on the hydroxide and some other polonium compounds; or the reduction of polonium hydroxide with hydrazine, hydroxylamine or sodium dithionite in alkaline solution and polonium tetrachloride with stannous chloride, titanous chloride or sodium dithionite in HCl solution. 7 ref. (C1; Po)

182-C.* (Italian.) Decoppering of Lead and Treatment of Copper-Bearing Byproducts in the San Gavino Monreale Foundry. A. Bianchini. *Metallurgia Italiana*, v. 51, Feb. 1959, p. 57-64.
Treatment of copper-bearing scums in an oscillating furnace with sodium carbonate and sodium (without addition of sulphur and litharge), flux-less conversion of matte, retreatment of copper-rich converter slags in an air furnace. 10 ref. (C21c, A11d; Pb, Cu)

183-C. Study of the Velocity of the Magnesium Reduction Process of Zirconium Production. F. G. Reshetnikov and E. N. Oblomeev. *Soviet Journal of Atomic Energy*, v. 4, Apr. 1958, p. 459-463.
(C1p, 1-59; Zr)

184-C.* (German.) Behavior of Iron Amalgam During Heat Treatments. Gerhard Jangg, Erich Fitzer, Otto Adlhart and Hans Hohn. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 557-562.
Extraction of Fe from the amalgam by oxidation. Increase of iron particle size caused by heat. 8 ref. (C29; Fe, *Hg*)

185-C.* Separation of Tantalum and Niobium. G. L. Miller. *Industrial Chemist*, v. 35, Apr. 1959, p. 175-182.
Review. (To be continued.) (C-general; Cb, Ta)

186-C. Volatilization of Tin Chloride From Bolivian Slimes. K. K. Kershner and A. A. Cochran. *U. S. Bureau of Mines, Report of Investigations 5459*, 1959, 12 p.
High percentages of the total Sn were expelled as chlorides. (C19r; Sn)

187-C. Electrodeposition of Titanium From Fused Chloride Baths Using $TiCl_4$ as a Feed Material. W. R. Opie and K. A. Svanstrom. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 253-256.
Results indicate that it is feasible to electrolyze $TiCl_4$ in a simple fused chloride cell to obtain metal of high purity. By confining the Ti values and reduction reaction to the vicinity of the cathode the bath can be kept comparatively free of reduced chlorides of Ti; thus a diaphragm is not required for operation. 23 ref. (C23; Ti)

188-C. Preparation of Two Lithium-Arsenic Compounds. R. E. Tate and F. W. Schonfeld. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 296-298.
LiAs and Li_3As formed by bomb reaction. Both compounds were coarsely crystalline and occurred as groups of acicular cyrstals radiating from nucleation centers. (C26; Li, As)

189-C. (German.) Evaporation in Zone Melting. Gunther Ziegler. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 491-494.

Evaporation coefficients and concentration curves for phosphorus in Si. 6 ref. (C28k; Si, *P*)

190-C.* (French.) Simple Analog Device for Studying an Ingot During Zone Melting. F. Bertein. *Journal de Physique et la Radium*, v. 19, Suppl. 12, Dec. 1958, p. 121A-123A.

Permits study of variations of solute concentration during successive refining operations. (C28k, 1-53)

191-C.* (German.) Preparation of High-Purity Metals by Amalgamation. G. Jangg. *Metall*, v. 13, May 1959, p. 407-411.

Refining by crystallization from an amalgam. Increase of concentration of metal salt solutions by reaction with amalgams. Electrolytic extraction with Hg anodes; preparation of high-purity Ti, Th, Zn, Cd and Fe. 26 ref. (C29, C23; Ti, Th, Zn, Cd, Fe)

192-C.* (Russian.) Titanium Oxide From Binary Mixtures by Means of Carbon. Zh. L. Vert and M. V. Kametsev. *Zhurnal Neorganicheskoi Khimii*, v. 4, no. 1, 1959, p. 17-22.

Interaction of double oxide of titanium with carbon at normal pressure begins at about 950° C. Reduction of TiO_2 proceeds gradually with formation of intermediate oxides of types $Ti_2O_3 \cdot 3\text{-}4\ TiO_2$, Ti_4O_7 and Ti_8OS and as it reaches 1800° C., forms solid solution of TiO-TiC with about the same content of oxygen and carbon. 12 ref. (C26; Ti, *C*)

193-C. Preparation and Properties of Uranium Monocarbide Castings. Arthur C. Secrest, Jr., Ellis L. Foster and Ronald F. Dickerson. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1309, Jan. 2, 1959, 16 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Arc melting appears to be the best method for preparing high-quality UC. Based on density, thermal conductivity and thermal cycling data, cast uranium monocarbide appears to have all the necessary requirements for use as a reactor fuel material. 5 ref. (C5h; U, NM-a35)

194-C. (Russian.) Refining of Tantalum From Columbium and Titanium Impurities by Ion Exhcange. O. V. Al'tshuler and E. A. Sobotina. *Zhurnal Neorganicheskoi Khimii*, v. 4, Jan. 1959, p. 28-32.

Method produces Ta of high purity. 5 ref. (C19s; Ta, *Cb, Ti*)

195-C.* (French.) Heat Treating and Melting Procedures in the Preparation of Nuclear Fuels. P. Thome. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 288-294.

Types of vacuum furnaces distinguished primarily by the relative position of the retort and the vacuum chamber. Heat treating and arc casting furnaces used in a pilot plant with particular attention to the skull melting of uranium and uranium alloys. 29 ref. (C5h, J-general; U)

196-C.* (Hungarian.) Anode Resistance of Aluminum Cells. Imre Molnar. *Kohaszati Lapok*, v. 92, Feb-Mar. 1959, p. 76-81.

Data on voltage drop in current conducting elements of Al-electrolytic cells equipped with horizontal self-consuming anodes. 4 ref. (C23; Al)

197-C. New Process for Titanium. Fredric V. Schossberger. *Industrial and Engineering Chemistry*, v. 51, May 1959, p. 669-670.

Use of potassium chlorotitanate in the preparation of titanium tetrachloride, titanium dioxide and titanium metal. 14 ref. (C1; Ti)

198-C.* (German.) Hydrogen Content in Electrolytic Nickel. E. Raub and F. Sautter. *Metalloberflache*, v. 13, May 1959, p. 129-132.

Hydrogen content is influenced by the composition of electrolyte, pH value, temperature, cathodic current density and stirring. Ni-Tl and Ni-Zn alloys, deposited electrolytically, contain larger quantities of hydrogen as the content of Tl or Zn is increased. Hydrogen absorption is caused by lattice distortions. 9 ref. (C23p; Ni-b, *Tl, Zn, H*)

199-C.* (Hungarian.) Experiments With Exothermic Feeder Sleeves on Nonferrous Castings. Gyula Emod. *Kohaszati Lapok-Ontode*, v. 92, Feb-Mar. 1959, p. 90-95.

Use of exothermic feeder head is particularly useful for certain light metal and Cu alloys having a high degree of shrinkage during the cooling period. 8 ref. (C5n; Cu, EG-a39)

200-C. Physical Beneficiation of Low-Grade Uranium Ores. John N. Butler. Mackay School of Mines, University of Nevada. *U. S. Atomic Energy Commission*, RMO-2863. July 30, 1958, 134 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.75.

Methods investigated include flotation, wet and dry attritioning, magnetic separation and electrostatic separation. 51 ref. (B14; U)

201-C.* (Slovenian.) Copper, Arsenic and Antimony in Iron Ores. Ciril Rekar. *Rudarsko-Metalurski Zbornik*, no. 4, 1958, p. 401-416.

Techniques for the elimination of As in Yugoslav iron ores. (C19a; Fe, *As*)

202-C. (English.) Dressing of Mixed Copper Ores by Combined Leaching, Cementation and Flotation. Antonin Dvorak. *Czechoslavak Heavy Industry*, no. 4, 1959, p. 40-43.

(C19n, C27, B14h; Cu)

203-C.* (Rumanian.) Semicontinuous Casting of Aluminum and Aluminum Alloys. I. Suciu and H. Kremer. *Metalurgia si Constructia de Masini*, v. 10, Dec. 1958, p. 1076-1080.

Experimental casting of 110-mm. diameter ingots in 99.5% Al and two duralumin alloys. Pouring speeds are higher than conventionally produced ingots. (C5q; Al)

204-C.* (Russian.) Process for the Production of Metallic Manganese. V. S. Zel'din and L. G. Ilyushina. *Stal'*, Apr. 1959, p. 332-335.

Direct reduction of Mn-Si ore, instead of two-stage reduction, use of tilting furnaces, utilization of liquid conversion slag, increased working voltage and improved lime charging procedure, raised the furnace productivity and decreased the manufacturing cost. (C21; Mn, RM-n)

205-C.* Vacuum Melting. *Metal Treatment and Drop Forging*, v. 26, May 1959, p. 205-207.

Vacuum induction-melting unit and a consumable arc melting furnace described. Ti and Zr ingots exceeding 2½ tons produced. (C25, W18; Ti, Zr, 5-59)

206-C. Controlled Atmosphere Levitation System. B. Harris and A. E. Jenkins. *Journal of Scientific Instruments*, v. 36, May 1959, p. 238-240.

A system designed to melt and cast small quantities of metals under controlled atmosphere conditions. 6 ref. (C28, 1-52)

207-C. The Floating Zone Process. W. Bardsley. *Research Applied in Industry*, v. 12, May 1959, p. 183-187.

Process by which material can be zone refined and grown into single crystals without a crucible container. 4 ref. (C28k, N3r)

208-C. Extraction of Rare-Earth Elements From Bastnaesite Concentrate. Van E. Shaw. *U. S. Bureau of Mines, Report of Investigations*, no. 5474, 1959, 12 p.

(C-general; EG-g)

209-C. (Russian.) Theory and Practice of Tin Refining. N. N. Murach. *Zhurnal Prikladnoi Khimii*, v. 32, Mar. 1959, p. 556-563.

Filtering of impure Sn under vacuum produces a metal of high purity. Fe is removed with Si forming an intermetallic FeSi. Further separation of liquid phases Sn-FeSi during solidification produces high-purity Sn. 6 ref. (C25; Sn-a, *Fe, Si*)

210-C. (Translation—ConBur.) Kinetics of the Liberation of Copper by the Diaphragm Method of Internal Electrolysis. A. K. Zhdanov, V. A. Khadeev and F. Mirzabekov. *Journal of Applied Chemistry of the USSR*, v. 31, Apr. 1958, p. 627-629.

(C23; Cu)

211-C.* D-C Casting of Copper and Copper Alloys. H. H. Sinason. *Precision Metal Molding*, v. 17, June 1959, p. 38, 84.

New mold designs and materials. Revised theories of heat exchange between mold interface and cooling water provide high surface and structural qualities in mill shapes and castings produced by a continuous direct chill process. (C5q; Cu)

212-C. Casting Unit Feature of Primco Set-Up. *Canadian Metalworking*, v. 22, June 1959, p. 32-33.

Direct chill casting of Al. Process and equipment. (C5q, 1-52; Al)

213-C. (Russian.) Elimination of Nonmetallic Inclusions in the Refining of Metals. A. G. Spasskii and N. S. Klyagina. *Liteinoe Proizvodstvo*, Apr. 1959, p. 30-32.

20 ref. (C5r; 9-69)

214-C.* (Russian.) Heat Balance of Aluminothermic Smelting in Producing Ferrotitanium. S. I. Suchilnikov and V. V. Melikhov. *Stal'*, v. 19, May 1959, p. 425-428.

Determination of the specific heat of this process, according to established dependence on temperature, and use of simplified calculations, permitted more accurate computations of heat losses. Preheating of the furnace shaft results in more complete recovery of Ti and reduces the consumption rate of Al. 5 ref. (C26; AD-n32, *Fe, Ti*)

215-C.* Thermodynamics and Kinetics in Vacuum Metallurgy. Thomas B. King. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 35-58.

Applications of thermodynamics in relation to gas-solid reactions, degassing of

solid metals and oxide reduction by solid carbon; oxidation reactions; metal-crucible reactions; gas-liquid reactions. 12 ref. (C5, C5m, C25, E25s, 1-73)

216-C.* Thermodynamics and Kinetics in Vacuum Induction Melting. A. M. Aksoy. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 59-78.

Purification in vacuum induction melting is attained through dissociation, deoxidation, degassification and volatization. Thermodynamic data are also given for desulphurization and the evaluation and control of melting. 22 ref. (C5j, 1-73)

217-C.* Thermodynamics and Kinetics in Vacuum Arc Melting. P. C. Rossin. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 79-97.

The three major reactions which take place within the melting zone are dissociation, deoxidation and degassification. The dissociation reaction applies primarily to the thermal dissociation of compounds of metal oxides, carbides, hydrides, sulphides and nitrides. (C5h, 1-73)

218-C.* Consumable Electrode Arc Melting of Non-Refractory Metals. James H. Johnson. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 153-161.

At the present time consumable vacuum arc melting offers the only suitable commerical method of producing Zr, Ti and Hf. (C5h, 1-73; Zr, Ti, Hf)

219-C.* Consumable Electrode Arc Melting of Refractory Metals. S. J. Noesen and R. M. Parke. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 162-171.

Process is able to consolidate large bodies of high-melting metals and combines melting with casting method which avoids the common ingot defects of center porosity and chemical segregation. Relative amount of purification taking place at different stages in the process was studied with 6-in. diameter Mo ingots. 4 ref. (C5h, 1-73; Mo, EG-d37)

220-C.* Skull and Permanent Electrode Melting. John L. Ham. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 172-185.

For the production of cast shapes from metals and alloys too reactive to be retained in existing crucible materials, skull melting is virtually the only method which can be used. The process permits the recycling of odd sizes of scrap and permits holding the liquid bath long enough to obtain samples for chemical analysis and to determine whether a certain addition should be made before the heat is poured. (C5k, 1-73)

221-C.* Induction Melting of Ingot Products. W. E. Jones. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 189-203.

Effect on high-temperature properties of vacuum induction melting of Udimet 500 and 52100 steel. Correlations exist between leak rates and pressures and the properties obtained in the metal. (C5j, D8m, 1-73, Q-general, 2-62; Ni-b, ST)

222-C.* Induction Melting of Cast Shapes. P. E. Beamer. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 204-217.

Investment casting techniques are utilized to form alloys which are currently used for high-temperature blading in "production gas turbines". This permits the direct conversion of vacuum melted alloys from the molten state to a semifinished or commercially usable part. Waspalloy, Udimet 500, Ni-base alloys such as GMR 235, Inco 713, Guy Alloy, M-252 and Fe-base alloys such as A-286, Discalloy, and M-308 have been vacuum investment cast successfully. (C5j, E15, 1-73; Ni-b, Fe-b)

223-C.* Electron Bombardment Melting Techniques. Hugh R. Smith, Jr. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 221-235.

The effect of electron beam melting upon the composition of various reactive metals is significantly different from changes occurring in other types of melting systems operating at higher pressures than is possible with electron beam melting. The metals processed have been purified by devolatization reactions to a greater extent than is possible in vacuum arc or conventional vacuum induction melting. 6 ref. (C5k)

224-C.* Degassing in the Liquid State. Max Auwarter. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 239-254.

Degassing during arc melting, levitation melting and induction melting. Vacuum stream degassing of steel. 14 ref. (C5h, C28, C5j, D9s, 1-73)

225-C.* Distillation of Metals Under Reduced Pressures. Hillary W. St. Clair. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 295-305.

Distillation is quite effective in separating metals of different volatility when the more volatile metal is present in greater or nearly equal proportions, but as it becomes depleted its activity and rate of diffusion decrease to a point where further removal by selective distillation becomes impracticable. The rate of distillation depends primarily on the rate at which thermal energy is transferred to the surface. (C22, 1-73)

226-C.* Refractory Metals. Ivor E. Campbell. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 337-349.

Applications of vacuum technology include metal production, oxide-carbide reduction, and hot wire reduction, consolidation by reduced pressure arc melting and consumable electrode melting and annealing. 4 ref. (C28, C1, C5h, 1-73; EG-d37)

227-C. The New Hayden Smelter: Its Unique Design Features. Ralph K. Johnson. *Journal of Metals*, v. 11, June 1959, p. 376-381.

(C21; Cu)

228-C. Leach-Precipitation-Flotation Process. M. W. Franz. *Journal of Metals*, v. 11, June 1959, p. 382-385.

LPF process results in the recovery of 2 lb. of Cu per ton of mill feed. Nonsulphide Cu minerals are tested by leaching with sulphuric acid and precipitation by sponge iron produced from pyrite concentrate. (C19n, B14h; Cu)

229-C. Survey of European Arc Melting. Helmut Gruber. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 138-152.

Examples of vacuum arc melting apparatus, electrode feed and control, typical European equipment and installations. 11 ref. (C5h, W18s, 1-73)

230-C.* Vacuum Arc Melting and Casting of Titanium. R. W. Huber, E. J. Chapin and I. R. Lane, Jr. *Foundry*, v. 87, June 1959, p. 88-93.

Operation of skull furnace and associated equipment. Structures of ingots cast in graphite molds. (To be continued.) 8 ref. (C5h, C5m, 1-73; Ti)

231-C.* Vacuum Arc Melting and Casting of Titanium. R. W. Huber, E. J. Chapin and I. R. Lane, Jr. *Foundry*, v. 87, July 1959, p. 86-90.

Ti melted and cast under direct vacuum conditions at a pressure of about 0.1 micron without the use of inert gas for arc stability has toughness in spite of the large grain size in the as-cast material. (C5h, E15, 1-73; Ti)

232-C.* (German.) Precipitation of Thorium by Electrolysis of Molten Salts. P. Drossback and F. Neumayr. *Zeitschrift fur Electrochemie. Berichte der Bundesgesellschaft fur Physikalische Chemie*, v. 63, no. 4, 1959, p. 516-520.

Electrolysis of molten $ThCl_4$ and $KThF_5$ as components of mixtures of other salts. Determination of the polarization voltage as a function of time. Voltage varies when the electrode rotates. (C23n; Th)

233-C.* (French.) Heterogeneous Catalysis as a Metallurgical Method. Jean A. Ternisien. *Metaux-Corrosion-Industries*, v. 34, Apr. 1959, p. 151-161.

Purification of Al and V with metallic elements and compounds as catalysts. Melting, boiling temperature, data on specific heat and vapor pressures for various elements and their fluorides, iodides, bromides and chlorides. 23 ref. (C28; Al, V)

234-C. (Hungarian.) Halide Metallurgy. Antal Aradi. *Kohaszati Lapok*, v. 14, May 1959, p. 216-220.

High-purity metals can be produced through their chlorides. Major problems arising are high volatility of chlorides at elevated temperatures, furnace design and heating. (C1p)

235-C.* Thermodynamic Principles in the Refining of Metals. F. D. Richardson. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 23 p.

Influence of concentration, other impurities and alloying elements on chemical potential of impurities in metal solutions. Use of gases, intermetallic compounds, alloys, oxides or sulfides as extracting phases in refining procedures. 33 ref. (C-general, D11, P12, 3-69; 14-68)

236-C.* (Ukrainian.) Formation of Chromium Carbides. T. Y. Kosolapov and G. V. Samsonev. *Dopovidi Akademii Nauk Ukrain'skoi R.S.R.*, no. 3, 1959, p. 298-300.

Optimum conditions for the formation of Cr_3C_2 and Cr_7C_3 by reduction of chromium oxide with soot in a hydrogen at-

mosphere. $Cr_{23}C_7$ can be obtained by this method. 5 ref. (C26; Cr, 14-68)

237-C. Commercial Production of Indium. B. G. Hunt, C. E. T. White and R. A. King. *Canadian Mining and Metallurgical Bulletin*, v. 52, June 1959, p. 359-63.

Recovery of In from anode slime by roasting the slime with sulphuric acid, leaching with water, purifying the leach solution, recovering the In by sponging with Zn or Al and refining electrolytically. (C19n, C23; In)

238-C. Production of Fusible Alloy Wire. *Wire Industry*, v. 26, June 1959, p. 575, 601.

Steps in the casting of heavy-gage fuse wire. (C5q; 4-61)

239-C.* (Russian.) Effect of Sulfur-Containing Compounds on Electrolytic Yield of Magnesium During Electrolysis of Carnallite. S. A. Pushkova. *Zhurnal Prikladnoi Khimii*, v. 22, May 1959, p. 1056-1060.

Sulfates and sulfides present in carnallite easily decompose under action of metallic Mg, chlorine and air and cause the precipitation of sulfur. Due to poor solubility of MgS in a chlorine solution part of the sulfides are removed with the residue. 6 ref. (C23p, 3-69; Mg, S)

240-C.* (German.) Application of Electrical Energy for the Production of Nonferrous Metals, Copper, Zinc, Lead and Tin. H. Schackmann. *World Power Conference, 11th Sectional Meeting, Transactions*, v. 7, no. B.5, 1958, p. 193-212.

Refining, remelting and alloying processes by means of arc furnaces, resistance arc furnaces and low-frequency induction furnaces. 10 ref. (C21d; Cu, Zn, Pb, Sn)

241-C. Process Pair Whittles Uranium Costs. *Chemical Week*, v. 85, July 11, 1959, p. 35-38.

Semicontinuous pulsed ion exchange system used together with an electrolytic reduction cell yields high-purity uranium at relatively low cost. (C19s, C23; U)

242-C. How Cross Section Affects Floating Zone Refining. *Iron Age*, v. 184, July 9, 1959, p. 102.

An increase in the diameter of the tubes used for melting produces a more stable molten zone without exceeding the maximum height. (C28k)

243-C. (Slovenian.) Extraction of Salts Formed by Carbamic Acid with Metals, From Solutions of a Low pH Number. Sergej Gomiscek. *Rudarsko-Metalurski Zbornik*, no. 1, 1959, p. 17-20.

Extraction of Fe, Co, Ni, V, Cu, As, Sb and Sn in the form of salts. 7 ref. (C19; Fe, Co, Ni, V, Cu, As, Sb, Sn)

244-C.* (Norwegian.) Preparation of Ferro-Alloys. H. Hagerup-Jenssen. *Kjemi, Bergvesen og Metallurgi*, v. 19, Mar. 1959, p. 9-15.

Production of ferrosilicon, ferrochromium, ferromanganese and ferrosilico-manganese from raw materials. (C-general; AD-n31, *Cr, Mn, Si*)

245-C.* Ram Reactor Provides Continuous Zirconium Production. W. W. Dunham, Jr., and R. D. Toomey. *Journal of Metals*, v. 11, July 1959, p. 438-440.

New process is built around continuous reduction of Zr tetrachloride and periodic compacting and withdrawal of the metal product in a form suitable for arc melting. The name ram reactor process comes from the hydraulic ram used to consolidate and push out the product. (C1p; Zr)

246-C.* Zirconium by Sodium Reduction. Weston Starratt. *Journal of Metals*, v. 11, July 1959, p. 441-443.

Production of reactor-grade Zr at the Ashtabula, Ohio, plant of Mallory-Sharon Metals Corp. Separation of Hf from Zr and removal of Fe by liquid-liquid extraction and the elimination of Al. No reduction is claimed to be cheaper than Mg reduction. (C26, C19n; Zr)

247-C. Thermal Conditions in the Bomb Reduction of Uf_4 to Metal. Kenneth O. Beatty, Jr., and Orville R. Magoteaux. National Lead Co. of Ohio. *U. S. Atomic Energy Commission*, NLCO-771, June 10, 1959, 37 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Preheating of the green salt-Mg charge is necessary to bring some portion of the charge to ignition temperature (about 900° F.) and all of the charge to an average temperature (about 400° F.) high enough to assure molten products. The temperature distribution in the charge as a result of preheating was predicted as a function of the thermal properties and dimensions of the charge and of the preheat time. (C1p; U, *Mg*)

248-C.* (German.) Preparation of Uranium and Thorium. G. Wirths. *Metall*, v. 13, July 1959, p. 621-625.

Leaching and reduction processes. Composition of end products. 15 ref. (C19, C26; U, Th)

249-C. (French.) Autoradiographic Control of the Separation of Uranium From Thorium in Zone Melting. Garin-Bonnet, H. Faraggi, J. Erler and J. F. Petit. *Les Memoires Scientifiques*, v. 56, June 1959, p. 14-18.

Nondestructive inspection by neutron autoradiography. (C28k, S11q; U, *Th*)

250-C. (German.) Present Stage of the Manufacture of Metals With High Melting Points. Pt. 2. R. Kieffer and F. Benesovsky. *Metall*, v. 13, July 1959, p. 652-655.

Preparation of Ta and Ta alloys and Cb and Cb alloys. 22 ref. (C-general; Ta, Cb)

251-C.* Consumable-Electrode Vacuum Remelting of High-Temperature Alloys. R. K. Pitler, E. E. Reynolds and W. W. Dyrkacz. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 378-387.

Beneficial results include lower gas contents, freedom from inclusions, improved forgeability, improved room and high-temperature ductility and fatigue strength. Process makes possible production of larger ingots of highly alloyed high-temperature materials than hitherto possible because of rapid cooling rate which minimizes segregation and refines ingot structure. (C5h, 1-73, Q-general, M27d; Ni-b, 5-59, SGA-h)

252-C.* Quality Aspects in Vacuum Arc Melting. Edward A. Loria. *Blast Furnace and Steel Plant*, v. 47, June 1959, p. 601-607.

Two prime purposes of vacuum arc melting or remelting are to improve mechanical properties that are segregation or structure-sensitive and improve soundness, particularly in large billet cross sections. Application of vacuum technique to a wide variety of alloys which cannot be melted or hot worked economically by conventional techniques. (C5h, D8m, 1-73)

253-C. Decontamination of Thorium-Uranium Alloys by Consumable Arc-Melting. R. E. Johnson and E. W. Murbach. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-3590, June 15, 1959, 15 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Consumable-electrode arc melting process as a means of decontamination is in general inferior to the nonconsumable arc melting process. The method is applicable only to the removal of the volatile fission products. When the temperature is taken high enough to remove other impurities, losses of vital metal become appreciable. It could, however, be used as one step in a decontamination process. (C5h, A11d, T11g, Th-b, *U*)

254-C. Separation of Beryllium From Aluminum by Differential Desulphatization. M. R. Seshadri and R. Mallikarjunan. *Indian Institute of Science, Journal*, v. 41, Apr. 1959, p. 7-13.

A study of the dissociation pressures of Al and Be sulphates indicates the feasibility of selective desulphatization of anhydrous Al sulphate from a mixture of the two metal sulphates. (C28; Be, Al)

255-C.* (English.) Thermodynamics of the Reactions Taking Place During the Oxidation Period of Copper Refining. Z. Horvath. *Acta Technica Academiae Scientiarum Hungaricae*, v. 25, no. 1-2, 1959, p. 159-186.

Thermodynamics of the oxidation of Sn, Zn, Pb, Fe, Ni, Sb, As, Cd and S. (C21, P12; Cu)

256-C.* The Preparation of High-Purity Uranium Metal by the Bomb Reduction of Uranium Tetrafluoride With Calcium. R. W. Kewish, R. J. Bard, J. P. Bertino, O. E. Fry, S. W. Hayter, F. J. Hill, B. L. Kelchner and A. W. Savage, Jr. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959. p. 425-429.

Massive high-purity uranium metal, containing very low concentrations of a number of light elements, is prepared on the 250-g, scale by bomb reduction of high-purity UF_4 with high-purity Ca in Ca oxides crucibles. (C1p; U, *Ca*)

257-C.* High-Purity Tantalum. R. F. Rolsten. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 472-476.

Pure Ta was prepared using the "iodide" process in a modified deBoer deposition bulb. Analyses and workability are used as criteria of purity. The condensed solid iodide phase was isolated and identified by chemical and X-ray powder-diffraction methods. 11 ref. (C1p; Ta)

258-C.* Iodide Columbium. R. F. Rolsten. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 478-483.

Iodide Cb prepared by the thermal decomposition of Cb iodide on an indirectly heated quartz surface. The metal was deposited on and easily removed from the quartz surface without contamination. Various commercial grades of Cb were used and, in all cases, the Cb deposited was considerably purer than the commercial material. 4 ref. (C1p; Cb)

259-C.* (French.) Separation of Zirconium and Hafnium. Saint-James. *Metaux Corrosion Industries*, v. 34, June 1959, p. 258-266.

Description of various processes such as the crystallization process starting from ZrF_6K_2; reduction of $ZrCl_4$ to $ZrCl_3$ followed by distillation; separation by organic solvents. Preparation of Zr by electrolysis of a salt bath containing ZrF_6K_2. 9 ref. (C-general; Zr, Hf)

260-C. (Book.) Uranium Production Technology. Charles D. Harrington and Archie E. Ruehle, Editors. 579 p. 1959. D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J. $17.50

Production of uranium compounds and metal of nuclear purity from uranium ore compounds. 24 ref. (C-general, A-general; U)

261-C.* Zone-Melting in Aluminum-Zinc, Aluminum-Copper-Zinc Alloys and Zinc. Katashi Masumoto and Tomo-o Sato. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 73.

Effects of number of passes and length of molten zone on distribution of solute atoms along cylindrical specimens. (C28k; Al-b, *Cu, Zn,* Zn-a)

262-C.* The Metallurgy of Thorium. A Preparation of Zn-Th Alloy Using a Fused Zn Catched in Fused Electrolysis and Vacuum Distillation of the Alloy. Yoshiki Ogawa, Yoshihiro Hisamatsu, Kazutaka Kawamura and Jo Isono. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 75.

Electrolytic preparation of Zn-Th alloy and vacuum distillation of alloy in production of pure Th metal sponge. (C23, C22, 1-73; Zn-b, *Th*)

263-C.* Study on Pure Chromium. Pt. 1. Trial Produce of Pure Chromium and Some of Its Properties. Susumu Yoshida and Yukio Ohba. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 75.

Preparation of pure Cr by electrolysis and hydrogen reduction treatments. Behavior of sheathed ingots during forging and rolling. (C23, C26, F22, F23, Q23; Cr-a)

264-C.* Electron Bombardment Floating Zone Melting and Allied Electron Bombardment Techniques. Alan Lawley. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 1-17.

Summary of papers presented at S.E.R.L. Laboratories, Baldock, Herts, England. Electron beam apparatus and melting of Mo, Ni, Cu, V, Cb, Ta, Pt, Rh, Ru, Ir, Os, Ge, Ta-Cb, Ta-V, U-Zr, Mo-Re, Ti-C, WC, W_2C, TaC and ZrO_2. Electron bombardment evaporation. Analysis of zone refined metals; electron beam welding of Al. (C28k, K6; Mo, Ni, Cu, Al, V, Cb, Ta, Pt, Rh, Ru, Ir, Os, Mo-b, U-b, Ti-b, Ta-b, W-b, Zr-b, 14-68)

265-C.* An Electron Beam Apparatus for Purification of Beryllium. J. Hetherington. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 18-22.

Power supply, electron gun and vacuum system of electron beam apparatus for the zone refining and evaporation of Be. (C28k, 1-52, 1-73; Be)

266-C.* Electron Beam Apparatus for Zone Levelling W-Ta and W-Nb Alloys. D. P. Ferriss and R. M. Rose. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 23-24.

Vacuum system; design of movable electron gun. (C28k, 1-52, 1-73; W-b, *Cb, Ta*)

267-C.* E-B Melting of Ti and Ti Alloys. Stanley Abkowitz. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 34-37.

Electron beam melting of Be, B, boron carbide, boron-silicon compounds, tantalum carbide, titanium carbide and zirconium diboride. (C5k; Be, Ta, Ti, B, *Si*, 14-68)

268-C.* Electron-Beam Floating-Zone Melting of Platinum-Group Metals. W. P. Allred, R. C. Himes and H. L. Goering. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., p. 38-43.

Electron beam floating zone purification of Ru, Pt, Rh and Pd rods. (C28k, X24f, 1-73; Ru, Pt, Rh, Pd)

269-C.* Electron Bombardment Melting of Tungsten. H. W. Schadler. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 51-57.

Characteristics of electron bombardment equipment. Production of high-purity tungsten single crystals by floating zone refining. Variation of electrical resistivity and proportional limit of crystals with the amount of impurities. 6 ref. (C28k, Q21b, P15g, 3-69; W, 14-61)

270-C.* Electron Bombardment Apparatus for Zone-Melting of Tungsten. J. L. Orehotsky and A. J. Opinsky. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 44-47.

Vacuum system, anode assembly and cathode. Preliminary results on zone purification of tungsten rods. (C28k, 1-73, 1-52; W)

271-C.* Conversion of a Consumable Arc Melting Furnace to Electron Beam Melting of Titanium. L. L. France. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 62-72.

Electron gun assembly and other features of modified arc furnace. Electron bombardment melting and casting of Ti ingots. (C5k, C5h, W18s, 1-52, 1-73; Ti)

272-C.* Zone Melting of Tungsten by Electron Bombardment. W. R. Witzke. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 73-81.

Electron bombardment zone melting apparatus. Preparation of high-purity tungsten crystals by floating zone refining. Ductility of zone melted metal. (C28k, 1-73; W)

273-C.* On the Purification of Tungsten by Electron Beam Refining. J. W. Pugh. Paper from "Proceedings of First Symposium on Electron-Beam Melting '. Alloyd Research Corp., Watertown, Mass., 1959, p. 89-93.

Electron beam zone melting apparatus. Ductility of pure tungsten single crystals. (C28k, Q27a; W-a, 14-61)

274-C. Preparation of Anhydrous Chlorides of Cerium and Thorium. R. Didchenko. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 401-402.

New method is based on the formation of a double salt or complex between cerium trichloride and pyridinium chloride and subsequent thermal decomposition of this salt in dry hydrogen chloride under reduced pressure. (C1p; Ce, Th)

275-C. Thermodynamic Treatment of Disproportionation Equilibria Involving Complex Ion Formation in Molten Salts. K. Grjotheim and J. M. Toguri. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 403-407.

Equilibrium between Ti metal, $TiCl_2$ and $TiCl_3$ in a solvent of molten metal chlorides. 8 ref. (C1p; Ti)

276-C. Separation of Rare Earths by Ion Exchange. J. E. Powell and F. H. Spedding. *Metalurgical Society of AIME, Transactions*, v. 215, June 1959, p. 457-463.

Use of chelating agents in the separation of rare earths by ion-exchange. Recent pilot-plant operations at the Ames Laboratory. 41 ref. (C19s; EG-g)

277-C. U^{233} Purification and Metal Production. J. P. Bertino and J. A. Kircher. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission, LA-2245*, Jan. 29, 1959, 46 p. (Available from U. S Office of Technical Services, Washington 25, D. C.) $1.25.

U^{233} is chemically separated from nonradioactive contaminants by precipitation as $UO_4 \cdot xH_2O$, which is calcined to U_3O. This in turn is reduced to UO_2 and converted to UF_4. Pure metal is prepared by bomb reduction of the UF_4 with Ca as the reducing agent. (C6c, C1p; U)

278-C. (Russian.) Charging Blocks Refined From Alloy Turnings. V. Z. Zykov and S. M. Levinzon. *Metallurg*, July 1959, p. 33-34.

A higher quality alloy steel is produced when the turnings are melted into charging blocks and subsequently added to the furnace, rather than adding them as they come from the metalworking shop without processing. Refining was done in an electric arc and an induction furnace. (C5h, C5j, A11d; EG-a38)

279-C. (Italian.) Metallurgy of Aluminum. Giuseppe Barchiesi. *Fonderia*, v. 8, July 1959, p. 289-291.

Preparation and refining processes. (C-general; Al)

280-C.* Zone Refining of Molybdenum. J. A. Belk. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 50-55.

The electron bombardment floating zone melting method. (C28k; Mo)

281-C.* Zone Melting of Refractory Metals Including Rhenium and Tungsten. G. A. Geach and F. O. Jones. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 56-59.

Zone melting is an attractive method for preparing large crystals of the refractory metals which are difficult to handle by other crystal-growing methods. Two techniques are used—arc melting on a water-cooled Cu hearth and electron bombardment melting of a "floating zone" in a vertical bar. Arc melting techniques are more useful for zone refining although the zone melted bars are usually polycrystalline. 6 ref. (C28k; Re, W, EG-d37)

282-C.* Arc-Melting Processes for the Refractory Metals. A. R. Moss. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 60-72.

Basic types of arc-melting furnaces. Factors in the selection of consumable or nonconsumable electrode processes. Mold design. 16 ref. (C5h, W18s; EG-d37)

283-C.* Electrolytic Copper Refining at High Current Densities. S. J. Wallden, S. T. Henriksson, P. G. Arbstedt and Th. Mioen. *Journal of Metals*, v. 11, Aug. 1959, p. 528-534.

Evidence points to the fact that minimum Cu refining costs can be achieved at higher current densities than are currently employed. Experiments conducted at current densities up to 500 amp. per sq.m. in specially constructed channel cells in Sweden. 6 ref. (C23p; Cu)

284-C.* (English.) Electrolytic Refining of Zinc. Pt. 5. Removal of Lead From Zinc Sulfate Solution With Xanthate or Tetramethyl Thiuramdisulfide. Seitaro Fukushima. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 220-229.

Influence of amount of reagent, agitation time, acidity and temperature on removal of Pb. 6 ref. (C23p; Zn, *Pb*)

285-C.* (English.) Studies on Electrolytic Refining of Zinc. Pt. 6. Application of Xanthate or Tetramethyl Thiuramdisulfide to Purification Process of Leached Zinc Solution. Seitaro Fukushima. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 230-243.

Influence of impurities such as Mn, Co and Fe on removal of Pb from zinc sulphate solution. Combined treatments for removal of Pb and Co. Effect of residual reagents on electrodeposition of Zn. 13 ref. (C19n, C23p, 3-69; Zn, *Mn, Co, Fe, Pb*)

286-C.* (French.) Choice of Procedures in Fabrication of Uranium Metal. P. Vertes. *Energie Nucleaire*, v. 1, Jan-Feb. 1959, p. 43-46.

Solvent extraction processes. (C19n; U)

287-C. (German.) Use of Oxygen-Enriched Blast in Nonferrous Shaft Furnaces. Wolfgang Knaul. *Neue Hutte*, v. 4, July 1959, p. 406-416.

17 ref. (C21a)

288-C. (Russian.) Production of Columbium Iodides and Their Properties. D. M. Chizhikov and A. M. Grin'ko. *Zhurnal Neorganicheskoi Khimii*, v. 4, May 1959, p. 979-981.

Iodide compounds of Cb are obtained by passing iodine vapors over incandescent Cb. The resulting products are CbI_5, CbI_4 and $CbI_{3.2}$. 5 ref. (C1p; Cb)

289-C. (Russian.) Refining of Columbium From Columbium Iodide. D. M. Chizhikov and A. M. Grin'ko. *Zhurnal Neorganicheskoi Khimii*, v. 4, May 1959, p. 982-984.

Method of obtaining pure Cb by the decomposition of a CbI filament at 1300-1600° C. and holding the vessel temperature at 400-600° C. where decomposition takes place. 7 ref. (C1p; Cb)

290-C.* Vacuum Melted Metals and Alloys—Why Use Them? John L. Everhart. *Materials in Design Engineering*, v. 50, Aug. 1959, p. 89-97.

Comparison of the mechanical properties and characteristics of air and vacuum-melted Ni, Co, Fe and steel alloys. (C5, D9, 1-73; Ni-b, Co-b, Fe-b, ST)

291-C. (German.) Titanium. Hjalmar Depken. *Chemische Rundschau*, v. 12, Aug. 1, 1959, p. 409-411.

Preparation, properties and applications. (C19, Q27a, Q29n; Ti, 17-57)

292-C. (Russian.) Equilibrium Conditions for Reduction of Zinc Oxide With Metallic Iron. A. I. Okun'ev, A. K. Kiryanov and B. I. Sergin. *Doklady Akademii Nauk, SSSR*, v. 125, June 1959, p. 1282-1284.

6 ref. (C26; Zn, *Fe*)

293-C.* The Present State of Titanium Extractive Metallurgy. W. J. Kroll. *Metal-*

lurgical Society of AIME, Transactions, v. 215, Aug. 1959, p. 546-553.

Ore beneficiation in the arc furnace, the reduction of TiO_2, the reduction of tetrahalide to lower halide, Ti sponge production by Mg and Na reduction of $TiCl_4$, reduction of TiF_4, and refining of raw Ti. Electrolytic Ti refining in relation to the elimination of individual impurities, and the electrowinning of Ti. 17 ref. (C-general; Ti)

294-C. Removal of Fission Products From Molten Thorium-Uranium Alloy. A. G. Buyers, J. Chilton and W. E. McKee. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 624-626.

Decontamination using a salt-bed process. The method consists of induction melting the alloy supported by a vertical column of compacted calcium fluoride. The molten metal then melts its salt environment and, under gravity, passes down through the salt column. 4 ref. (C5j, T11g, A11d; Th-b, U, 14-60)

295-C.* The Efficiency of Zone-Refining Processes. L. W. Davies. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 672-675.

For a given monotomic distribution of solute impurity in an ingot, figures of merit are defined which are relevant to a discussion of solvent purification and of the concentration to one end of the ingot of the solute, when considered as a desirable impurity. The optimum conditions for solvent purification and solute concentration are identical. 7 ref. (C28k)

296-C. Electrolytic Refining and Recovery of Copper. Otto Schulz. *Demag News,* no. 152, 1958, p. 34-35. (C23; Cu)

297-C. Recovery of Magnesium and Cadmium From Incendiary Alloys by Vacuum Distillation. H. S. Caldwell and M. J. Spendlove. *U.S. Bureau of Mines, Report of Investigations* 5476, 1959, 17 p.

Vacuum distillation tests on a Mg alloy containing 20% Cd indicated that it would not be feasible to separate the two metals by selective vaporization of Cd. (C22, 1-73; Mg)

298-C. Titanium Electrorefining: Cathode Studies and Deep Bath Deposition. D. H. Baker and J. R. Nettle. *U.S. Bureau of Mines, Report of Investigations* 5481, 1959, 11 p.

8 ref. (C23; Ti)

299-C.* (Italian.) Recovery of Gallium Alkaline Solutions of the Bayer Process by Electrolysis on Rotating Mercury Cathode. M. E. Landi. *Alluminio,* v. 28, no. 5, 1959, p. 219-224.

Electrolytic process for the extraction of Ga from alkaline solutions by means of a hollow rotating cylindrical Hg cathode and separation from the Hg by leaching. Ga is recovered by secondary electrolysis. (C23; Ga)

300-C. (Russian.) Reduction of Columbium Pentoxide With Carbon. P. V. Gel'd and G. P. Shveikin. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk,* Jan-Feb. 1959, p. 44-49.

A mixture of Cb pentoxide and lamp black, graphite or tar is pressed into compacts and exposed to a temperature of 1200° C. in a vacuum. Reduction is influenced by the structure of Cb_2O_5 and the pressure. 11 ref. (C25, 3-71, 3-74; Cb)

301-C. (Russian.) Reduction of Zinc Ferrite With Carbon Dioxide. G. G. Gvelesiani, T. E. Konyshkova and D. M. Chizhikov. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk,* Jan-Feb. 1959, p. 50-54.

Reduction at temperatures of 800-1000° C. and pressures of CO_2 of 10-450 mm. Within the ranges tested, increased temperature and pressure caused an acceleration of the reduction process. 12 ref. (C25, 2-61, 3-74; Fe, Zn)

302-C. (Russian.) Influence of Chromium on the Surface Tension of Slags Present in the Smelting of Nickel From Its Ore. A. V. Vanyukov and N. I. Utkin. *Nauchnve Doklady Vysshei Shkoly-Metallurgiya,* no. 1, 1959, p. 11-13.

Reduction of surface tension with an increased CrO content. 8 ref. (C21a, 2-60; Ni, 14-60, RM-q, *Cr*)

303-C. Electrolytic Method Promises Cheaper, Purer Titanium. *Steel,* v. 145, Sept. 7, 1959, p. 100.

Reduction of the ore with carbon and separation of the pure metal in a molten salt. (C23; Ti, *C*)

304-C. (Book.) Proceedings of First Symposium on Electron-Beam Melting. James S. Hetherington, Editor, 93 p., 1959. Alloyd Research Corp., 202 Arsenal St., Watertown 72, Mass. $1.50.

Equipment for and application of electron bombardment to zone refining and welding. Papers separately abstracted. (C26k, K6, 1-73)

305-C.* (German.) Separation of Suspended Metals and Metallic Compounds From the Mansfeld Blast Furnace Slags. A. Lange and W. Lindenlaub. *Bergakademie*, v. 11, July 1959, p. 399-407.

Separation of Cu by means of gravity could not be achieved when Cu content was below 0.1% even at slag temperatures of 1400° C. without change of composition. Since the Cu is not in a state of dissociation, the separation cannot be attained electrolytically. 7 ref. (C28, W17g; RM-q)

306-C. (Russian.) Correlation Between Current Density and Conductance in the System Involving Carbon Electrode, Cryolite Bath, and Dissolved Aluminum. L. N. Antipin, S. F. Vazhenin and A. A. Sinyagov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 48-52.

Measurement of the conductance between an outer electrode serving as an anode and an inner electrode without electrical charge, and conductance between the outer electrode and the graphite crucible serving as a cathode. 8 ref. (C23n; Al)

307-C. (Russian.) Influence of Aluminum on the Anode Effect in the Electrolysis of Cryolite-Alumina Baths. A. I. Belyaev and L. A. Firsonova. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 53-57.

Effect of Al in solution on current density. (C23n; Al)

308-C. (Russian.) Degassing of Aluminum-Silicon Alloys With the Help of a Flux. M. V. Sharov and O. I. Nikitaeva. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 58-62.

Effect of holding time at 700-750° C. and degassing under a flux on hydrogen content. (C5m, N15e, 3-67; Al-b, *Si, H*)

309-C. (Russian.) Thermochemistry of Molten Silicates of Lead. S. G. Bratchikov, O. A. Esin and I. T. Sryvalin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 32-37.

10 ref. (C21; Pb)

310-C. (Russian.) Effect of the Ratio of Additions $CuF_2 : MgF_2$ Present in the Cryolite Bath on the Solubility of Gamma and Alpha Al_2O_3. E. A. Zhemchuzhina and A. I. Belyaev. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 56-60.

6 ref. (C23n; Al)

311-C. (Russian.) Losses of Magnesium During Electrolytic Preparation. E. A. Zhemchuzhina and A. J. Belyaev. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 61-64.

Losses by chemical reaction with the molten $MgCl_2$ itself, reaction with NaCl and by oxidation in air. Effects of cathodic potential and bath composition. (C23n, 2-60; Mg, *Cl*)

312-C. (Russian.) Conditions for the Precipitation of Copper From Hydrometallurgical Solutions. I. N. Plaksin, N. A. Suvorouskaya and V. V. Shikhova. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 69-73.

Cementation by the addition of Fe from diluted H_2SO_4 solutions. Effects of Fe, $CuSO_4$ and H_2SO_4 concentrations and of stirring. (C27; Cu)

313-C.* Electrolytic Purification of Uranium. J. E. Antill, D. S. Butler and E. Barnes. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 3-8.

Behavior of impurities in the purification of uranium by a soluble anode electrolysis technique. A diaphragm cell allows pure powder to be produced on a semicontinuous basis and be compacted without leaching. (C23, 3-69; U)

314-C.* Zone Melting of Uranium. J. E. Antill, E. Barnes and M. Gardner. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 9-18.

Experiments in a vertical furnace have shown that density differences between an impurity and uranium may be harnessed to increase the purification. Slow zone speed (1/4 in. per hr.) is necessary to remove soluble metallic impurities, while the nonmetallic elements, oxygen and carbon, separate at much faster speeds (3 in. per hr.). Zone melting applied to the removal of fission products from uranium shows most promise as a modified self-slagging process. (C28k; U)

315-C.* The Extraction Metallurgy of Thorium. J. H. Buddery. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 35-49.

Preferred methods are the reduction of thoria with Ca, the reduction of Th tetrafluoride with Ca in the presence of a booster, and fused salt electrolysis. The first method yields a very fine metal powder, the second a sponge, the last a crystalline powder. 21 ref. (C-general; Th)

316-C.* Thorium Arc Melting. A. H. Roberson. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 56-62.

Consumable electrode arc melting produces high-quality ingots that are more acceptable for atomic energy uses than metal melted in refractory crucibles. Sponge can be formed into electrodes by several methods. (C5h; Th)

317-C.* Induction Melting of Thorium. P. D. Corzine. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 63-65.

Beryllia remains the most useful material, not only for the containers themselves, but for slip linings and washes in crucibles and molds of graphite. Problems of segregation, subsurface gas and cracking in alloy melts together with a summary analysis of 16 75-lb. billets of a 5.4% U alloy. (C5j, W18h; Th-b, *U*)

318-C.* The Preparation of Metallic Plutonium. E. Grison. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". Pergamon Press, Inc., New York 22, 1959, p. 91-97.

Reduction of PuF_4 by Li, Ba and Ca. Preparation of Pu powder by the decomposition of the hydride PuH_2, which can be prepared by the action of hydrogen on the solid metal, at about 200° C. 7 ref. (C1p; Pu, *Li, Ba,* Ca)

319-C.* The Preparation of Plutonium-Aluminum and Other Plutonium Alloys. O. J. C. Runnalls. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 98-118.

Preparation by the direct reduction of Pu trifluoride and Pu dioxide. Pu trifluoride is reduced more rapidly at 900° C. than at 1125° C. with liquid Al, owing to the evolution of gaseous Al monofluoride at the lower temperature. Pu dioxide is reduced rapidly by an excess of liquid Al at 1200° C. in the presence of liquid cryolite, forming Pu-Al alloys with a Pu yield above 99%. 14 ref. (C26; Pu-b, *Al*)

320-C.* Zirconium Arc Melting. A. H. Roberson. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 121-136.

The extreme reactivity of molten Zr imposes many restrictions on conventional melting. Induction melting in graphite crucibles adds about 0.35% carbon to the metal. Commercial melting is carried out by consumable electrode arc melting in a water-cooled Cu crucible. Electrodes may be sponge or machine turnings pressed into briquettes or massive scrap welded into usable shapes. 8 ref. (C5h, W18h; Zr)

321-C.* The Extraction of Beryllium. R. G. Bellamy. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 169-180.

The chief commercial process is the extraction of Be hydroxide from beryl using sulphuric acid or a complex alkali fluoride roasting treatment for opening up the ore followed by the Mg reduction of Be fluoride prepared from the hydroxide. The low-temperature electrolysis of Be chloride offers a potentially purer product, but the production rate is low. 27 ref. (C19n, C26, C23; Be)

322-C.* Melting and Casting of Beryllium. A. Kaufmann. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 181-182.

A sound casting requires a clean, gas-free mold to avoid a scabby surface due to mold outgassing. Graphite is suitable, providing that it is first baked out in vacuum and is not exposed to moist air when not in use. Thickness of the graphite wall must be carefully chosen, since Be carbide will form if the mold becomes too hot, while cracking of the metal occurs if the cooling rate is excessive. (C5; Be)

323-C.* Ultrasonic Vibrations Refine Grain Size. D. H. Lane, J. W. Cunningham

and W. A. Tiller. *Metal Progress*, v. 76, Sept. 1959, p. 108-110.

Vibration during consumable-electrode melting refines ingot grain structure and prevents segregation by means of low-loss transmission of sound energy through the bottom of the mold. (C5h, 1-74; Fe-b)

324-C.* Metallurgical Extraction. Electrolytic Zinc Processes. Floyd S. Weimer, Guy T. Wever and Roland J. Lapee. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 174-225.

Leaching, filtering and purifying treatment for preparation of suitable electrolyte. Electrolyzing conditions and equipment. Polarization and overvoltage. Effect of impurities on electrolysis of Zn. 12 ref. (C19n, C23n, 3-69; Zn)

325-C.* Metallurgical Extraction. Horizontal Retort Practice. Furnaces, Retorts and Condensers. K. A. Phillips. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142, Reinhold Publishing Corp., New York 22, 1959, p. 225-251.

Furnace types, manufacture of retorts and condensers. Practices in reduction and distillation of Zn. 18 ref. (C21, 1-52, C22g; Zn)

326-C.* The Vertical Retort Process. G. F. Halfacre and W. M. Peirce. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 252-264.

Briquetting and coking of charge; reduction of oxidized Zn materials with coke or coal in vertical retort furnace, condensation of Zn vapor, metal recovery and thermal efficiency. 5 ref. (C22g; Zn)

327-C.* Metallurgical Extraction. The Sterling Process. G. T. Mahler. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 265-270.

Carbon reduction of oxidized Zn bearing materials in Sterling electric-arc furnace. (C21d; Zn)

328-C.* Metallurgical Extraction. The Electrothermic Process of the St. Joseph Lead Co. George F. Weaton. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 270-286.

Development of electric furnace processes. Roasting and sintering Zn concentrate. Reduction in resistance furnace with charge acting as electrical resistor. Condensation of Zn vapor; treatment of residue. 7 ref. (C21d, C22g; Zn)

329-C.* Metallurgical Extraction. The Production of Zinc in a Blast Furnace. S. W. K. Morgan and S. E. Woods. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 286-297.

Previous attempts at blast furnace production. Operation of furnace and Pb splash condensers. Theory of the process. 8 ref. (C21a; Zn)

330-C.* Metallurgical Extraction. Extraction From Slag. Harold E. Lee and W. T. Isbell. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 307-314.

Reduction of slag in reoxidation of Zn vapor by coal-fired slag fuming process. Operational data. Electrothermic slag fuming. 18 ref. (C22g; Zn)

331-C.* Metallurgical Extraction. Melting and Casting of Market Shapes. T. H. Weldon. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142, Reinhold Publishing Corp., New York 22, 1959, p. 322-333.

Reverberatory and induction melting of electrolytic Zn. Hand and machine casting of slabs. Casting, retort and electrothermic process. 4 ref. (C5; Zn)

332-C.* The Refining of Zinc. Elmer L. Miller. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 334-343.

Differences in solubility and specific gravity utilized in liquation refining to remove Pb and Fe from crude molten Zn. Production of high-purity Zn by redistillation. 4 ref. (C28h, C22h; Zn)

333-C.* Use of Zinc in Various Forms for the Metallurgical Extraction of Other

Metals (Including the Parkes Process). T. D. Jones. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 627-636.

Parts processed for desilvering Pb bullion. Precipitation of Cd from Pb baghouse dust. Extraction of Au and Ag from cyanide solutions. Recovery of Tl and rare metals. Production of Sn-Pb solder. 11 ref. (C27, C28; Pb, Cd, Ag, Au, Tl, Ir, Rh, Os, Ru, Sn)

334-C.* (German.) Preparation of Iron Powder From Iron Amalgam by Distillation. Gerhard Jangg, Gotthard Csizi and Hans Hohn. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 460-465.

Hg content after distillation as functions of distillation temperature and time. Velocity of Hg evaporation at various temperatures and thicknesses of stratum. Density of compacts obtained by pressing and sintering the powder produced as influenced by distillation temperature. 10 ref. (C22, 2-61, 3-67, H15; Fe)

335-C. Extraction of Uranium, Magnesium, Zirconium, and Cerium From Bismuth With a Fused Fluoride Salt Mixture. Max D. Adams, Jack Fischer, Robert J. Meyer and Norman D. Phillips. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-6017, June 1959, 18 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Extraction with a molten mixture of sodium fluoride and zirconium fluoride. The effects of high concentrations of Mn and of Hf sparging. Comparative rates of extraction. (C19r; Cb, Ce, Mg, U, Zr, B)

336-C. Anhydrous Chromic Chloride Production by Chlorination. R. L. Annis. *Mines Magazine*, v. 49, Aug. 1959, p. 21-24.

A potential source of high-purity Cr metal is established by a new process for producing anhydrous chromic chloride in quantity. (C19r; Cr)

337-C.* Some Aspects of the Fabrication Technology of Beryllium and Beryllia. D. T. Livey and J. Williams. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 311-318.

Decomposition of Be $(OH)_2$ prepared for nuclear application, and fabrication properties of oxides formed by calcination. 6 ref. (C-general, R1h, 2-62; Be, NM-a34)

338-C.* Electrorefining Titanium Using an Internally Heated Cell. O. Q. Leone, J. R. Nettle and D. H. Baker, Jr. *.U. S. Bureau of Mines, Report of Investigations* no. 5494, 1959, 20 p.

Trials of a pilot model internally heated Kroll process cell for Ti refining under He atmosphere. (C23p, 1-52; Ti)

339-C.* (Dutch.) Electron Beam Melting. D. A. de Fremery. *Metalen*, v. 14, Sept. 12, 1959, p. 264.

Apparatus for melting Cb, Zr or Ta and other materials with a high melting point. (C5k, 1-52; Cb, Zr, Ta)

340-C.* (Russian.) Introduction of Oxygen Enriched Blast in the Melting Furnace Charge at the UST'-Kamenogorsk Lead-Zinc Combine. A. M. Vartanyan, D. S. Kopchenko, N. N. Kubyshev, S. S. Novoselov, M. V. Yakushin and E. A. Samkov. *Tsvetnye Metally*, Aug. 1959, p. 18-24.

Enriching the blast with 25% oxygen increased the productivity by 15-20%, reduced the consumption of coke by 10-15% and decreased the furnace dust by 20-25%. 13 ref. (C21a; Pb)

341-C.* (Russian.) Combining in One Apparatus the Dust Collection and the Hydrometallurgical Treatment of Copper Smelter's Dusts. P. A. Pazdnikov and B. V. Mal'tsev. *Tsvetnye Metally*, Aug. 1959, p. 28-34.

Hydrometallurgical equipment catches Cu, Zn and Pb acids, sulphides and sulphates and absorbs SO_2 and SO_3 gases. (C19n, A8a, 1-52; Cu, Zn, Pb)

342-C.* (Slovenian.) Hydrometallurgical Production of Cadmium and Zinc From Intermediary Products of the Pyrometallurgical Production of Zinc. Krsto Cazafura and Janez Wohinz. *Rudarsko-Metalurski Zbornik*, no. 2, 1959, p. 133-136.

Extraction from dust collected in the Cottrels and the Dwight-Lloyd agglomerator by direct leaching or leaching after roasting. 16 ref. (C19n, B15, C21; Cd, Zn)

343-C. Work on the Metallurgy of Uranium in Belgium. Th. Kroll. Paper from "Prog-

ress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 28-31.

Extraction and refining processes. (C-general; U)

344-C.* Electro-Deposition of Titanium-Aluminium Alloys. H. N. Sinha. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 165-174.

Effect of Al on room and elevated-temperature mechanical properties of Ti. Laboratory electrodeposition of Ti-Al alloys from fused chloride baths. Voltage, current density and bath composition. 11 ref. (C23n, Q-general, 2-60, 2-62; Ti-b, *Al*)

345-C.* The Direct Reduction of Zinc Sulphide With Iron Oxide and Excess Carbon. R. Mallikarjunan and A. A. Krishnan. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 185-186.

Feasibility of reducing ZnS with iron oxide and excess carbon. 6 ref. (C22g; Zn)

346-C.* Metallurgical Thermochemistry of Titanium. K. K. Kelly and Alla D. Mah. *U. S. Bureau of Mines, Report of Investigations* 5490, 1959, 48 p.

Extraction and refining processes. (C26, P12; Ti)

347-C.* (Russian.) Behavior of Silver Dissolved in Nitric Acid During the Electrolytic Refining of Copper. A. G. Syrovegin. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 66-71.

The transition of Ag from the anode into the electrolyte is understood as an oxidation by NO_3 ions. Transport of Ag to the cathode is thought to be caused by reduction of Ag^+ by metallic Cu, and migration of Ag particles being in the state of suspension. The Ag content of the refined product can be reduced by decreasing the temperature, adding Cl-ions and the use of an anode diaphragm. 5 ref. (C23p, 2-61, 2-60; Cu, 9-51, *Ag*)

348-C.* (Russian.) Extraction of Gold and Arsenic From Ochreous Ores Resistant to Cyanidation. V. G. Ageenkov and N. V. Svistunov. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 88-96.

The ores showing resistance to cyanidation are pretreated in a solution of caustic soda, extracting at the same time the As. Arsenic of extraction as a function of NaOH concentration, temperature and time of treatment. 5 ref. (C19, 2-60, 2-61, 3-67; Au, As)

349-C.* (Russian.) Processing of Sintered Nickel Oxide Ores in a Shaft Furnace With Preheated Blast. I. D. Reznik, A. I. Evdokimenko, I. I. Zaberezhnyi, B. P. Sherman, A. N. Kudrin, V. I. Serpov and L. K. Petrov. *Tsvetnye Metally*, no. 7, 1959, p. 30-36.

Effect of the blast temperature on the heating power of coke, composition of top-gas and costs. 5 ref. (C21a; Ni)

350-C. (Russian.) Chemical Stability of Molten Cryolyte. V. P. Mashovets and N. A. Novikava. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 83-87.

13 ref. (C23n; Al)

351-C. (Russian.) Cyanidation of Gold Ores Containing Copper. A. S. Romanov. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 106-111.

Dissociation constants of Cu-compounds; determination of Cu-cyanide in the solution; effect of Cu on cyanidation. 11 ref. (C19p, 2-60; Au, Cu)

352-C. (Translation—Brutcher no. 4688.) Mechanical Charging of Furnaces Used in Melting Ferro-Alloys. V. M. Grebenik, Ya. V. Dashevskii, L. D. Sokolov and V. A. Sharapov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 68-72.

(C5f, W18s; Fe, AD-n32)

353-C.* Vacuum Metallurgy in the United States. A. E. Franks. Paper from "Progress in Vacuum Science and Technology". Pergamon Press, Inc., 122 E. 55th St., New York 22, 1959, p. 59-74.

Review of recent developments including induction melting of steels, nonferrous alloys and nuclear materials of high purity; consumable electrode melting Ti and Zr; and melting of high-temperature alloys and refractories by both methods. Vacuum processes for low-carbon ferrochrome, sintering of mixed carbides and vacuum stream degassing of steel. (C5h, C5j, C5m, D8m, D8s, 1-73; Ti, Zr)

354-C.* Electrodeposition Behavior of Trace Amounts of Copper. Richard C. DeGeiso and L. B. Rogers. *Electrochemical*

Society, Journal, v. 106, May 1959, p. 433-440.

Deposition onto inert electrodes takes place more readily than Nernst equation predicts. Method may prove suitable for separation of radio-Cu from radio-Zn and Ga. 23 ref. (C23p; Cu)

355-C.* Vacuum Melting and Degassing. J. Suiter. *Australian Institute of Metals, Journal*, v. 4, Aug. 1959, p. 95-102.

Melting and degassing of Fe, Ni and Co-base alloys; reactions in vacuum melting; vacuum melting equipment and processes; effect of vacuum treatment on mechanical properties. 6 ref. (C5k, C5m, 1-73, D8m, Q-general; Fe, Ni, Co)

356-C.* Processing Materials With Electron Bombardment. Alan Lawley. *Electronics*, v. 32, Sept. 4, 1959, p. 39-41.

Electron beams give metals better purity, high-temperature stability and strength. 16 ref. (C5k)

357-C.* Balances Design in Electrostatic Precipitation. R. L. Chamberlain. *Blast Furnace and Steel Plant*, v. 47, Oct. 1959, p. 1086-1089.

"Balanced-design" electrostatic precipitator achieves maximum reliable gas cleaning with a minimum of equipment and maintenance cost. A balance has to be maintained between capacity, efficiency and consistency or reliability of the precipitator. (C27, 1-52)

358-C. New Nickel Process on Stream. O. A. Lee. *Chemical Engineering*, Sept. 7, 1959, p. 145-152.

Extraction and concentration of Co and Ni ores. (C19n; Co, Ni)

359-C. (Russian.) Properties of Vanadium Prepared by Reduction With Carbon in a Vacuum. M. S. Makunin, A. Yu. Polyakov and A. M. Samarin. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 35-39.

Reduction of compacts pressed from V_2O_3 and lampblack at 1300-1550° C. After this treatment the vanadium prepared still contains 1-2% carbon and 1-2% oxygen. After saturation with hydrogen, at 450-900° C., it can be again crushed to powder, pressed and subjected to another reduction treatment. Further refining is achieved by arc melting. (C25, C5h; V)

360-C.* Separation of the Lanthanons at Amalgam Cathodes. Pt. 3. Electrochemical Fractionation of the Lanthanons at a Lithium Amalgam Cathode. E. L. Onstott. *American Chemical Society, Journal*, v. 81, Sept. 5, 1959, p. 4451-4458.

Individual lanthanons electrolyzed at different rates. Effect of electrolyte composition. 18 ref. (C23, C29, 2-60; EG-g)

361-C.* Tungsten for Electric Lamp Filaments. D. J. Jones and A. Leach. *Metallurgia*, v. 60, July 1959, p. 7-11.

Extraction of tungstic acid from ores; decomposition to tungstic oxide and reduction to metal powder; compacting, sintering, swaging and wiredrawing; control of recrystallization and grain growth in filaments. 6 ref. (C19, C26, H10c, H14g, H15n, F28, N5; W)

362-C.* The Preparation and Properties of Niobium Obtained by the Iodide Method. D. M. Chizhikov and A. M. Grin'ko. *Academy of Sciences of the USSR, Chemical Technology Section, Proceedings*, v. 122-123, Sept-Dec. 1958, p. 121-122.

Columbium is purified by heating the metal powder with solid I_2, then reducing the CbI_3 by a hot Cb or tungsten filament. (C26; Cb)

363-C. (Russian.) Kinetics of the Reduction of Lead From a Melt of Its Silicates. L. G. Berezkina and D. M. Chizhikov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 109-111.

The degree of reduction, achieved by blowing a current of CO against the melt surface, was tested by means of gamma irradiation. The reduction velocity is determined by the speed of diffusion toward the surface. 6 ref. (C26, 2-61, 3-67; Pb)

364-C.* (English.) Treatment of Uranium Ores. Pt. 1. Leaching of Uranium Ore From Matsuiwa Mine. Kingo Sudo and Akichi Kigoshi. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 332-338.

Pressure oxidation leaching, sulphuric acid leaching and pressure and atmospheric oxidation leaching. (C19n; U)

365-C.* (German.) The Hydrometallurgical Process of Tetrahedrite Concentrates. Ferdinand Kadlec. *Freiberger Forschungshefte*, v. B34, May 1959, p. 5-16.

Leaching in high concentrated Na_2S solution; filtration. Electrolysis and vacuum distillation of Hg from the cathode metal. (C19n; Cu, Sb, Hg)

366-C.* (German.) Production of Alkaline Earth Metals, Mainly Magnesium, by Thermal Reduction. H. Seliger. *Freiberger Forschungshefte*, v. B34, May 1959, p. 38-79.

Thermal reduction by means of oxygen, Si, Al and carbides. Since the reaction takes place above the boiling point of the metals, separation is achieved by distillation and condensation in the solid or liquid state. (C26; EG-f)

367-C.* (German.) Selenium Production From Anodic Pulp. Siegbert Loschau. *Frieberger Forschungshefte*, v. B34, May 1959, p. 101-117.

Three phases in the electrowinning of Se are recovery from anodic pulp produced by the refining process of electrolytic Cu, refining and production of 99.995% pure Se. (C23n; Se-a)

368-C.* (German.) Heterogenious Equilibria in the Zn-S-O System and Their Impact on the Lange-Barthel Floating Zone Melting Process. G. Fischer. *Frieberger Forschungshefte*, v. B34, May 1959, p. 118-132.

New concentration process by means of zone melting. Zn volatilization occurs by sublimation and oxidation of ZnS and CO_2 gases. (C28k, B15; Zn)

369-C.* (German.) Melting of Nonferrous Metals in the Cupola. F. Paschke. *Giesserei Praxis*, no. 17, Sept. 10, 1959, p. 301-305.

Crucible melting furnaces with modern heat and fume collecting systems; melting Cu, Zn, Sn and Pb alloys in crucible melting cupolas arranged in line. (C5g; Cu, Zn, Sn, Pb)

370-C. (Russian.) Continuous Processing of Matte in a Converter. D. A. Diomidovskii, L. M. Shalygin, A. A. Gal'nbek and I. A. Yuzhaninov. *Tsvetnye Metally*, no. 2, 1959, p. 27-34.

(C21b; Cu)

371-C. (Russian.) Electrothermal Distillation of Zinc From Silver Containing Foam in the Ust'-Kamanogorsk Lead Plant. D. O. Averchenkov, D. S. Kopchenko, V. F. Pron'kin, V. A. Sidorovskii, I. I. Kershanskii and V. P. Ovcharenko. *Tsvetnye Metally*, no. 1, 1959, p. 33-40.

9 ref. (C22; Zn, Ag)

372-C. (Russian.) Autoclave Hydrometallurgical Processes With Copper-Nickel Ores. S. I. Sobol'. *Tsvetnye Metally*, no. 2, 1959, p. 34-40.

7 ref. (C19; Cu, Ni)

373-C. (Russian.) Hydrometallurgical Processing of Copper-Nickel Matte. V. P. Govorov. *Tsvetnye Metally*, no. 2, 1959, p. 41-46.

5 ref. (C19; Cu, Ni)

374-C. (Russian.) Preparation of Metallic Yttrium. L. A. Izhvanov and N. P. Vershinin. *Tsvetnye Metally*, no. 1, 1959, p. 44-47.

Reduction of yttrium fluoride by Ca. 4 ref. (C26; Y, Ca)

375-C. (Russian.) Dendritic Structure of Cathodic Nickel. T. V. Gran, K. I. Trukhina and N. N. Kulikova. *Tsvetnye Metally*, no. 2, 1959, p. 46-49.

Conditions favoring this undesirable phenomenon. (C23p, N12d, 9; Ni)

376-C. (Russian.) Automatic Controlled Processes in the Reduction of Titanium by Magnesium. A. G. Arkad'ev, V. A. P'yankov, Kh. L. Strelets and G. V. Forsblum. *Tsvetnye Metally*, no. 1, 1959, p. 53-62.

Preparation of Ti from its tetrachloride. 4 ref. (C26; Ti)

377-C. (Russian.) Manufacture of Cb-Ta Alloys by the Carbide Method. O. P. Kolchin and N. P. Chuveleva. *Tsvetnye Metally*, no. 2, 1959, p. 60-64.

Preparation of metallic Cb and Ta from a mixture of their oxides and carbides. (C21; Cb, Ta, 14-68)

378-C. (Russian.) Stripping of Starting Sheets in Vertical Position. O. V. Donskoi and V. V. Bure. *Tsvetnye Metally*, no. 1, 1959, p. 94-96.

Improvements in the removal of electrolytically refined Cu from the starting sheets. (C23p; Cu)

379-C. The Separation of Tantalum and Niobium. Pt. 2. G. L. Miller. *Industrial Chemist*, July 1959, p. 341-347.

Liquid-liquid separation methods. (To be continued.) (C19; Ta, Cb)

380-C. (Russian.) Factors Influencing the Process in the Converter Treatment of Copper and Copper-Nickel Mattes. M. V. Iolko. *Tsvetnye Metally*, no. 3, 1959, p. 19-22.

(C21b; Cu, Cu-b, *Ni*)

381-C. (Russian.) Converter Processing of Matte With a High Lead Content. M. A. Abdeev, O. G. Miller, N. N. Kubyshev and A. T. Matveev. *Tsvetnye Metally*, no. 3, 1959, p. 23-25.

(C21b; Cu)

382-C. (Russian.) Solubility of Lead in a Mixture of Cu_2S, FeS and Na_2S. I. B. Smirnov and F. M. Loskutov. *Tsvetnye Metally*, no. 3, 1959, p. 25-29.
Effects of the FeS and Cu_2S content on solubility. 7 ref. (C21b; Pb)

383-C. (Russian.) Starting and Operation of Industrial Equipment for the Zone Melting of Lead. A. Yu. Baimakov and I. M. Selivanov. *Tsvetnye Metally*, no. 3, 1959, p. 32-37.
3 ref. (C28k, 1-52; Pb)

384-C. (Russian.) Ways for Further Improvement and Intensification of the Electrorefining of Copper. A. I. Levin and V. I. Vlasov. *Tsvetnye Metally*, no. 5, 1959, p. 32-38.
9 ref. (C23p; Cu)

385-C. (Russian.) Automatization and Continuous Control of the Electrolytic Process of Magnesium Preparation. V. V. Krivoruchenko. *Tsvetnye Metally*, no. 3, 1959, p. 37-44.
12 ref. (C23n; Mg)

386-C. (Russian.) Formation of Volatile Ge-H Compounds During the Cementation Process and Possbilities for the Winning of Ge From the Gaseous Phase. V. A. Leitsin. *Tsvetnye Metally*, no. 3, 1959, p. 44-49.
6 ref. (C27; Ge, *H*)

387-C. (Russian.) Use of Oxygen in Blast Furnace Smelting of Lead. A. M. Vartanyan and D. S. Kopchenko. *Tsvetnye Metally*, no. 5, 1959, p. 46-49.
(C21a; Pb)

388-C. (Russian.) Influence of the Charge Composition on Yield of Lead in the Processing of Waste Products of the Electrorefining of Zinc in the Waelz Furnace. V. A. Leitsin and A. M. Gorbunov. *Tsvetnye Metally*, no. 5, 1959, p. 59-62.
4 ref. (C21, C23p; Pb, Zn)

389-C. (Russian.) Investigations on the Smelting of Nickel From Its Oxides in a Blast Furnace Using a Radioactive Sulphur Isotope as a Tracer. N. F. Uspenskii and N. P. Diev. *Tsvetnye Metally*, no. 5, 1959, p. 63-67.
(C21a; Ni)

390-C. (Russian.) Reduction of the Consumption of Fluorides and Increase of Productivity in the Production of Aluminum. A. E. Manin, L. A. Shlychkov and M. A. Nikolaev. *Tsvetnye Metally*, no. 5, 1959, p. 67-72.
5 ref. (C23n; Al)

391-C. (Russian.) Extraction of Rhenium From Industrial Solutions Using Activated Carbon. E. I. Gulyaeva, I. E. Zimakov and B. I. Rudenko. *Tsvetnye Metally*, no. 5, 1959, p. 73-77.
(C19; Re)

392-C.* Arc Decomposition of Rhodonite. Victor Harris, John D. Holmgren, Samuel Korman and Charles Sheer. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 874-876.
Extraction of Mn by arc vaporization process from anodes containing rhodonite decomposes to MnO and SiO_2. (C5h; Mn)

393-C.* On the Crystallization of Simple Rhombohedral Boron From Platinum. F. H. Horn. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 905-906.
Red allotrope of boron previously won by pyrolysis of halide or hydride obtained from the melt of boron-Pt alloy system. (C25, M24b; B-b, *Pt*)

394-C. Separation of Yttrium and Rare-Earth Nitrates With the Solvent Extraction System-Tri-N-Butylamine-3 Methyl-2-Butanone. W. G. Gruzensky and G. T. Engel. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 738-742.
The optimum separation between yttrium and the different rare-earth elements occurring with it depends upon the amount of amine present in the extractant. 18 ref. (C19n; Y)

395-C. The Reduction of Nickel Oxide. R. E. Cech. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 769-781.
Metallographic observations on hydrogen-reduced Ni oxide crystals suggest that nucleation of Ni occurs at structural singularities in the oxide. 14 ref. (C26; Ni)

396-C. (Russian.) Autoclave Hydrometallurgy of Copper and Nickel. I. N. Maslenitskii. *Tsvetnye Metally*, no. 4, 1958, p. 1-5.
(C19, 3-74; Cu, Ni)

397-C. (Russian.) Electrosmelting of Lead and Zinc. V. N. Kostin. *Tsvetnye Metally*, no. 1, 1958, p. 3-10.
(C21d; Pb, Zn)

398-C. (Russian.) Present Status of the Zinc Electrolysis. G. N. Pakhomova. *Tsve-*

tnye Metally, no. 4, 1958, p. 16-28.
25 ref. (C23p; Zn)

399-C. (Russian.) Electrothermal Processes in the Lead-Zinc Production. M. M. Lakernik. *Tsvetnye Metally*, no. 2, 1958, p. 20-27.
Electric furnace smelting. 6 ref. (C21d; Pb, Zn)

400-C. (Russian.) Processing of Enriched Sulphide Ores in the Converter by the Selective Method. A. A. Babadzhan, V. A. Aglitskii, A. T. Drobchenko, A. D. Garenskikh, V. D. Bulatov, D. P. Kondrashov, V. K. Medvedev and V. L. Milyaev. *Tsvetnye Metally*, no. 1, 1958, p. 24-30.
7 ref. (C21b; Cu, Pb, Zn)

401-C. (Russian.) Manufacture of Anodes From Liquid Crude Copper. V. A. Aglitskii and D. A. Kronberg. *Tsvetnye Metally*, no. 4, 1959, p. 26-29.
4 ref. (C23p; Cu)

402-C. (Russian.) Automation of Converter Processes, Utilization of Converter Gases and Process Control by the Spectroscopic Method. V. A. Bagdasarov. *Tsvetnye Metally*, no. 5, 1958, p. 28-34.
(C21b, A8a, S18, 18-74; Cu)

403-C. (Russian.) Extraction of Thallium From Flue Dusts of a Lead Plant by Amalgamation. M. T. Kozlovskii, P. I. Zabotin, S. P. Buchman, M. V. Nosek and Ya. Z. Malkin. *Tsvetnye Metally*, no. 1, 1958, p. 30-41.
10 ref. (C29, A8a; Tl)

404-C. (Russian.) Mechanical Regulation of the Distances Between the Electrodes and Automatic Temperature Control With Electrowinning Equipment for Magnesium. N. M. Zuev. *Tsvetnye Metally*, no. 6, 1958, p. 33-37.
(C23n, 1-52, 18-74; Mg)

405-C. (Russian.) Distillation of Zinc From Foam Containing Silver. I. I. Kershanskii and V. P. Ovcharenko. *Tsvetnye Metally*, no. 4, 1958, p. 34-43.
(C22; Ag)

406-C. (Russian.) Automatization of the Process of Titanium-Magnesium Production. M. S. Shneerov, M. L. Podgoetskii and E. M. Braverman. *Tsvetnye Metally*, no. 6, 1958, p. 38-41.
(C19, 18-74; Ti, Mg)

407-C. (Russian.) New Method of the Separation of Cadmium From Nickel. V. M. Andreev and V. E. Kuzental'. *Tsvetnye Metally*, no. 1, 1958, p. 41-44.
A melt of Cd containing small amounts of Ni is added to molten Al. Purified Cd collects at the bottom. (C-general; Cd, *Ni*)

408-C. (Russian.) Preparation of Lead-Calcium Alloy by the Carbide Method. V. V. Rodyakin. *Tsvetnye Metally*, no. 4, 1958, p. 43-49.
Preparation by addition of $CaCl_2$, CaF_2, Al and CaC_2 to a melt of lead. 5 ref. (C-general; Pb, Pb-b, *Ca*)

409-C. (Russian.) Use of Floculation Agents for the Purification of Zinc Sulphate Solution in the Extraction of Zinc. A. D. Mayants and F. I. Barotitskaya. *Tsvetnye Metally*, no. 1, 1958, p. 44-47.
6 ref. (C19n; Zn)

410-C. (Russian.) Vacuum Distillation of Lead and Lead and Zinc Compounds From Lead-Copper Matte. P. I. Mechenov. *Tsvetnye Metally*, no. 1, 1958, p. 48-52.
5 ref. (C22, 1-73; Pb, Zn)

411-C. (Russian.) Intensification of Aluminum Electrolysis. L. S. Bugarev, A. I. Zheleznov and R. I. Shindel'man. *Tsvetnye Metally*, no. 4, 1958, p. 49-52.
(C23p; Al)

412-C. (Russian.) Determination of Parameters for the Electrolytic Preparation of Aluminum. A. G. Arkad'ev, L. A. Baldovskii and G. V. Forsblum. *Tsvetnye Metally*, no. 4, 1959, p. 49-56.
(C23p; Al)

413-C. (Russian.) The Problem of Gas Removal From the Anode in Electrolysis of Aluminum. I. P. Gupalo. *Tsvetnye Metally*, no. 4, 1958, p. 53-57.
(C23p; Al)

414-C. (Russian.) Lead Production in a Plant of the Chinese National Republic. F. M. Loskutov. *Tsvetnye Metally*, no. 1, 1958, p. 62-70.
Blast furnace practice, electrorefining of crude lead. 4 ref. (C21a, C23p; Pb)

415-C. (Russian.) Improvement and Intensification of the Semicontinuous Casting of Aluminum Ingots. N. A. Oreshko. *Tsvetnye Metally*, no. 4, 1958, p. 74.
(C5q; Al)

416-C. (Russian.) Slag Sublimation Equipment. P. A. Donchenko, A. B. Novozhilov

and N. K. Salomatov. *Tsvetnye Metally*, no. 6, 1958, p. 74-82.
Equipment for the extraction of Pb, Zn and Cu from slag resulting from the blast furnace Pb production. (C22; Pb, Zn, Cu)

417-C. (Russian.) Electrosmelting of Lead and Zinc. P. V. Sergeev. *Tsvetnye Metally*, no. 6, 1958, p. 83-85.
(C21d; Pb, Zn)

418-C. (Russian.) Removal of Copper From Crude Lead. S. S. Novoselov and M. V. Yakushin. *Tsvetnye Metally*, no. 8, 1958, p. 15-20.
Melting under addition of iron pyrite.
6 ref. (C28; Pb, *Cu*)

419-C. (Russian.) Metal Loss With the Slag in Blast Furnace Lead Smelting. V. V. Rodyakin. *Tsvetnye Metally*, no. 8, 1958, p. 21-24.
(C21a; Pb)

420-C. (Russian.) Electrowinning of Nickel. A. L. Rotinyan. *Tsvetnye Metally*, no. 7, 1958, p. 23-30.
17 ref. (C23n; Ni)

421-C. (Russian.) Possibility of the Existence of Lead Ferrites in the Blast Furnace Slag Obtained in Lead Smelting. B. S. Khristoforov. *Tsvetnye Metally*, no. 8, 1958, p. 24-28.
12 ref. (C21a; Pb)

422-C. (Russian.) Extraction of Mercury in a Lead Plant. L. V. Manchenko and N. P. Chirkova. *Tsvetnye Metally*, no. 8, 1958, p. 28-34.
5 ref. (C22; Hg, *Pb*)

423-C. (Russian.) Electrothermal Processing of Sintered Ore. M. M. Lakernik, L. G. Lavrov and N. A. Fokin. *Tsvetnye Metally*, no. 6, 1959, p. 32-38.
Smelting Zn with coke as a reducing agent in an electric furnace. (C21d; Zn)

424-C. (Russian.) Extraction of Tellurium and Indium From Antimony Containing Slags. Ya. Z. Malkin, V. Ya. Sergienko, N. V. Bovtnta and I. G. Yudelevich. *Tsvetnye Metally*, no. 8, 1958, p. 34-39.
4 ref. (C19n; Te, In, RM-q, Sb)

425-C. (Russian.) Autoclave Leaching of Cobalt Containing Materials. G. N. Dobrokhotov and N. I. Onuchkina. *Tsvetnye Metally*, no. 7, 1958, p. 35-39.
6 ref. (C19n; Co)

426-C. (Russian.) Leaching of Zinc From Fuming Process Sublimates. V. V. Kostelov and V. S. Morachevskaya. *Tsvetnye Metally*, no. 10, 1958, p. 39-43.
Leaching with H_2SO_4 of 120-150 g. per liter concentration. 4 ref. (C19n; Zn)

427-C. (Russian.) Removal of Iron From Ni-Co-Fe Melts by an Oxidizing Blow Under a Wustite Slag. N. I. Gran'. *Tsvetnye Metally*, no 7, 1958, p. 40-44.
The melt is treated in a side-blown converter without the addition of a flux.
6 ref. (C21b; Ni-b, *Co, Fe*)

428-C. (Russian.) Importance of Amalgamation in the Metallurgy of Nonferrous and Rare Metals. P. P. Tsyb. *Tsvetnye Metally*, no. 8, 1958, p. 40-45.
18 ref. (C29; EG-a38)

429-C. (Russian.) Behavior of Antimony and Arsenic Dissolved in Nitric Acid During the Eletrorefining of Copper. A. G. Syrovegin. *Tsvetnye Metally*, no. 6, 1959, p. 42-50.
20 ref. (C23p; Cu *Sb, As*)

430-C. (Russian.) Effects of Mineralogic Composition and Structure of Bauxite on Its Behavior in the Bayer Process. M. F. Kompaniets. *Tsvetnye Metally*, no. 8, 1958, p. 50-52.
(C19n, C23n; Al)

431-C. (Russian.) Transformations of Nickel Oxide Ores Taking Place During the Smelting Process in a Blast Furnace. V. V. Lapin and N. N. Kurtseva. *Tsvetnye Metally*, no. 6, 1959, p. 51-56.
5 ref. (C21a; Ni)

432-C. (Russian.) Interaction Between Current and Magnetic Field in the Aluminum Electrolysis. B. I. Rubin. *Tsvetnye Metally*, no. 8, 1958, p. 53-56.
4 ref. (C23n; Al)

433-C. (Russian.) Manufacture of High-Purity Nickel Strip. K. P. Kalinin, M. P. Lyamina and M. Z. Spiridonova. *Tsvetnye Metally*, no. 7, 1958, p. 56-60.
Rolling from material prepared in an induction vacuum furnace in an arc vacuum furnace. 12 ref. (C5h, C5j, F23; Ni, 4-53)

434-C. (Russian.) Preparation of Titanium by the Electrolysis of Consumable Anodes in Molten Substances. A. B. Suchkov, B. A. Borok, T. N. Ermakova, M. I. Rodnyi and

L. D. Boldina. *Tsvetnye Metally*, no. 6, 1959, p. 57-62.
(C23n; Ti)

435-C. (Russian.) Plasticity of Nickel Containing Small Admixtures of Sulphur and the Desulphurization of Nickel During Melting. I. L. Rogel'berg and E. S. Shpichinetskii. *Tsvetnye Metally*, no. 7, 1958, p. 61-65.
22 ref. (C5, Q23p; Ni)

436-C. (Russian.) Importance of Electrolyte Composition in the Intensification of Electrowinning of Aluminum. A. I. Belyaev. *Tsvetnye Metally*, no. 10, 1958, p. 61-66.
6 ref. (C23n; Al)

437-C. (Russian.) Fluid Bed Heating of Antimony Ores. I. V. Babina. *Tsvetnye Metally*, no. 7, 1958, p. 70-77.
(C22; Sb)

438-C. (Russian.) Behavior of Germanium in the Pyrometallurgical Treatment of Copper Ores and Concentrates. A. I. Okunev and Yu. F. Ryabov. *Tsvetnye Metally*, no. 7, 1958, p. 78-84.
9 ref. (C21; Cu, *Ge*)

439-C. (Russian.) Practice and Consumption Figures of the Carbide Alloying Process. A. Ya. Nashel'skii. *Tsvetnye Metally*, no. 10, 1958, p. 81-82.
Preparation of a lead-calcium alloy by adding CaC_2 to a melt of Pb at 750-800° C. (C26; Pb-b, *Ca*, AD-n32, 14-68)

440-C.* An Electron Bombardment Furnace for the Production of Vacuum-Melted Metals. E. S. Candidus and J. C. Simons, Jr. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 86-88.
Arcs and glow discharges which might hamper the melting operation or damage the electron source have been eliminated. Furnace design also permits the use of a relatively inexpensive pumping system. (C5k, 1-52, 1-73)

441-C.* Electron Bombardment Melting—a High Vacuum Technique Applied to Metallurgy. Hugh. R. Smith, Jr., Charles D'A Hunt and Charles W. Hanks. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 164-167.
System parameters include correlation of high vacuum pumping with melting rate and degree of melt stock purification; effect of high vacuum and high temperature on the thermodynamics of metallurgical reactions; comparative results of the application of the technique, especially with regard to highly refractory metals. (C5k, 1-73, 2-62)

442-C.* Skull Furnace Design and Application. G. N. Facaros, D. R. Carnahan and L. M. Bianchi. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 168-174.
Major components of a vacuum skull furnace and typical melting crucibles. Advantages are: no crucible contamination; a fast rate of casting; and vacuum purification. These make vacuum skull casting a practical production process. (C5k, 1-52, 1-73)

443-C. (Russian.) The Alkali Method of Smelting Lead. M. P. Smirnov and L. N. Kudryashova. *Tsvetnye Metally*, no. 9, 1958, p. 14-23.
Enriched lead ore is heated together with NaOH. 7 ref. (C21; Pb)

444-C. (Russian.) Fluid Bed Heating of Enriched Zinc Ore and Simultaneous Distillation of Lead and Cadmium. I. V. Babina and A. D. Besser. *Tsvetnye Metally*, no. 12, 1958, p. 20-24.
(C22; Pb, Cd)

445-C. (Russian.) Electrowinning of Cadmium in Cells With Rotating Cathodes. I. I. Dzliev. *Tsvetnye Metally*, no. 12, 1958, p. 24-28.
9 ref. (C23p; Cd)

446-C. (Russian.) Smelting of Lead in Electric Furnaces. A. P. Sychev and G. F. Platonov. *Tsvetnye Metally*, no. 12, 1958, p. 28-30.
6 ref. (C21d; Pb)

447-C. (Russian.) Processing of Slags in an Electric Furnace. M. M. Lakernik and B. I. Slonimskii. *Tsvetnye Metally*, no. 9, 1958, p. 28-31.
Reductive heating with coke to win Cu, Pb, Zn and noble metals contained in the slag. (C21d; RM-q, Cu, Pb, Zn, Ag, Au)

448-C. (Russian.) Electrowinning of Titanium. Yu. I. Ostroushko, G. A. Meerson, G. F. Silina and R. B. Shtrapenina. *Tsvetnye Metally*, no. 12, 1958, p. 38-44.
12 ref. (C23n; Ti)

449-C. (Russian.) Effect of Titanium Chlorides Present on the Quality of Sponge Titanium. L. V. Biryukova and L. L. Neroslavskaya. *Tsvetnye Metally*, no. 11, 1958, p. 43-46.

Significance of $TiCl_3$ and $TiCl_2$ resulting from the reduction of $TiCl_4$. (C26, 2-61; Ti, 6-74)

450-C. (Russian.) Wetting Properties of Magnesium in the Reduction of Titanium. G. V. Forsblum and E. G. Goldelenok. *Tsvetnye Metally*, no. 9, 1958, p. 43-47.

Importance of wetting properties in the reduction from Ti tetrachloride. (C26; Ti)

451-C. (Russian.) Formation of Lower Chlorides and Titanium Shapes in the Reduction of $TiCl_4$ by Sodium. V. A. Shubin and V. A. Pazukhin. *Tsvetnye Metally*, no. 12, 1958, p. 44-50.

(C26; Ti)

452-C. (Russian.) Intensification of the Electrowinning of Aluminum With Equipment Being in Service. I. P. Gupalo and A. A. Kostyukov. *Tsvetnye Metally*, no, 11, 1958, p. 52-60.

4 ref. (C23n; Al)

453-C. (Russian.) Effects of CaF_2 and MgF_2 on the Conductivity of the System Carbon Electrode-Cryolite Bath-Molten Aluminum. L. N. Antipin and S. F. Vazhenin. *Tsvetnye Metally*, no. 12, 1958, p. 56-60.

9 ref. (C23n; Al)

454-C. (Russian.) Production of a Model Electric Field Simulating the Anode Field in the Electrowinning of Aluminum. M. A. Korobov and V. P. Mashovets. *Tsvetnye Metally*, no. 11, 1958, p. 60-66.

6 ref. (C23n; Al)

455-C. Continuous Dissolution of Uranium-Aluminum Fuels in a Trickle-Type Column Dissolver. J. C. Bresee, D. L. Foster and E. O. Nurmi. *Chemical Engineering Progress Symposium Series (Nuclear Engineering, Pt. 5.)*, v. 55, no. 22, 1959, p. 25-32.

Advantages of potentially high-capacity volume dissolver over the limited size batch dissolver for serving a solvent-extraction system. Effects of acid-feed rate and type of slugs (cast or extruded) upon discoloring rate and product concentration. (C19, A11d, T11g; U-b, *Al*)

456-C.* Conversion of Uranium Hexafluoride to Uranium Tetrafluoride. S. H. Smiley and D. C. Brater. *Chemical Engineering Progress Symposium Series (Nuclear Engineering, Pt. 7)*, v. 55, no. 27, 1959, p. 57-63.

Comparison of the hydrogen reduction process and the trichlorethylene process for converting uranium hexafluoride to uranium tetrafluoride. (C26; U)

457-C.* The Nitrophos Extraction Process for the Separation of Zirconium and Hafnium. Wayne H. Keller and Irwin S. Zonis. *Chemical Engineering Progress Symposium Series (Nuclear Engineering, Pt. 7)*, v. 55, no. 27, 1959, p. 107-112.

Reactor grade Zr produced by the Nitrophos (nitric acid-tributyl phosphate) extraction process. (C19, 3-69; Zr, Hf)

458-C.* (Japanese.) Production of Metallic Magnesium by the Reduction Method. Pt. 3. Effect of Some Additions and Calcining Temperature on Reduction of Dolomite by Fe-Si. Masao Ikeda. *Japan Institute of Metals*, v. 23, Aug. 1959, p. 437-441.

Additions of NaF, NaCl, $3NaF \cdot AlF_3$ and $CaCl_2$ decrease while CaF_2 and MgF_2 increase the Mg yield. Calcining temperature of about 1000° C. gives maximum yield. MgF_2 is better than CaF_2 as a dolomite briquette binder. 5 ref. (C26; Mg)

459-C. Sodium Reduction of Titanium Tetrachloride. Shiro Yoshizawa, Tomoyasu Hashino and Susumu Sakaguchi. *Kyoto University, Engineering Research Institute, Technical Reports*, v. 9, Mar. 1959, 11 p.

The reaction rate of the sodium reduction of Ti tetrachloride was controlled by diffusion of Ti tetrachloride through the solid product film formed on the surface of sodium; the activation energy was 6.04 k-cal. per mol. 8 ref. (C26; Ti)

460-C. (Hungarian.) Semicontinuous Casting of Aluminum. L. Tibor. *Kohaszati Lapok*, v. 92, Aug. 1959, p. 345-349.

(C5g; Al)

461-C. (Hungarian.) Quality of Semicontinuous Cast Aluminum Blocks. L. Tibor. *Kohaszati Lapok*, v. 92, no. 9, 1959, p. 402-406.

(C5q; Al)

462-C. (Polish.) Ammonia Leaching of Low-Zinc Calamine Ores. W. Wazewska-Riesenkampf. *Prace Instytutow Hutniczych*, v. 11, no. 3, 1959, p. 119-126.

11 ref. (C19n; Zn)

463-C. (Russian.) Electrowinning of Lead and Nickel From NaOH Solutions. V. D. Ponomarev, B. N. Zuer. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 84-87.
4 ref. (C23n; Pb, Ni)

464-C. (Russian.) Converter Processes With Nickel Matte. L. L. Chermak. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 94-100.
6 ref. (C21b; Ni)

465-C. (Russian.) Technical Possibilities of the Precipitation of Cobalt by Sodium Hypochlorite. N. G. Mantulin. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 101-105.
Precipitation with NaClO from solutions in H_2SO_4. 8 ref. (C27; Co)

466-C. (Russian.) Electrowinning of Titanium From Its Dioxide Added to a Molten Mixture of K_2TiF_6 and NaCl. F. M. Kolomitskii, V. D. Ponomarev. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 106-112.
(C23n; Ti)

467-C. The Purification of Beryllium by Distillation. A. J. Martin. *Vacuum*, v. 7-8, Apr. 1959, p. 38-45.
17 ref. (C22; Be)

468-C. The Chemistry of the Lower Valences of Titanium. Thomas C. Franklin and Haig Verne Seklemian. Baylor University *Wright Air Development Center Technical Report* no. 58-349, Sept. 1958, 63 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.
113 ref. (C-general; Ti)

469-C. (Hungarian.) Variables of the Semi-Continuous Casting Process and Their Effect on the Quality of Aluminum Ingots. Pt. 2. Tibor Laar. *Kohaszati Lapok*, v. 92, Oct. 1959, p. 442-445.
(C5q; Al, 5-59)

470-C. (Hungarian.) Preparation of Lead-Calcium Alloys. Lajos Pilissy. *Kohaszati Lapok*, v. 92, Oct. 1959, p. 472-477.
10 ref. (C-general; Pb-b *Ca*)

471-C. (Russian.) X-Ray Testing of the Dependence of Dendritic Liquation on the Cooling Rate. I. I. Novikov, F. S. Novik. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1195-1198.
7 ref. (C28h, M22g; Al-b, *Fe, Si, Zn*)

472-C. (Russian.) Determination of the Quantity of Electrodeposited Metal for Various Current Densities by Measuring the Quantity of Gas Developed During the Process. N. I. Mikhailov. *Zavodskaya Laboratoriya*, v. 25, Oct. 1959, p. 1204-1205.
(C23, S11j)

473-C. Recovery of Thorium From Sulphate Solutions by Anion Exchange. T. V. Arden, J. D. Nolan, B. J. Gower and F. A. Wright. *Journal of Applied Chemistry*, v. 9, Aug. 1959, p. 406-409.
Uranyl and thorium sulphate passed through columns of anion-exchange resin results in absorption of both metals followed by displacement of thorium by uranium. 8 ref. (C19s; Th)

474-C. (Translation—ATS.) The Ferrocyanide Method of Extracting Small Amounts of Thallium From Solutions of Nonferrous Metals. I. V. Tananaev and M. A. Glushkova. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 1899-1904.
(C19p; Tl)

475-C. (Translation—ATS.) The Extraction of Tantalum and Niobium From Sulfuric Acid Solutions by Means of Cyclohexanone. Pt. 2. Ya. G. Goroshchenko. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 1904-1913.
6 ref. (C19; Ta, Cb)

476-C. (Translation—ATS.) Extraction and Separation of Niobium and Titanium From Oxalic Acid Solutions by the Ion-Exchange Method. I. D. Fridman and I. N. Yudina. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 1914-1919.
7 ref. (C19s; Ti, Cb)

477-C. (Translation—ATS.) The Quality of Titanium Sponge Obtained by the Thermal Magnesium Method. V. V. Sergeev. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 1919-1924.
Effect of Fe, oxygen, carbon, nitrogen and Cl. (C19; Ti, 6-74)

478-C. (Translation—Brutcher no. 4365.) Technology of Vacuum Melting of Metals and Alloys. A. V. Emyashev. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 54-61.
(C25; EG-d37)

479-C. (Translation—Brutcher no. 4373.) Production of Compact Carbon-Free Ferrochromium and Metallic Manganese by Vacu-

um Treatment. S. L. Khitric. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 112-122.
(C5m, 1-73; Fe-b, *Cr*, Mn, AD-n32)

480-C. (Translation—Brutcher no. 4375.) Kinetics and Mechanism of Reduction of Chromium Oxide by Carbon in Vacuum. A. A. Vertman and A. M. Samarin. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 132-146.
(C21d, 1-73, Cr)

481-C. (Translation—Brutcher no. 4376.) A Vacuum Process for the Production of Ductile Vanadium. A. Yu. Polyakov. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 147-154.
8 ref. (C21, 1-73, Q23p, 2-60; V)

482-C. (Translation—Brutcher no. 4377.) Production of Carbon-Free Ferrochromium by Decarburization of High-Carbon Ferrochromium in Vacuum. S. V. Bezobrazov. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 155-162.
(C25; Fe-b, *Cr*, C)

483-C. (Translation—Brutcher no. 4597.) Temperatures at Which the Reduction of Metal Oxides by Solid Carbon Begins. V. P. Elyutin, R. F. Merkulova and Yu. A. Pavlov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute", Metallurgizdat, Moscow, 1958, p. 79-87.
Research with radioactive isotopes. Relationship between temperature at which reduction begins and melting temperature of a metal oxide is assumed. 16 ref. (C22g, P12n, 1-59; 14-68)

484-C. (Translation—ConBur) Present Situation in the Production and Use of Thorium. G. E. Kaplan, I. I. Zarembo and T. A. Uspenskaia. *Soviet Journal of Atomic Energy*, v. 5, Aug. 1958, p. 983-991.
Methods of smelting and refining Th.
(C19n, C19r, C21, C23n; Th)

485-C. (Translation—Brutcher no. 4366.) Vacuum Arc Melting of Molybdenum. A. S. Stroev, A. M. Ivanov and E. S. Ovsepyan. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958. p. 62-65.
(C25; Mo)

SECTION D

FERROUS REDUCTION and REFINING

1-D.* New Processes in Iron and Steel. C. R. Wheeler. *Steel Review*, no. 3-6, Oct. 1958, p. 25-34.

The L-D, Kaldo and Rotor processes, new direct reduction processes, low-shaft furnace techniques and rotary furnaces processes. (D8, D10)

2-D. How to Make More Steel. *Metal Progress*, v. 74, Nov. 1958, p. 97-99.

Republic Steel increased production 40% by methods improvement without adding melting equipment. (D1, D5, F23, 1-52; ST)

3-D. Use of Oxygen in Electric Furnace Steelmaking. *National Cylinder Gas Information Report*, no. 16, Aug. 1958, 10 p.

Metallurgical, economic advantages, equipment required, operating procedure for use of O_2. (D5g; ST-f, O)

4-D. (German.) Automatic Regulation of Blast Furnaces. A. N. Makarow. *Neue Hutte*, v. 3, July 1958, p. 404-408.

(D1, W17g, 18-74)

5-D.* New Process Achieves Direct Reduction of Iron Ore. *Canadian Mining Journal*, v. 79, Aug. 1958, p. 78-80.

Strategic-Udy process can convert ore to steel in one continuous operation; is practical for low-volume production; allows utilization of cheap ores; is highly flexible. (D8j)

6-D.* Some Effects of Pressure on Consumable Electrode Arc Melting. J. W. Suiter. *Dept. of Mines and Technical Surveys, Mines Branch Research Report, Ottawa, Canada*, no. R1, May 30, 1958, 9 p. $.25.

Effects of varying the argon pressure in the range of 1×10^{-2} to 650 mm. Hg on the weight of metal melted per unit of energy dissipated when melting Ti and steel in a consumable electrode arc furnace. 4 ref. (D5g, C5h, W18s, 3-74; CN-g, Ti)

7-D.* Equilibrium Measurements Between Carbon-Saturated Mn-Fe-Si Melts and CaO-Al_2O_3-MnO-SiO_2 Slags. E. T. Turkdogan and R. A. Hancock. *Institution of Mining and Metallurgy, Bulletin*, no. 621, Aug. 1958, p. 573-600.

The variation of the slag metal, Si and Mn distribution ratios are related to the Fe content of the metal and the slag composition. Effects of Si and Fe on the solubility of graphite in molten Mn. 21 ref. (D11h, D11n)

8-D.* Refractories for the New Steelmaking Processes. J. H. Chesters. *Iron and Coal Trades Review*, v. 177, Aug. 8, 1958, p. 329-335.

Wear of refractory linings in Kaldo, L-D and Rotor steelmaking processes and in openhearths when using the oxygen lance. 9 ref. (D10, RM-h)

9-D.* Russian Continuous Converter—Tapping Spout Method of Steelmaking. R. Sewell. *Iron and Steel*, v. 31, Nov. 1958, p. 523-524.

Liquid pig iron is refined in a converter in the form of a 75-ft. long tapping spout. Refining achieved by top blowing with O_2. Production is 3-4 tons per min. (D3f, D9n; ST)

10-D.* Continuous Casting of High-Speed Steel. B. H. C. Waters, W. H. Pritchard, A. Braybrook and G. T. Harris. *Iron and Steel*

Institute, Journal, v. 190, Nov. 1958, p. 233-248.

Continuous-casting plant operated on a pilot scale for the production of high-speed and other alloy steels as 4-in. square cast billets. Types of billet fracture encountered in the operation; pouring and mold systems used to overcome them. 8 ref. (D9q; TS-m)

11-D.* The Oxidation Mechanism in the Open Hearth Furnace. A. L. Hodge. *Iron and Steel Engineer*. v. 35, Nov. 1958, p. 97-100.

Maximum openhearth production rates require a maximum amount of high-temperature heat in excess of bath temperature and maximum availability of chemical oxygen. (D2g, D11r)

12-D.* Quality Control in Specialty Steel Production. J. S. Pendeleton, Jr., and H. O. Beaver, Jr. *Metal Progress*, v. 74, Nov. 1958, p. 100-103.

Scrap, composition, temperature and design influence ingot quality. Control of these variables produces ingots with consistent properties from heat to heat. (D9, N12b; ST, 5-59, 9-69, 17-54)

13-D.* (French.) Selection of Nozzle Sizes and Pouring Speeds for Teeming of Flat, Rimmed Steel Ingots (Top Pouring). J. Leclerc and J. Goureau. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 710-715.

Shop study of defects in 10 and 15-ton ingots as influenced by nozzle diameters, pouring speeds and temperatures, mold dimensions and ladle capacity. Formula for selection of nozzle diameters for ingots of any size and shape. (D9p; ST-d)

14-D. Furnace Lines, Operating Methods and Theory of Southern and Northern Blast Furnace Practice. John R. Hunt. *Engineering Sciences (U. S. Steel Corp.)*. v. 5, 1958, 36 p.

Comparison of differences in ratio of working volume to hearth area and other structural variations of blast furnaces due to different ore compositions. 24 ref. (D1, W17g, 17-51)

15-D. Phoenix-Lance Process. H. Th. Brandi. *Iron and Coal Trades Review*, v. 177, Sept. 5, 1958, p. 555-556. (From *Stahl und Eisen*, June 26, 1958.)

(D3f)

16-D. Fiftieth BISRA Steelmaking Conference. *Iron and Coal Trades Review*, v. 177, Sept. 12, 1958, p. 615-619.

Summaries of five papers on influence of refining, finishing and casting on steel quality. (D-general)

17-D. Openhearth Furnace Regenerators—a Survey of Theoretical and Experimental Work With Recommendations for the Calculation of Preheat. *Iron and Steel Institute, Journal*, v. 190, Nov. 1958, p. 254-271.

34 ref. (D2g, W18r)

18-D. The Vacuum-Lifter Process of the Dortmund-Horder Huttenunion AG. F. Harders. *Iron and Steel Institute, Journal*, v. 190, Nov. 1958, p. 306-311.

Molten steel is drawn up into a vacuum chamber mounted over the ladle. Degassing takes place, reducing O_2 and H_2 content, improving steel quality. (D9s, 1-73; ST-c)

19-D. New Developments in Steelmaking in Europe. D. L. McBride. *Society of Automotive Engineers*, Preprint no. 30C, 1958, 9 p.

Review of low-shaft blast furnaces, electric smelting, bessemer process, Kall-Do process, Oberhausen rotary furnace, 13 ref. (D3, D8n, D10)

20-D.* Research on the Use of Pure Oxygen in Refining Processes. Paul Metz. *Blast Furnace and Steel Plant*, v. 46, Nov. 1958, p. 1187-1191, 1223.

Industrial tests made with the OCP process; high metallic yield; high consumption of scrap; low consumption of oxygen; great speed of refining; dephosphorization with high final C contents; high degree of desulphurization; easy production of low-S and low-P steels; N_2 content of steel depending on the degree or purity of oxygen used in refining; high solubility of basic slag; oxygen content at the end of blowing equivalent to that of openhearth steels. (D3f, 1-65)

21-D.* Carbon Arc and Induction Melting. J. A. Edwards. *Iron & Steel*, v. 31, Sept. 1958, p. 449-451.

Techniques compared with reference to design of part to be cast, relative cost, control or reproducibility of results, versatility. (D5a, D6; C5h, C5j)

22-D.* The O.C.P. Process. Paul Metz. *Iron & Steel*, v. 31, Sept. 1958, p. 455-460.

Controlled blowing of oxygen and powdered lime makes it possible to obtain new basic bessemer steels with low N and P contents and with high degree of cold ductility. Pure oxygen is injected over surface of metal bath, and at the same time, either air, oxygen-enriched air or oxygen-steam mixture is blown in through converter bottom. 21 ref. (D3f, 1-65)

23-D.* Survey of Basic Bessemer Instrumentation. B. O. Smith. *Iron & Steel*, v. 31, Sept. 1958, p. 463-464.

Considerable reduction in blowing time likely to be achieved by use of oxygen-enriched air or oxygen-steam places a premium on reliable, rapid-acting instruments for operation and control of the process. Important process parameters are bath temperature and end-point determination. Radiation methods of measuring bath temperature are sufficiently accurate and reliable; methods based upon flame composition or flame opacity show inconsistent results. No direct method of end-point determination exists and there is a need for high-speed continously indicating instrument for bath analysis. 12 ref. (D3, S16a, S18, X9)

24-D.* (German.) Application of Oxygen During the Production of Unalloyed and Low-Alloyed Steels in the Basic Electric Furnace. Rolf Peters. *Neue Hutte*, v. 3, July 1958, p. 409-415.

Dependence of refining speed on amount of oxygen supply and carbon content of the molten unalloyed steel; absorption of oxygen by the molten metal and relationships between the amount of refined carbon, bath temperature and oxygen efficiency. Behavior of Mn, P and N in iron; furnace life; comparison of this process with the normal refining process. 9 ref. (D5g, 2-60)

25-D.* (German.) Design of an Immersion Thermocouple and Its Application in Open-hearth Steelworks. Helmut Loscher. *Neue Hutte*, v. 3, July 1958, p. 416-425.

Prevention of measuring errors due to wire deposits or embrittlement of Pt-Rh wires. Sensitivity of measuring instruments shown by immersion temperature curves. Mean temperature increase of the bath is dependent on the admission temperature and the heat supply. An improvement of steel quality and technological process results from observing the correct tapping and casting temperatures. 28 ref. (D2, X9q)

26-D.* (German.) Desulphurization of Iron Melts With Solid Limestone and Dolomite. Wilhelm Anton Fischer and Horst Spitzer. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 535-542.

Equilibria between iron melts with 0.3% C up to carbon saturation and solid limestone or solid dolomite was investigated between 1200 and 1700° C., and equilibrium constants were determined. The activity of lime with respect to desulphurization at 1500 to 1700° C. seems to be equal both in limestone and in dolomite. 27 ref. (D11n; S)

27-D.* (Rumanian.) Desulphurizing Power of Blast Furnace Slag. Traian Tr. Negrescu. *Studii şi Cercetări de Metalurgie*, v. 1, July-Dec. 1956, p. 283-296.

Previous papers showed how to calculate the maximum quantity of sulphur which a molten silicon-lime-aluminum slag can absorb. Another series of experiments relating to the SiO_2-CaO-MgO system, at 1500° C., establishes a quantitative relation. The free lime in the $5CaO \cdot 8SiO_2$ entities combines with part of the sulphur of the metal bath to form $pCaO \cdot qS$ groups which contain less lime, the higher the temperature. Al does not take direct part in desulphurization, but favors its speed. Mg only serves to make part of the lime available. 6 ref. (D1, D11n)

28-D. Production of Pig Iron in the Low-Shaft Furnace. *Iron and Coal Trades Review*, v. 177, Oct. 17, 1958, p. 911-917.

Furnace construction and reduction conditions in low-shaft melting compared with normal blast furnace practice. 19 ref. (D8n; CI-a)

29-D. Conversion of Iron Using Pure Oxygen. P. Metz. *Iron and Coal Trades Review*, v. 177, Oct. 17, 1958, p. 931-939.

Development of the Oxygene-Chaux-Pulverisee process to convert pig iron to low-nitrogen steel. (D3b; CI-a, ST-g)

30-D. Refining Pig-Iron in the Bottom-Blown Converter. J. Daubersy and A. Decker. *Iron and Coal Trades Review*, v. 177, Oct. 31, 1958, p. 1027-1931.

"Mixed blast" process utilizing oxygen-steam and CO_2. (D3b)

31-D. Steel Mill Lubrication. *Lubrication*, v. 44, Oct. 1958, p. 133-152.

Steelmaking process, major lubricants involved, methods and problems of application. (D-general, W18, W23a, W24k; NM-h)

32-D. Developing the Oxygen Process for Steel Melting. *Mechanical World*, v. 138, Nov. 1958, p. 505-506.

Oxygen lancing at Appleby-Frodingham Steel Cos., Scunthorpe, England. (D2g)

33-D. Oxygen Lancing Trials on O. H. Furnace. *Refractories Journal*, v. 34, Oct. 1958, p. 467-470.

Roof wear and modifications in furnace design necessary for the oxygen process. (D2g, W18r)

34-D. Oxygen in Electric Furnace Benefits Producer and User. *Steel*, v. 143, Nov. 24, 1958, p. 108, 112.

(D5g)

35-D. (Polish.) Analysis of Blast Furnace "Blowing In" and Drying Methods Applied in Polish Metallurgy. S. Zielinski and A. Maslanka. *Hutnik*, v. 25, July-Aug. 1958, p. 250-257.

Effect of blast furnace "blowing in" and drying methods on durability of furnace lining. U.S. and Polish methods compared. (D1, B19b, W17g)

36-D. (Polish.) Examination of Nonmetallic Inclusions in Steel. Juliusz Foryst. *Hutnik*, v. 25, July-Aug. 1958, p. 257-262.

Laboratory research in steel deoxidation by Fe-Mn-Si-Al deoxidisers with variable chemical constitution indicates favorable effect of growing ratio Mn:Si on deoxidation. Quantity of oxygen inclusions remaining in steel after deoxidation apparently depends on ratio Mn:Si; smallest amount of inclusions observed when ratio Mn:Si was 6:1. Results indicate that percentage of impurities in steel poured at low temperatures (1540-1570° C.) is considerably higher than in steel poured at higher temperatures (1590 - 1610° C.). (D11r, D9p; 9-69)

37-D. (Polish.) Diminution of Shrinkage Cavity in Steel Ingots by Application of Exothermic Forms. Ryszard Frackiewicz. *Hutnik*, v. 25, July-Aug. 1958, p. 262-268.

Experiments with six melting operations indicate that exothermic forms permit saving of 12.2% of steel in 1060-kg. ingots and 12.5% in 630-kg. ingots. (D9k, 9-67)

38-D. (Polish.) Application of Choking Coils in Arc Furnaces. Jerzy Pietka and Francigszek Fikus. *Hutnik*, v. 25, July-Aug. 1958, p. 278-284.

Shortened melting time by 20% and consumption of electric energy by more then 5%. (D5, W18s)

39-D.* (German.) Reduction of Iron Ores. Gerhard Heynert, Eberhard Schurmann and Jakob Willems. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1493-1505.

Physical and chemical processes taking place in a blast furnace studied with the help of a laboratory model furnace. Experiments on the reduction equilibria of pure Fe oxides and mixtures of oxides and on the equilibrium of pure C with a mixture of carbon-monoxide and carbon-dioxide. 15 ref. (D1, D11r)

40-D.* (German.) Behavior of Rimming Steel in Ingot Casting and in the Solidification Process. Heinrich Rellermeyer and Rudolf Hammer. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1505-1513.

Observations with rimming basic bessemer steel. Time of gas evolution increases with the temperature, and the gas develops less violently the greater the proportion [C]/[O]. S and P segregation zones depend on the shape of ingot. 12 ref. (D9, D11h; ST-d)

41-D.* (German.) Amount and Composition of Oxide Suspensions Present in Basic Open-hearth Steel During Melting. Kurt Born and Heinz Wittstruck. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1514-1525.

Samples taken at intervals during the whole melting process are examined electrolytically to determine the composition of oxide particles present in a state of suspension. It was found that 60 to 80% of the suspension was made up by SiO_2 and the balance by alumina. 32 ref. (D2, 9-51; ST, NM-a34)

42-D.* (Portuguese.) Recent Improvements in the Hoganas Process. Use of Sponge Iron in the Manufacture of Steel. Adaptation to Brazilian Conditions. Anchyses C. Lopes. *Engenharia, Mineracao e Metalurgia*, v. 28, Aug. 1958, p. 79-91.

Hoganas process due for introduction in Brazil, which possesses raw materials highly suitable for direct reduction techniques. Advantages of sponge iron as raw material in production of sheet steel; use in basic and acid electric furnaces; economics of this process in Brazil. 7 ref. (D8j)

43-D.* (German.) Equilibrium Tests With Dolomite, Iron (II), Oxide Slags and Iron Melts. Wilhelm Anton Fischer and Horst Spitzer. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 611-617.

Solubility of oxygen, composition of slag and distribution of sulphur determined at temperatures between 1530 and 1700° C. 26 ref. (D11n)

44-D.* (German.) Desulphurization and Deoxidation of High-Purity Iron in the Vacuum Melting Process. Walter Janiche and Herbert Beck. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 631-642.

Desulphurization by addition of Sn, Sb or Bi, which form fast evaporating sulphides. 28 ref. (D8m, D11n, D11r, Fe, *Sn, Sb, Bi*)

45-D.* Diffusion of Calcium in Liquid Slags. Tunezo Saito and Kazuo Maruya. *Tohoku University, Science Reports of the Research Institutes*, v. 10, Aug. 1958, p. 306-314.

Self-diffusion coefficients of calcium in molten slags ($CaO-SiO_2$, $CaO-Al_2O_3$, $CaO-SiO_2-Al_2O_3$ and $CaO-SiO_2-Al_2O_3-MgO$ systems) were measured by the method of semi-infinite medium in the range from 1350 to 1600°C. Diffusion coefficients were in the order of 10^6 to 10^7 sq. cm. per sec. and the activation energies were 40 to 70 kcal per g-mol for all slags investigated. The diffusion coefficient had good correspondence to both the specific electric conductivity and the viscosity coefficient. Behavior of Al_2O_3 and MgO in basic slags. (D11m, D11n, P12e, P15g, Nla; RM-q)

46-D.* (French.) Review of the Production of Semi-Flat Ingots Weighing in Excess of Three Tons. Jean Duflot and S. Derot. *Fonderie*, no. 153, Oct. 1958, p. 467-474.

Growing importance of rectangular ingots used in steelmaking prompted extensive study on alloys used and casting methods applied in producing rectangular ingot molds by 14 leading steel mills in France. Composition of ingot mold material and comparative figures on findings during similar study five years ago also illustrate the trend of development. 5 ref. (D9, W19c; ST)

47-D.* (Swedish.) Some New Methods of Sponge Iron Production. Martin Wiberg. *Jernkontorets Annaler*, v. 142, no. 6, 1958, p. 289-355.

Theoretical conditions for the reduction of iron ore with CO, H_2 and CH_4. Hoganas, Wiberg, Stelling, Tanner, Jensen, Scortecci, Gallusser, Hydrocarbon Research H-Iron, U. S. Steel Nu-Iron, Esso-Little, R-N, Madaras and Monterry methods of sponge iron production. Principles of methods proposed by Cavanagh, Echevarria and Aspegren. Proposes modernizing Wiberg method to employ natural gas, oil + oxygen or natural gas, coal + oxygen instead of coke + electrical energy. Suggests that when pellets are reduced in a shaft furnace, according to Wiberg method the combustion zone of the shaft should be converted into a pelletizing furnace with green pellets charged directly. Future developments for reduction of fine-grain ores. (D8j, D11j; 6-74, Fe)

48-D. Use of Natural Gases in the Reduction of Iron Ores. H. Galluser. *Blast Furnace and Steel Plant*, v. 46, Dec. 1958, p. 1301-1302

(D8j; RM-m35)

49-D. Economies Claimed for New Steel Process. *Chemical Engineering Progress*, v. 54, Nov. 1958, p. 82, 86.

Strategic-Udy method for the production of semi-steel by direct reduction of iron ore. (D8j)

50-D. Some Applications of Oxygen in Steelmaking. R. Mallikarjunan. *Current Science*, v. 27, Sept. 1958, p. 334-335.

Linz-Donawitz and Kal-Do processes. (D10)

51-D. Freeze Hearth Contents to Study Ore-to-Iron Cycle. *Industrial Laboratories*, v. 9, Nov. 1958, p. 28.

Quenching contents of blast furnace with nitrogen stops process in midcycle enabling study of ore to iron process. (D1, D11)

52-D. Some Impressions of the Continental Steel Industry. G. R. Bashforth. *Metallurgia*, v. 58, Sept. 1958, p. 135-140, 142.

Recent developments and new practices in the steel industry in continental Europe. Design, roof construction and instrumentation in openhearths. Use of oxygen in ladle and converter; continuous casting processes. (D-general)

53-D.* (German.) Speed of the Reduction of Ferric Oxide by Hydrogen. Ludwig von Bogdandy and Hans-Gunter Riecke. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 603-609.

Effect of changing temperature and speed of hydrogen flow. 24 ref. (D8j; D11r)

54-D. (Portuguese.) New Development of the Hoganas Process. Use of Sponge Iron in Steel Fabrication. Anchyses C. Lopes. *Engenharia, Mineracao e Metalurgia*, v. 28, Aug. 1958, p. 79-91.

Description of process and modern plant. Sponge iron used in basic arc furnaces and, together with scrap, in the basic openhearth furnace. 7 ref. (D2a, D5a; Fe, 6-74)

55-D. (Translation—SLA, ASLIB-GB70.) Degassing of Steel in Vacuum. H. Zakowa and R. Radzwicki. *Hutnik*, v. 7, no. 11, 1956, p. 41-45.

(D9s, 1-73)

56-D. (Translation—SLA, ASLIB-GB70.) Industrial Application of Vacuum Degassing of Steel, Especially for Large Forging Grade Ingots. A. Tix. *Stahl und Eisen*, v. 76, no. 2, 1956, p. 61-68.

See item 105-D, 1956. (D9s, 1-73; ST)

57-D. (Translation—SLA, R-4465.) Melting of High-Quality Rimming Steel for Automobile Sheet. F. I. Antonyuk and A. I. Marinov. *Metallurg*, v. 1, 1956, p. 24-27.

(D5; ST-d, 4-53)

58-D. (Translation—SLA, ASLIB-GB70.) Nonmetallic Deposits on the Sprue and Wear of Runner Bricks With Killed Openhearth Steels. K. G. Speith. *Stahl und Eisen*, v. 76, Nov. 1, 1956, p. 1426-1438.

See item 23-D, 1957. (D9n, D2; RM-h, ST)

59-D. (Translation—SLA, ASLIB-GB152.) Results on Vacuum Casting of Steel. Pt. 1. Z. Eminger and F. Kinsky. *Hutnicke Listy*, v. 11, no. 6, 1956, n.p.

(D8m)

60-D. (Translation—SLA, ASLIB-GB70.) The Treatment of Metals in a Vacuum. G. V. Speranskii. *Metallurg*, no. 8, 1956, p. 12-15.

See item 343-D, 1956. (D8, M; AY)

61-D.* (Czech.) Metallurgy of Nitrogen Alloyed Chromium-Manganese and Manganese-Nickel Steels. Frantisek Poboril and Marcela Zezulova. *Hutnicke Listy*, v. 13, Nov. 1958, p. 969-979.

The nitrogen soluble in a given steel in equilibrium represents the critical amount below which pores and segregations are avoided. 25 ref. (D9r, N12, 9-68, 2-60; ST, *C, Mn, Si, P, S, Cr, Mo, Ni, N*)

62-D.* (Japanese.) Vacuum Casting. M. Yamazoe. *Metals*, v. 28, Nov. 1958, p. 833-836.

Large steel ingots usually are subject to porosity, pinholes, blowholes, white spots and dislocations, which can be avoided by vacuum casting. Capacity of

vacuum pump should be 40,000 to about 4,000,000 liters per min., and hence a steam ejector, an oil ejector and mechanical booster are used. (D9s, 1-73; ST)

63-D.* (Rumanian.) Influence of Processing Upon the Nature and Amount of Nonmetallic Inclusions in Steel. Silvia Dascălu. *Studii si Cercetări de Metalurgie*, v. 3, no. 1, 1958, p. 39-52.

Speed of decarburization and duration of deoxidation have direct influence; therefore, composition of charge must be strictly controlled. Slags have only indirect influence. Quantity of deoxidizers and sequence of introduction also have influence. 9 ref. (D11j, D11r, D2; ST, *Mn*, 9-69)

64-D.* (Russian.) Influence of Blast Temperature on Dimensions of Oxidizing Zone in Blast Furnace. N. I. Vasil'chenko, V. I. Kotov and A. N. Nikitin. *Stal'*, v. 18, Oct. 1958, p. 869-874.

Increase in temperature and kinetic energy of blast with well-developed circulatory motion of coke at the tuyeres leads to enlargement of the combustion zone (without alteration of the oxygen zone). Modification of the factors which determine the smooth performance of the furnace alters sharply the size of the combustion and oxygen zones. Experiments conducted on blast furnace with 14 tuyeres of 180 mm. diameter. Furnace capacity 1000 tons of pig iron in 24 hr. (2.0-3.5% Si). 9 ref. (D1, D11j, 2-61)

65-D.* (Russian.) Life of Openhearth Refractory Lining When Using Oxygen. E. I. Koval'chuk and G. I. Popov. *Stal'*, v. 18, Oct. 1958, p. 890-893.

Use of oxygen somewhat reduces wear on refractories, however, continued efforts are required for improvement in design, quality and maintenance of furnace lining. Methods for lengthening refractory life include facing the regenerator walls with chrome magnesite, improving quality of free bricks by increasing their thickness and stability at temperatures of 1700° as well as deformation temperature under load. (D2g, W18r; RM-h)

66-D.* (Russian.) Improving the Structure of Rimming Steel Ingot Taps. A. M. Uzienko, I. A. Tkachenko and A. P. Varshavskii. *Stal'*, v. 18, Oct. 1958, p. 899-905.

Structure can be considerably improved by prolongation of the metal rim in the mold and the addition of glass or microgranite (for steels Ct 3kp killed by ferrosilicon). Cropping can be reduced 3-5% without any sacrifice of metal quality. 3 ref. (D9k, M27; ST)

67-D.* (Russian.) Properties of Sheet Made of Stainless Steel Killed by Aluminum. D. A. Litvinenko, A. I. Marinov and V. K. Barzii. *Stal'*, v. 18, Oct. 1958, p. 931-938.

Experiments show effectiveness of producing killed stainless steel, suitable for manufacture of VGV grade cold rolled sheet from undressed slabs by deoxidation of metal with Al shot. Al is poured into ingot molds from the top which results in better surface quality of sheet than is obtained by deoxidation of steel by Al in the ladle. Steel thus produced is used for auto parts and is free of defects of mechanical aging and lowering of plastic and drawing qualities. (D11r, Q-general; SS, *Al*, 4-53)

68-D.* (Russian.) Operation of Blast Furnace at 1.5 Atm. Pressure. L. Ya. Levin, I. A. Kuz'min, V. D. Kailov and A. B. Shur. *Stal'*, v. 18, Nov. 1958, p. 964-968.

Raising of blast furnace top pressure from 1.0 to 1.5 atm. gage increases productivity by 1.9% with simultaneous reduction of coke consumption rate and increase of blast temperature. Due to inadequate composition of the charge used there was no increase in the blast flow. Main factor accounting for reduction of specific coke consumption was increase of blast temperature from 950 to 1000°. (D1b)

69-D.* (Russian.) Semicontinuous Casting of Stainless Steel. M. S. Boichenko, O. T. Gavrilov and Yu. B. Kan. *Stal'*, v. 18, Nov. 1958, p. 983-987.

Casting of IKI8H9T steel slabs for production of cold rolled sheet resulted in satisfactory quality with reduced metal consumption. Surface quality of cold rolled sheet produced by this method is similar to that produced by usual method and meets the standard TU 3126-52. Mechanical and corrosion properties are satisfactory. (D9q; SS, 4-53)

70-D.* (Russian.) Heat Balance of Experimental Melt in Oxygen Blown Converter. P. Ya. Sorokin. *Stal'*, v. 18, Nov. 1958, p. 987-992.

Study of heat balance in 50-kg. laboratory converter shows that reason for high metal loss during burning is due to local overheating of metal resulting in evaporation of different elements. The

influence of this factor can be minimized by application of finely disintegrated bottom blowing and by addition of iron ore. Dilution of oxygen blast with steam for lowering localized temperatures in the zone of reduction will reduce metal loss. 9 ref. (D3, D11k)

71-D.* (Spanish.) Scrapless Manufacture of Steel in the Electric Arc Furnace. Guillermo Coll. *Instituto del Hierro y del Acero*, v. 11, July-Sept. 1958, p. 168-176.

Scarcity and high price of steel scrap in Spain inspired experimental work in manufacture of steel in furnace with basic lining, with pig iron and iron oxide as only raw materials. In view of good results, both metallurgical and economic, Araya plant of Ajuria y Urigoitia, S. A., now uses this method exclusively. Metallurgical details. (D5a)

72-D. (Czech.) Use of Oxygen in Czechloslovakian Steel Mills. Alexander Dekanovsky. *Hutnicke Listy*, v. 13, Nov. 1958, p. 965-968.

Present use and supply of oxygen; prospects for the future. (D2g, D3b; O)

73-D.* Open Hearth Fuel Atomization. A. L. Hodge and G. W. Hinds. *Iron and Steel Engineer*, v. 35, Dec. 1958, p. 88-96.

Results in higher flame temperature and permits larger firing rates than with steam burners. 6 ref. (D2h, W18r)

74-D.* Use of Oxygen in a Modified Tilting Furnace. A. Jackson, R. Johnson, H. Marshall, R. A. Kipling, J. Purdie, E. E. Clark, E. F. Farrington, N. H. Turner, S. H. Brooks, L. H. Walton, R. B. Atkin, K. Paterson and W. Jackson. *Iron and Steel Institute, Journal*, v. 190, Sept. 1958, p. 1-29.

Bath lancing with oxygen during melting, using hand and mechanically operated lances. Use of modified design for 300-ton tilting openhearth furnace. Full instrumentation, waste heat boiler and fume cleaning plant. Results of five months operation. Roof wear and other problems, dismantling and reconstruction of furnace, increase in production and decrease in fuel usage with application of oxygen. (D2g, W18g, 1-52, 1-65, 18-70)

75-D.* Continuous Casting at Atlas Steels Ltd., Welland, Ont., Canada. G. C. Olson. *Iron and Steel Institute, Journal*, v. 190, Sept. 1958, p. 40-50.

Installation and operational features of machine. Development problems in continuous casting of austenitic stainless steel. Casting of tool and alloy constructional steel for bar and wire as well as low-alloy billets for extrusion of seamless pipe. Economics of continuous casting. (D9q; AY, CN, SS-e)

76-D.* (Czech.) Investigation of Influences Affecting the Fluctuation of Silicon Content in Basic Bessemer Pig Iron. Josef Lemfeld. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 675-679.

At equivalent sulphur content per ton of iron the quantity of Si in basic bessemer pig iron depends on quantity of siliceous ores in the charge. The effect of Czech ores in reducing Si content of iron is probably due to their easy fusibility and formation of a slag of lower viscosity which passes through furnace more rapidly and results in lower furnace temperature. (D3a, D11n, 2-60; CI-a, Si)

77-D.* (Czech.) Vacuum Cast Steel. Zdenek Motloch. *Hutnicke Listy*, v. 13, Nov. 1958, p. 1037-1050.

Amount of liberated gas depends on casting velocity and oxygen content. With rimming steel, formation of blowholes was suppressed and a killed steel structure obtained. Partial elimination of flakes also achieved. 6 ref. (D9, 1-73; ST, *Cr, Ni*)

78-D.* (German.) Final Composition of Bath and Slag in Bessemer Process. Franz Weber, Theo Kootz and Karl-Heinz Obst. *Stahl und Eisen*, v. 78, Nov. 27, 1958, p. 1734-1745.

Variables influencing dephosphorization and final composition of metal and slag are phosphorus content, bath temperature, iron and lime content of slag, size of lime particles, silicic acid, magnesia content and oxygen concentration of blast. Activity in system $FeO-CaO-P_2O_5$. Desulphurization process in basic converter. Production experiments reveal that highest phosphorus and oxygen values in iron are obtained with small graded lime. (D3, D11n; *O, P*)

79-D.* (Russian.) Cooling Well of Blast Furnace. N. V. Krepyshev. *Metallurg*, v. 3, Nov. 1958, p. 3-9.

A major reason for disruption of continuity in blast furnace operations is poor material or design in construction of well and foundation. Well temperature at furnace axis reaches 800° and foundation 1100°, resulting in cracking of base cement. Air cooling beneath the foundation lowers and evens out temperature distribution; also makes it possible to use

thinner bottom lining. Air cooling has resulted in two-fold increase in life span of foundation. (D1, W17g, 17-51)

80-D.* (Russian.) Grading Blast Furnace Burden. M. A. Sukonnik. *Metallurg*, v. 3, Nov. 1958, p. 9-12.

Grading charging materials increased gas penetrability, made possible intensification of smelting with reduced coke consumption. Increased basicity of Krivoirozh ores multiplies fines, interferes with furnace operation due to canalization of burden resulting in greater coke consumption and lowered productivity. (D1a)

81-D.* (Russian.) Production of Chromium-Molybdenum Steel. V. P. Bondarev. *Metallurg*, v. 3, Nov. 1958, p. 13-15.

Production of large sections of rolled steel (180-250 mm. diameter) resulted in 30% rejections and expense coefficient of 2.37 due to gas blisters forming under surface. New technology used for steels 12 MKH and 15 XHM where steel is melted without preliminary reduction with Si in furnace has sharply reduced spoilage and lowered expense coefficient to 1.47. (D9, F23p; ST, *Cr, Mo*)

82-D.* (Russian.) Automatic Regulation of Openhearth Heat Regime. N. S. Skorik. *Metallurg*, v. 3, Nov. 1958, p. 18-25.

Furnaces are heated by mixture of coke and blast furnace gases enriched with oxygen. Automation of heat regime was introduced to meet more precise requirements of magnesite chrome operations with oxygen. Heat regulation extends to control of cooling system, amount of carburizers, oxygen, liquid metal as well as gas and air apparatus. Operations still to be automated are smoke fumes, heating of upper part of furnace and insuring maximum combustion of all fuels. (D2g, 18-74)

83-D.* (Russian.) Production of Semikilled Steel. D. A. Litvinenko, L. M. Efimov and V. K. Barzii. *Stal'*, v. 18, Oct. 1958, p. 885-890.

Production by additional deoxidation of rimming steel in a ladle or in molds, using Al and Si. Best results obtained by introduction of 340-400 g. of Al per ton for 08 killed steel and 150-200 g. per ton MCt 3 killed steel into stream of molten metal before its surface in the mold reaches the prefixed level. Experiments conducted in 185-ton openhearth. (D2, D11r; ST-c, *Al, Si*)

84-D.* The Distribution of Alloying Elements Between Molten Iron and Silver. G. Derge. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 15-17.

Distributions of Cu, Mn and S illustrate problems on liquid-metal interactions which can be examined by experiments described. 4 ref. (D11, P12, N14; Fe, *Ag, Cu, Mn, S*)

85-D.* The Carbon-Oxygen Equilibria in Liquid Iron. J. F. Elliott. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 37-41.

Analysis of available data on the Fe-O-C system in the vicinity of 1600° C. in graphical illustrations showing thermodynamic relationships for the reactions between carbon and oxygen. 8 ref. (D11r, P12; ST, *C, O*)

86-D.* The Alumina-Graphite Reaction in Liquid Iron and the Aluminum Deoxidation Constant in Steelmaking. J. Chipman and F. C. Langenberg. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 46-50.

Al_2O_3-saturated Al_2O_3 - SiO_2 - CaO slags were equilibrated with graphite-saturated Fe-C-Si-Al melts at 1600 and 1700° C., and the reaction Al_2O_3 (in slag) studied. 13 ref. (D11n, D11r; NM-k36, ST, *Al*)

87-D.* Oxide Slags—a Survey of Our Present Knowledge. F. D. Richardson. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 55-62.

Silicate structures, thermodynamic properties, solubilities of neutral metals, water in slags. 16 ref. (D11n; RM-q)

88-D.* Summary of Some Experimental Work on the Activity of Silica in Liquid Silicate Systems. L. Yang, C. L. McCabe and R. Miller. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 63-64.

Activity of silica in the liquids of the CaO-SiO_2 system at 1637° C. determined by the use of the Knudsen cell to measure the pressures of SiO and O_2 above the

melt and above pure cristobalite. 4 ref. (D11n; ST, *Si*)

89-D.* The Activity of Silica in Lime-Alumina-Silica Slags at 1600° C. F. C. Langenberg, H. Kaplan and J. Chipman. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 65-67.

Si distribution for graphite-saturated Fe-Si-C alloys in equilibrium with $CaO-Al_2O_3-SiO_2$ slags; composition of $CaO-Al_2O_3-SiO_2$ slags in equilibrium with alloys of constant Si content. (D11n; ST, *Si, Al, Ca*)

90-D.* Activities in Ternary Silicate Melts. F. D. Richardson. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 68-75.

Silicate phase diagrams and thermal data suggest that mixtures of two molten metasilicates behave nearly ideally (relative to the separate silicates) even when there are large differences between the sizes of the cations and heats of formation of the separate silicates. 26 ref. (D11n, P12; ST)

91-D.* Electrical Measurements on Oxides and Solid Cells at Temperatures of 1200 to 1800° C. W. A. Fischer. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 79-83.

Iron oxide-alumina system and other bivalent systems. 8 ref. (D11n, P12; ST, 14-68)

92-D.* The Action of Calcium Fluoride in Slags. T. Baak. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 84-86.

Calcium fluoride lowers melting point and decreases viscosity of slags. $CaO-CaF-SiO_2$ system discussed; practical applications. (D11n, 3-69; ST, *Si, Ca*)

93-D.* Formation and Destruction of Foams and Emulsions in Iron and Steelmaking. P. P. Kozakevitch. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 89-92.

Properties and applications of foams and emulsions. 7 ref. (D11n; ST)

94-D.* Kinetics of Metallurgical Reactions With Particular Reference to the Open Hearth. L. S. Darken. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 101-108.

Chemical kinetics at high temperatures where local equilibrium is developed. Heat requirement, bubble formation and growth, foaming, frothing, boundary layer in the slag at the slag-metal interface. 5 ref. (D11, D2d, P13h; ST)

95-D.* Theory of Degassing of the Open-Hearth Bath During Carbon Boil. P. Vallet. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 109-112.

Conclusions of W. Geller's theory and theory showing that the residual H_2 and N_2 are partially eliminated by the evolution of CO, which is generated in large quantities during the carbon reaction. 6 ref. (D2, D11h)

96-D.* Kinetic Factors in the Desulfurization of Pig Iron by Blast-Furnace Type Slags. J. C. Fulton and J. Chipman. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 113-116.

Experiments clarify the mechanism of sulphur transfer between liquid pig iron and blast-furnace type slags. With 6% Si in the metal to maintain equilibrium with SiO in the slag, the transfer rate is slightly affected by stirring rate. 11 ref. (D1, D11n; CI-a, *S, Si*)

97-D.* The Deoxidation of Iron Melts With Silicon. W. A. Fischer. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 117-122.

Deoxidation dependent on amount of Si added; temperature of the melt; size of the furnace; agitation of the melt; kind of crucible lining; inclusions formed during the different periods of time and in different crucibles during the course of the reaction. (D11r, 2-60; ST, *Si*)

98-D.* Electrochemical Nature of Sulfur Transfer in the System Carbon-Saturated-Iron-Slag. T. B. King and S. Ramachandran.

Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 125-135.

Investigation of the reaction by which sulphur is transferred from carbon-saturated iron to oxide slags. 9 ref. (D11n, P13; ST, *S, C*)

99-D.* Desulfurization and Dephosphorization of Carbon-Saturated Iron. C. E. A. Shanahan. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 136-141.

Data showing that the desulphurization rate by $CaO-SiO_2-Al_2O_3$ slags can be high and mechanisms account for the removal of phosphorus from hot metal in the presence of high carbon-concentration levels by oxygen blowing. (D11n; Fe, *C, S, P*)

100-D.* Effect of Temperature and Silica on the Dephosphorization of Iron With Lime. G. Tromel. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 142-146.

Activity of P_2O_5 grows with increasing SiO_2 content. (D11n, 2-61, 2-60; Fe, *Si*)

101-D.* Some Swedish Experiences of the Importance of Physical Chemistry for the Development of Process Metallurgy. B. Kalling. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 149-158.

Reduction of Fe ore, blast-furnace process, external desulphurization of pig iron, decarburization of solid pig iron, acid and basic openhearth process, deoxidation and tapping. 30 ref. (D11)

102-D.* Study of Slag-Metal Mixing Efficiency by Models. C. B. A. Shanahan. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 165-172.

Efficiency of mixing obtained by pouring the metal into the slag is much greater than that obtained either by simple gas blowing or by rabbling. The faster the amalgam is poured into the acid, the greater the efficiency of mixing. 4 ref. (D11n)

103-D.* Theoretical Study on the Solidification Progress of Ingots of Finite Dimensions. P. Vallet. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 194-199.

Verifies quantitatively the proposed equation, different adaptations, calculation of coefficient of the parabolic law of Lightfoot. Values obtained with ingots of different shapes and dimensions (prisms or spheres) when the metal is poured in sand molds agree. 7 ref. (D9, N12; ST)

104-D.* Effect of Mold Geometry on Vertical Solidification. C. W. Sherman. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 200-202.

Transverse solidification data for 0-9% tapered ingots of various sizes. Freezing time data. 8 ref. (D9, N12, 3-73; ST)

105-D.* Solidification of Stainless Steel Ingots. D. J. Carney and B. R. Queneau. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 209-213.

Based on premise that artificial nucleation of solidifying metals is possible, the addition of types of metallic powders to ferritic types of stainless steels produced a finer as-cast grain size. (D9, N2, N12; SS, AD-p, 35)

106-D.* On Segregation in Steel Castings. C. M. Adams, Jr. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 216-217.

Mechanical, chemical, thermal factors and segregation coefficient influence the degree, the direction and the average distance of solute migration during solidification, and affect segregation either by modifying mass transfer through the liquid or by causing local flow of solute-rich liquid. (D9, N12; ST, 9-69)

107-D.* Kinetic Problems in Steelmaking. C. Wagner. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 237-251.

Characteristics of metal-slag reactions, kinetics of transport-controlled reactions, exchange reactions involving radioactive isotopes, displacement reactions in quasi-binary systems, kinetics of

phase boundary reactions, local cell action, reduction of SiO_2, evolution of CO. 34 ref. (D11n, P12)

108-D.* Strategic-Udy Direct Iron Reduction Process. *Iron and Coal Trades Review*, v. 177, Dec. 19, 1958, p. 1463-1467.

Smelting technique utilizing a direct-fired rotary kiln for partial pre-reduction of iron ore before charging to an electric arc smelting furnace. To save thermal and electrical energy, the hot pre-reduced ore from the kiln is charged directly to the smelting zone of the furnace making it possible to control the reduction reaction with comparative ease. (D8j)

109-D.* Activity of Carbon in Liquid Iron-Carbon Solutions. A. Rist and J. Chipman. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 3-12.

Designed to yield the activity-composition relationship. Apparatus and experimental procedure, results, sources of error, data interpretation and thermodynamic calculations, comparison with data on austenite. 26 ref. (D11h, P12b; Fe, *C*)

110-D.* Activity of Carbon in Molten Fe-C Alloys at High Carbon Content—Progress Report. J. A. Cordier and P. P. Kozakevitch. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 13-14.

Measuring carbon activity at concentrations where difficulties are encountered with C deposition when using gas mixtures containing CO and CO_2 alone. (D11h, P12b; ST, *C*)

111-D.* Slag-Metal Reactions of Chromium in Carbon-Saturated Melts. C. W. McCoy and W. O. Philbrook. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 93-98.

Behavior of Cr in distributing itself between slag and metal under the low oxygen pressures that prevail for saturated Fe and for blast-furnace-type slags. Materials, apparatus, procedure and kinetics of Cr reduction. 15 ref. (D11n; *C*, Cr)

112-D.* Chemical Equilibrium in the Basic Bessemer Process. A. M. Decker. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 173-178.

Quantitative study of equilibrium between slag and metal at the end of the blow. Residual manganese, phosphorus, oxygen and sulphur content of the steel bath can be calculated if the slag analysis is known. 9 ref. (D11n, D3)

113-D.* Solidification of Steel Ingots. M. Tenenbaum. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 181-193.

Rimming steels, effect of gas information, solidification in big-end-up hot topped molds, ingot solidification, teeming. 6 ref. (D9, N12; ST)

114-D.* (German.) Behavior of Barium Sulphate in the Blast Furnace. Rolf Ebert and Georg von Struve. *Neue Hutte*, v. 3, Nov. 1958, p. 676-682.

Between 350 and 600° C., crystalline heavy spar is more subject to dust formation than other components of the charge. Above 600° C., barium sulphate is reduced to barium sulphide by the coke and furnace gas. A smaller quantity reacts with ferrous oxide and silica. The developing sulphur dioxide reacts with ferrous oxide forming iron sulphide. 16 ref. (D1a, D1g, D11; Ba, S)

115-D.* (Rumanian.) Structural and Thermodynamic Basis for the Reactions of Liquid Slags. Traian Tr. Negrescu. *Studii si Cercetari de Metalurgie*, v. 3, no. 2, 1958, p. 161-202.

Slag systems SiO_2-CaO-Al_2O (at 1500° C.) SiO_2-CaO-FeO (at 1500 and 1650° C.) SiO_2-CaO-MgO (at 1500° C.), SiO_2-CaO-MnO (at 1425° C.) and SiO_2-CaO-BaO (at 1500° C.). 13 ref. (D11n, 2-60, 2-61; Si, Ca, Al, Mg, Mn, Ba, O)

116-D. Vacuum Pouring Lowers Hydrogen Content of Large Forgings. *Powerfax*, v. 36, Winter 1958, p. 16-18.

Degassing process at Bethlehem Steel. (D9s, D9p, 1-73)

117-D. (Rumanian.) Utilization of Manganese Ores With Low Iron Content. D. Totoescu and A. Steclai. *Studii si Cercetari de Metalurgie*, v. 3, no. 1, 1958, p. 53-67.

Most of the ores of the region of Vascau-Moneasa used only for the extraction of the iron because Mn content is relatively small.

They cannot be treated in blast furnace. Purpose was to find a way of applying the Krupp-Renn process. 16 ref. (D8j; *Mn*)

118-D. (Russian.) Reduced Metal Expenditure in Casting Large Forging Ingots. V. A. Malyshev, A. F. Gorbachev and A. G. Papush. *Metallurg*, v. 3, Nov. 1958, p. 16-18.

Electric heating of ingot deadheads of carbon and alloy steels has largely eliminated porosity. Despite considerable reduction in size of ingot head quality of steel did not decline. (D9s)

119-D. (Russian.) Quality of Foundry Pig Iron Produced in Blast Furnace. L. I. Gol'denberg. *Stal'*, v. 18, Oct. 1958, p. 874-877.

Intensification of blast furnace process and raising the tapping temperature when smelting foundry pig irons have sharply increased contamination of melt by refining foam and resulted in deterioration of quality of cast product. In production of low-Si irons, with subsequent addition of 20% ferrosilicon when remelting in cupola, it is possible to reduce contamination. (D1, 2-61, 17-54)

120-D. (Russian.) Scrap Supply of Openhearth Furnaces. V. Sobolev. *Stal'*, v. 18, Oct. 1958, p. 950-951.

(D2a; RM-p)

121-D. (Russian.) Aging and Thermal Load of an Openhearth Furnace. E. A. Kapustin, V. A. Makovskii and G. D. Karpov. *Stal'*, v. 18, Oct. 1958, p. 952-956.

In connection with difficulties in estimating gradual changes in operation of openhearth, indexes are proposed for idling thermal load and active thermal load which makes possible comparison of relative heat economy and intensity of various furnaces. (D2h)

122-D. (Russian.) Smelting Ferrosilicon From Krivoy Rog Iron Ores. B. M. Nosovitskii, G. A. Panev and L. V. Brodetskii. *Stal'*, v. 18, Nov. 1958, p. 969-976.

Preventing irregular blast furnace performance and incrustation by eliminating from burden materials containing iron silicates, by increasing the circumferential flow of gases by selecting proper charging sequence and by periodically returning to smelting of ordinary pig iron. Increasing basicity of slag from 1.0 to 1.25 at the same time that magnesium oxide content is raised from 2.2 to 3.5% improves process of desulphurizing ferrosilicates in iron. 7 ref. (D1; AD-n31, Si)

123-D. (Russian.) Expediency of Smelting Ferrosilicon in Blast Furnace. Yu. S. Maksimov and Ya. S. Shchedrovitskii. *Stal'*, v. 18, Nov. 1958, p. 976-978.

Comparison of physicochemical and technico-economic conditions of ferrosilicon production in blast furnaces and in electric furnaces shows advantages of production by electrothermic process using closed-type electric furnaces. 6 ref. (D1, D5; AD-n31, Si)

124-D. (Russian.) Production of Various Grades of Steel in Top-Blowing Basic Converter Blowing. S. I. Lifshits. *Stal'*, v. 18, Nov. 1958, p. 979-983.

Rimming and killed steel used for crane rails produced by this process possess mechanical and technical properties equal to low-alloy openhearth steels. Further expansion of converter process will require investigation into intensification of desulphurization process which will make possible the use of pig with varying S and Mn contents. (D3, 1-65; ST-c, ST-d)

125-D. (Russian.) Stirring Openhearth Bath by Rotating Magnetic Field. G. A. Ostroumov. *Stal'*, v. 18, Nov. 1958, p. 999-1002.

Theoretical calculations show possibility of using three-phase industrial current for excitation of the rotating magnetic field (traveling field) for electromagnetic stirring. More effective stirring of melt through its full depth creates more even distribution of temperature and facilitates gas penetration. 5 ref. (D2g)

126-D.* Continuous Casting of Steel. G. Fenton. *Iron & Steel*, v. 31, Dec. 24, 1958, p. 610-621, 646.

Abstracts of papers presented at autumn meeting of Iron and Steel Institute. Casting equipment, procedure and operations, steels cast, properties of ingots and slabs of Canadian, British, Russian, Belgian, French and German installations. (D9q, 1-52, 18-67; ST)

127-D.* New Methods of Pig-Iron Manufacture. A. N. Pochwisnew. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 337-338.

Current trends in Russia include blast enrichment by steam and oxygen, increased blast pressures and the construction of larger blast furnaces with extensive automation. Concluded that the blast furnace will continue to be the most practical means of producing pig iron in the forseeable future. (D1, 18-74; CI-a)

128-D.* The Imatra Thermit Hot-Topping Process. Pt. 1. Practice at the Imatra Works, Finland. A. I. Aitken, W. C. Fletcher and G. Fenton. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 349-359.

Process differs from conventional hot topping in that the ingot is poured to a lower level in the hot top and, when solidification is nearly complete, a Thermit powder is added to remelt the metal solidified in the hot top and fill up the original pipe cavity. (D9p)

129-D.* Gas Utilization in the Reduction of Iron Oxides. G. St. Pierre. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 159-164.

Calculations of the quantity of reducing gas required to produce a given amount of free iron from its oxide. Gaseous reduction accomplished with mixtures of CO and H_2. 7 ref. (D11g)

130-D.* (Japanese.) Advantages of the 500-Kg. Vacuum Furnace. S. Ikeuchi. *Metals*, v. 28, Dec. 1958, p. 929-932.

Magnetic properties of 50% Ni-Fe (coercive force and rectangularity of hysteresis curve) improved. Also 50% Co, 2% V iron alloy, Supermalloy and Alperm. Heat resisting alloys improved in life and formability. (D8m, P16, Q23g; SS, TS, Ni-b, Fe)

131-D.* Petroleum Techniques for Steel. F. D. Hoffert, E. A. Kelly and A. M. Squires. *American Society of Mechanical Engineers*, Paper no. 58-A-158, 1958, 4 p.

Oil and natural gas serve as sources of the reducing hydrogen in the H-Iron process. Combination of H-Iron and electric furnaces offers many possibilities. Flow diagrams, operating techniques and costs. (D8j)

132-D.* (Polish.) Effect of Chemical Composition of Deoxidizer, Fe-Mn-Si-Al, on the Quantity and Chemical Composition of Nonmetallic Inclusions in Steel. J. Foryst, W. A. Mczedliszwili and A. M. Samarin. *Prace Instytutow Ministerstwa Hutnictwa*, v. 9, no. 4, 1957, p. 151-159.

With increase of Mn in the alloy Fe-Mn-Si-Al the quantity of oxide inclusions decreases; the smallest content of inclusions was obtained when Mn:Si = 6; two-stage deoxidizing by Mn-Si (Si:Al= 1:0.01)followed by Al. Increase of Mn in the deoxidizer is followed by a considerable reduction in SiO_2 in steel, it slightly decreases MnO, and, does not affect FeO. 9 ref. (D11r, 9-69; AD-r)

133-D. Twin-Strand Continuous Casting at Barrow. *Iron and Steel*, v. 31, Dec. 1958, p. 594.

Twin-strand plant at United Steel Co.'s Barrow plant produces billets from 2 to 4 in. sq. and slabs up to 12 by 4 in. in carbon steels containing between 0.05 and 0.85% C. (D9q; CN)

134-D. (French.) Control of Flame Direction in Openhearth Furnaces With Lean Gas Firing. L. Septier, G. Cohen de Lara, S. Terrat, R. Bovics and M. Faure. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 993-1008.

Flame direction controlled successfully by regulation of the air flow. (D2h)

135-D. (German.) Technical and Economic Developments in the Low-Shaft Furnace Practice of the VEB Eisenwerke West in Calbe (Saale). Werner Schilling and Dieter Reimann. *Neue Hutte*, v. 3, Nov. 1958, p. 683-689.

Survey and composition of ores used; dimensions of ten furnaces. Increased economy by a higher hot blast temperature (850° C). 9 ref. (D8n, W17h; CI-a)

136-D. (German.) 100-Ton Openhearth Furnaces With Additional Tar Oil Heating. Friedrich Schafer. *Neue Hutte*, v. 3, Nov. 1958, p. 689-694.

Economic and practical consequences of the increased heat input. Installations for tar oil supply. 6 ref. (D2h, W18r; RM-k)

137-D.* (German.) Automatic Control of Basic Converter Heats. K. E. Mayer, H. Knuppel and A. Stumpf. *Stahl und Eisen*, v. 78, Nov. 13, 1958, p. 1670-1676.

Observations on the blowing process; automatic control instruments for converters recommended. 9 ref. (D3b, 18-74)

138-D.* (Hungarian.) Preventing Shrinkage Cavities by Means of Exothermic Sleeves. Gyula Csabalik. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 118-122.

Thermit treatment of risers for steel ingots weighing 700 lb. Structure, grain size and calorific value of the thermit used. Starting temperature of thermit reaction and design of thermit lining, shape and location of shrinkage cavities, calculations on ingot yield and enrichment relationship in the riser. (D9k)

139-D.* (Hungarian.) Correlations Between Factors Affecting the Dimensions of Oxida-

tion Zone in Blast Furnaces Operated With Humidified Blast. Otto Farkas. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 138-142.

Relation of combustion speed of coke to amount of steam investigated in laboratory and plant. Variation in kinetic energy of blast, in amount of gas produced, in kinetics of combustion reactions and their influence on the dimensions of the oxidation zone. 8 ref. (D1h)

140-D. (Book.) Physical Chemistry of Steelmaking. John F. Elliott, Ed. 257 p. 1958. Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York. $15.

Papers presented at a 1956 conference in Dedham, Mass. Covers liquid metals and properties of solutes in liquid iron and steel; equilibria of reactions in liquid iron and steel; behavior of metal oxides and components of iron and steelmaking slags; slag-metal equilibria in blast-furnace and steelmaking furnace systems; kinetics and slag-metal reactions; reaction rates in iron and steelmaking processes; application of fundamental data to process development and metallurgical problems in the steel industry; solidification of castings and ingots; research planning. Papers abstracted separately. (D11)

141-D. (Translation.) The Krupp-Renn Process in Germany. *Iron and Coal Trades Review*, v. 177, Nov. 21, 1958, p. 1223-1225. (*From Technische Mitteilungen Krupp*, v. 16, 1958.)

Operation of reconstructed plant at Salzgitter-Watenstedt. (D8j)

142-D. (Translation — BISI, 664.) The Desulphurization of Basic Bessemer Steels. A. Decker. *Revue Universelle des Mines*, v. 13, May 1957, p. 165-212.

See item 160-D, 1957. (D11h, D3, 1-65; ST)

143-D. (Translation — BISI, 952.) Automatic Regulation of Blast Furnace Working. G. G. Pietrkovskii and F. V. Ashikhmin. *Stal'*, v. 17, Jan. 1957, p. 16-20.

See item 328-D, 1957. (D1b, 18-74)

144-D. (Translation — BISI, 1096.) Practical Results in the Basic Converter With Use of Small Sized Lime Made in the Cross Flow Shaft Kiln. A. Latour and L. Heinen. *Stahl und Eisen*, v. 77, Apr. 4, 1957, p. 426-428.

See item 140-D, 1957. (D3, 1-65; ST, NM-e)

145-D. (Translation — Brutcher, 4416.) Inclusions in the Deoxidation of Steel With Silicon. W. A. Fischer and M. Wahlster. *Archiv fur das Eisenhuttenwesen*, v. 29, no. no. 1, 1958, p. 1-9.

See item 272-D, 1958. (D11r, D5; ST, 9-69, Si)

146-D. (Translation — Brutcher, 4424.) Preliminary Blowing of Hot Metal in Ladle With Oxygen-Steam Mixtures. Ya. A. Shneerov. Metallurg, Aug. 1958, p. 11-14.

See item 475-D, 1958. (D9m, D11r; CI-a)

147-D.* (French.) Gazal Process and Desulphurization of Thomas Pig. Pierre Zehringer. *Metaux-Corrosion-Industries*, v. 33, July-Aug. 1958, p. 293-304.

Origin of S in pig iron; influence on properties of steels. Desulphurizing agents, mechanism of reaction, Kalling and IRSID processes. Gazal process agitates molten metal in the ladle by means of gases (air, N or A) blown in through porous plugs cored into refractory lining of ladle bottom. Silicon carbide, graphite and alumina plugs and various desulphurizing agents were tried. Alumina plugs were most satisfactory, and they can also be used in degassing bronzes. Highest rate of desulphurization was obtained with slags containing about 87% sodium carbonate, 10% limestone flux and enough fluorspar to fluidify slag. 19 ref. (D11n, S)

148-D.* (Russian.) Remelting of Steels and Alloys in Arc-Vacuum Furnace to Reduce Contamination. G. N. Okorokov, A. Iu. Poliakov and A. M. Samariti. *Izvestiya Akademii Nauk SSSR*, May 1958, p. 69-72.

Remelting steel in vacuum furnace improves corrosion resistance, especially in low-carbon rust resisting steel. Remelting reduces the content of nonmetallic inclusions. (D8m, 9-69)

149-D.* (Russian.) Kinetic Effect of Burning Coke on the Size of Oxidizing Zone in Blast Furnaces. M. Ya. Ostroykhov. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 3-6.

Acidic region is determined by blast energy; magnitude of reduction by carbon + carbon dioxide, and depends on the kinetics of the process, such as velocity of gas filtration and temperature. (D1, D11j; RM-j43)

150-D. Steel From the Electric Furnace. *Chicago Purchaser*, v. 37, Jan. 1959, p. 76-77.

Melting techniques; costs and applications. (D5)

151-D. Electric-Furnace Smelting of East Texas Iron Ores. H. Kenworthy and A. G. Starlipe. *U. S. Bureau of Mines Report of Investigations 5427*, 1958, 12 p.

Good recovery obtained from low-grade domestic Fe ores. (D8n; RM-n, Fe)

152-D. Experimental Investigation Into Primitive Iron-Smelting Technique. E. J. Wynne and R. F. Tylecote. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 339-348.

A simple hearth furnace has been constructed for the production of Fe by the primitive method. Methods of charging the ore; effects of varying air flow, tuyere size, and ore and charcoal sizes. 21 ref. (D1, A2)

153-D.* Steelmaking Progress in Belgium and Luxemburg. A. Decker. *Metal Progress*, v. 75, Jan. 1959, p. 65-70.

Large furnace operating on fine coke with 15% moisture. OCP process injects a mixture of oxygen and lime powder through the mouth of a standard 30-ton basic converter. Slag poured off after about 14 min. when carbon is down to 0.7%. (D8n, D10; CI-a, ST)

154-D.* (Hungarian.) Blast Furnace With Elevated Pressure. Karoly Rethy. *Kohaszati Lapok*, v. 91, May-June 1958, p. 277-289.

Increasing blast furnace throat pressure decreases coke consumption, increases production, decreases volume of fires. Carbon content of pig-iron also increased. (D1a, 3-74)

155-D.* (Hungarian.) Production of Agglomerated Ore With Limestone, Fines and Sludges. Robert Forbath. *Kohaszati Lapok*, v. 91, May-June 1958, p. 241-250.

Agglomerated ores investigated to determine best ratios of components and sintering procedures. Use of agglomerated ores increased pig iron production, decreased coke consumption. (D1a, B16a; RM-n)

156-D. Vacuum-Melting of Steels. H. C. Child and G. T. Harris. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 414-431.

Equipment used for vacuum induction and consumable-electrode vacuum-arc melting. Comparison of the average gas content of various types of alloys made by air-melted basic electric process, vacuum-induction process and vacuum-arc process. 22 ref. (D8m)

157-D.* (Hungarian.) Use of Pig-Iron With Low Manganese Content in the Open-hearth Furnace. Gellert Repasy. *Kohaszati Lapok*, v. 91, May-June 1958, p. 251-261.

Percent of Mn effectively utilized in steelmaking influenced by amount of Mn in pig iron and amount added in steelmaking. Effect of sulphur content. (D2a, 2-60; CI-a, *Mn, S*)

158-D.* (Hungarian.) Desulphurization of Pig-Iron Outside the Blast Furnace. Devenyi Janos. *Kohaszati Lapok*, v. 91, May-June 1958, p. 262-268.

Calcium injected into molten Fe with N gas under pressure removes 50-90% of S present. (D11n; Ca, N, S)

159-D.* (Hungarian.) Blast Furnace Practice With Steam-Enriched Blast. Gyorgy Schmidt. *Kohaszati Lapok*, v. 91, May-June 1958, p. 269-276.

Use of blast enriched by steam increases economy, decreases coke consumption of blast furnaces. (D1h)

160-D.* Duplexing Steel for Casting. Gordon J. Pride. *Foundry Trade Journal*, v. 106, Jan. 8, 1959, p. 45.

Cr-Mo steel, Mn steel, low-alloy Ni steels, ferrovanadium additions, austenitic steel, when ordered in small lots for uneconomical melting furnace load, handled by splitting heats or ladle mixing. (D9m; ST,*Mn, Cr, Mo, Ni, V*, AD-n, SS-e)

161-D.* Use of Self-Fluxing Sinter. J. S. McMahan. *Blast Furnace and Steel Plant*, v. 47, Jan. 1959, p. 51-54.

Blast furnace production increased 43%, coke consumption reduced 26%. No additional capital investment required. (D1a)

162-D.* (French.) Contribution to the Study of the Heating of Openhearth Furnaces. L. Septier. *Publication IRSID*, Series A, no. 184, Sept. 1958, 71 p.

Thermal efficiency of fuel and furnace; development of combustion; heat recuperation of gas and oil-fired furnaces; heat exchange in checkerwork; design factors in improvement of furnace performance. 12 ref. (D2, D11k)

163-D.* (Hungarian.) Metallurgy of High-Purity Iron Production. Bela Vecsey. *Kohaszati Lapok*, v. 13, no. 8, 1958, p. 357-361.

Swedish Armco iron melted in high vacuum furnace with hydrogen atmosphere. (D8m; Fe-a)

164-D.* (Russian.) Alteration of Blast Furnace Process When Using Flux Sinter. N. N. Babarykin and F. A. Yushin. *Stal'*, Dec. 1958, p. 1057-1065.

Improved performance when using fluxed sinter is explained by intensification of the process of reduction in the zone of moderate temperature and by decrease in dimensions of the burden softening zone. (D1a)

165-D.* (Russian.) Automatic Control of Blast Furnace Performance by Static Pressure Control. N. N. Chernov and P. G. Zhigulev. *Stal'*, Dec. 1958, p. 1071-1077.

Automatic control by over-all static pressure drop proved to be efficient only in case where the individual pressure drops at two basic furnace height zones are controlled and when regulators act on tap gas pressure and hot blast parameters. (D1, X12)

166-D.* (Russian.) Thermodynamics of the Dephosphorization of Liquid Iron by Ferrous-Calcium Slags. I. Yu. Kozhevnikov. *Stal'*, Dec. 1958, p. 1078-1088.

Product of the reaction is calcium phosphate which dissociates and forms ions when the concentration of phosphorus in the metal-slag system diminishes. (D11n, P)

167-D. Metallurgical Fuel Developments Main Lines of the Postwar Years. D. W. Gillings. *Metal Progress*, v. 75, Jan. 1959, p. 111-115.

Extensive blending of high-volatile coal with first-grade coking coal has enabled supplies of acceptable metallurgical coke to be maintained as needed in Europe. Many British openhearths have been converted to oil firing practice for some years, while the adoption of electric melting for producing plain steels results from efficient power generation from low-grade coal. (D-general; RM-j, RM-k, RM-n, 16-61)

168-D. Progress in German Steelmaking. H. W. Balster. *Metal Progress*, v. 75, Jan. 1959, p. 116-119.

Blast furnaces will be using high pressures and oxygen, openhearth, electric and converter melting methods are constantly improved and rolling mills are being mechanized. (D-general)

169-D. (Hungarian.) Effect of Agglomerated Ore on Blast Furnace Efficiency. Laszlo Marczis. *Kohaszati Lapok*, v. 91, May-June 1958, p. 236-240.

Experience in using both raw and agglomerated ores as feed for blast furnace. Amount of coke and CaCO, sequence of charging varied depending on type and quality of ore. (D1a; RM-n, RM-q, RM-j43)

170-D. (Hungarian.) New Blast Furnace Technology in Producing Ferromanganese. Kokai Istvan. *Kohaszati Lapok*, v. 91, May-June 1958, p. 290-293.

(D1; Mn, AD-n31)

171-D.* Solidification Characteristics of Continuously Cast Low-Carbon Steels. M. Tenenbaum, C. F. Schrader and L. Mair. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 20-33.

Longitudinal sections of slabs illustrate structures of continuously cast killed, semi-killed and rimming steels. Typical macro-segregation curves; proposed mechanism for solidification of rimming steels. 10 ref. (D9q, M28h, N12; ST)

172-D.* Vacuum Pouring of Ingots for Heavy Forgings. J. H. Stoll. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 67-80.

Melting steel in conventional electric arc furnaces and pouring into ingot molds contained in vacuum tanks. Operation of production units capable of producing 250-ton ingots. Effect of vacuum casting on the hydrogen content, cleanliness, susceptibility to flaking and mechanical properties of the forgings. (D9k, Q-general, 1-73; ST-f, 4-51)

173-D.* (English.) Refining Pig Iron by the Kall-Do Process. Bo Kalling and Folke Johansson. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 455-466.

Detailed description and technology of the process using oxygen blown against the bath surface in a converter rotating about its longitudinal axis. 6 ref. (D10b)

174-D.* (English.) New Possibilities for the Improvement of Converter Methods. A. M. Samarin. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 511-518.

Molten bessemer rail steel exposed to a vacuum of 5-10 mm. Hg for 12 to 14 min. showed a decrease of hydrogen of

approximately 2 to 2.5 times while the nitrogen decrease was 10-20% and the oxygen amount was 3 to 4 times. 9 ref. (D9s, 1-73; ST-g, CI-a)

175-D.* (English.) Rate of Operation of Openhearth Furnaces. R. W. Evans. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 554-566.

Suggestions for improved openhearth practice; shortening of the process by increased fuel input, which makes necessary basic refractories; use of oxygen for decarburization; use of oxygen to assist combustion. Factors contributing to the output rate: furnace profile and design; design of burners. 11 ref. (D2, W18r)

176-D.* (English.) Intensification of the Openhearth Process by Means of Oxygen in the U.S.S.R. Myssovski. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 581-587.

With a roof of silica, use of oxygen is limited to the charging and melting period. To allow oxygen after slag formation, roofs of magnesite-chromite are necessary. With an oxygen enrichment of 25-30% the flame temperature rises by 100 to 150° C. 6 ref. (D2g, W18r)

177-D.* (English.) Continous Casting in the B.I.S.R.A. Experimental Plant. G. Fenton and J. Pearson. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 623-633.

Ingot casting a 1/2-ton basic arc furnace. From a common type tundish nozzle or a heated nozzle the liquid steel passes to a mold, flexibly mounted on springs to avoid rupture of the cast skin, lubricated with rapeseed oil and water cooled. A dummy-bar is brought into the mold when casting is started. Casting speed is variable. (D9q; ST-c, CN, AY-b)

178-D.* (French.) New Refining Processes—Oxygen With Powdered Lime. B. Trentini and M. Allard. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 494-500.

Melt with 3.57% C, 0.40% Si, 0.37% Mn, 1.80% P, 0.053% S refined in a basic converter by blowing an oxygen-powdered lime mixture against the bath surface. At the end of the first phase of process, the slag containing P_2O_5 is partly skimmed. In the second blowing phase, ore is added, then the slag is skimmed again. During the final blowing, a slag with high iron content that can be left in the converter develops. Steels with low P, S and N content obtained. 10 ref. (D3b; O, RM-q)

179-D.* (French.) New Research on Refining With Pure Oxygen. (Oxygen-Powdered Lime.) P. Metz. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 501-511.

History. Description of the converter used for blowing with an oxygen-powdered lime mixture and of the control system. 24 ref. (D3b; O, RM-q)

180-D.* (French.) Results Obtained With a 150(Metric) Ton Electric Furnace. Gaston. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 596-601.

Operation of the "Moore Lectromelt" arc furnace. (D5, W18s)

181-D.* (French.) Continuous Casting in the "Centre National de Recherches Metallurgiques", Section Hainaut in Charleroi. J. Zaeytydt. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 617-623.

Experimental plant for continuous casting of killed basic bessemer, electric carbon or low-alloy steels. (D9q; ST-g, CN, AY)

182-D.* (French.) Regulation of the Liquid Metal Supply in Continuous Casting. W. Siegfried and B. Broniewski. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 634-643.

Regulation by varying the tilting angle of the crucible; control of the metal supply by "magnetic pumps" producing a magnetic field. (D9q, C5q)

183-D.* (German.) Refinement of Low-Phosphorus Iron in the Bessemer Converter. H. Kosmider, A. Weyel and H. Neuhaus. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 443-450.

Percentage of possible scrap addition per ton pig iron as a function of oxygen enrichment; admissible scrap quantity with different types of blast; necessary calcium additions for various Si content; slag quantity for different P and Si content. 12 ref. (D3a, D3b)

184-D.* (German.) Refining by the Rotor Process. R. Graef and L. von Bogdandy. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 467-474.

Refining takes place in rotating cylindric furnaces where oxygen is supplied under the bath surface at the same time as oxygen is blown from the top against the surface. 6 ref. (D10)

185-D.* (German.) Pig Iron With 0.5 to 1.5% P Treated by the L-D Process. Herbert Trenkler. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 474-485.

Up to 0.5% P, the common top blowing (L-D) process is sufficient. With a higher P, double slagging becomes necessary. 9 ref. (D10a; CI-a, *P*)

186-D.* (German.) Production of Special Steel by the L-D Process. O. Cuscoleca and K. Ronser. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 485-494.

Production of rail steel with 0.6% C and 0.7-0.9% Mn. When the right amount of C is reached the blowing is stopped. FeMn is added if necessary. As a rule, for carbon and alloy steels, the temperature is regulated by the addition of scrap. 7 ref. (D10a)

187-D. The Aeordynamic Approach to Furnace Design. J. H. Chesters. *Iron and Steel*, v. 32, Jan. 1959, p. 3-9.

Flow patterns and mixing in open-hearth furnaces. The fuel stream behaves initially as a free jet, entraining the relatively low-velocity air around it but, on hitting the bath, it splashes and runs forward and up the side walls. 25 ref. (D2h, W18r, 17-51)

188-D. High Yield Stainless Steel Ingots. *Iron and Steel*, v. 32, Jan. 1959, p. 27-31.

Melting operations at Spartan Steel and Alloys Ltd., Birmingham, England. (D-general; SS, 5-59)

189-D. (English.) Basic Openhearth Steelmaking in the United States. M. W. Lightner and D. L. McBride. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 567-581.

18 ref. (D2, 1-65, W18r)

190-D. (English.) Large Electric Arc Furnace Steelmaking Experience in the U.S.A. A. C. Ogan and D. J. Carney. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 601-611.

17 ref. (D5, W18s)

191-D. (English.) Some Features of Continuous Casting at Barrow. I. M. D. Halliday. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 643-649.

(D9q)

192-D. (English.) Continuous Casting at Atlas Steels Ltd. G. C. Olson. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 671-684.

(D9q)

193-D. (English.) Experience With Industrial Continuous Casting in the USSR. Gurski. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 684-691.

(D9q)

194-D. (French.) Composition and Uses of Different Pig Irons. Guy Henon. *Fonderie*, no. 155, Dec. 1958, p. 559-565.

(D-general; CI-a)

195-D. (French.) Continuous Casting of Steel in France in 1958. P. Thomas. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 667-671.

(D9q)

196-D. (French.) Converter Processes. J. Daubersky and A. Decker. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 434-443.

Survey of oxygen-enriched air and steam-oxygen mixtures. Dephosphorization with sodium carbonate and desulphurization, refractories, process control and scrap. 28 ref. (D3)

197-D. (French.) Experience With the Bessemer Converter. Marc Allard. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 451-455.

Survey of research on rational converter profiles, desulphurization with calcium and special pumps for additions in powder form. 13 ref. (D3)

198-D. (German.) A Solid of Singular Shape Formed by Solidification in an Iron Melt. Hermann Schenk, Hans Baumann and Matthias Nacken. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 773-774.

4 ref. (D8m, M28; Fe)

199-D. (German.) Experiences With the Continuous Casting of Steel in Germany. K. G. Speith and A. Bungeroth. *Revue Universelle des Mines de la Metallurgie de la Mecanique*, v. 101, Dec. 1958, p. 649-656.

10 ref. (D9q)

200-D.* (French.) Direct Reduction of Iron Ore by Electrical Process. Albert de Sy. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1161-1170.

Twin-chamber normal frequency induction furnace is used, comprising a carburizing chamber and one in which the ore is reduced by dissolved C. Results of pilot furnace (1 ton, 150 kva.) operations producing 300-kg. ingot, rolled subsequently to billets of 80 mm. diameter. Metallurgical details and economic aspects. (D6, D8j)

201-D.* (French.) Refining Pig Iron by Pure Oxygen and Powdered Lime. B. Trentini and M. Allard. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1195-1208.

O.L.P. powdered lime-pure O process using injection of powdered material into metal bath applied to industrial scale (30 tons). Basic bessemer steels produced economically with low P, S and N content. Process applicable to the whole range of P contents including hematite irons. 7 ref. (D3b)

202-D.* (German.) Calculation of Indirect Reduction in Blast Furnaces and Low-Shaft Furnaces. Georg von Struve and Rolf Ebert. *Neue Hutte*, v. 3, Oct. 1958, p. 602-607.

Determination of dissociation temperatures for various carbonates. Influence of lump size and of heating-up rates on dissociation of carbonates. Establishment and application of a new formula of computation. 10 ref. (D1, D8n, D11)

203-D.* (Russian.) Intensification of Openhearth Process by Oxygen Blowing. V. H. Kornfel'd. *Stal'*, Dec. 1958, p. 1095-1102.

Effectiveness of oxygen blowing at various periods of smelting is not equal; in a number of cases it is rational to concentrate the feeding of oxygen during pouring of hot cast iron into the furnace and during melting. 15 ref. (D2g)

204-D. Alloy Trims Open-Hearth Costs. *Iron Age*, v. 183, Feb. 12, 1959, p. 105.

Chromium and silicon costs cut with a new high-Si, high-C ferrochrome. (D2; AD-n31, *Cr, Si, C*)

205-D.* (Russian.) Reducing Head Crop of Rimmed Steel Heavy Ingots. M. P. Sabiev. *Stal'*, Dec. 1958, p. 1089-1095.

Reducing duration of rimming and simultaneous addition of 45% ferrosilicon. By using a moderate rate of filling the casting mold it is possible to attain a dense peri-ferritic layer of sufficient thickness to give a good rolling surface. (D9p, D11r, AD-r30)

206-D. (Book-Russian.) Problems of the Use of Vacuum in Metallurgy. A. M. Samarin, Editor. 165 p. 1958. Akademiia Nauk SSSR, Moscow, USSR. $1.

Papers abstracted separately as Henry Brutcher translations. (D8m, C5, C25, 1-73)

207-D. (Translation—BISI, no. 1055.) Experiments Carried Out in the Plant on Smelting of Conakry Ore. Wilhelm Wolf, Wilhelm vor dem Esche and Helmut Sysocki. *Stahl und Eisen*, v. 78, July 24, 1958, p. 1020-1027.

See item 435-D, 1958. (D1a; CI-a)

208-D. (Translation—BISI, no. 1083.) Properties of Oxygen-Blown Converter Steel. P. Ya. Ryzhkov. *Stal'*, July 1958, p. 643-647.

See item 439-D, 1958. (D3f, Q-general; ST)

209-D. (Translation—BISI, no. 1113.) Reduction of Iron Oxides in a Layer at High Gas Phase Pressure. A. S. Tumarev and L. A. Panyushin. *Stal'*, Sept. 1958, p. 769-776.

See item 532-D, 1958. (D1, 3-74)

210-D. (Translation—BISI, no. 1118.) Dust Formation in Openhearth Furnaces When Oxygen is Used to Speed Up the Process. Yun Son Chol and E. V. Abrosimov. *Stal'*, June 1958, p. 506-509.

See item 396-D, 1958. (D2g, D11g)

211-D. (Translation—BISI, no. 1164.) The Rotor Process. Edgar Spetzler. *Neue Hutte*, Feb. 1958, p. 85-93.

See item 273-D, 1958. (D10c)

212-D. (Translation—BISI, no. 1193.) Utilisation of Manganese in Ferromanganese When Operating the Blast Furnace on Oxygen-Enriched Blast. A. N. Red'ko. *Metallurg*, v. 3, Sept. 1958, p. 7-10.

See item 486-D, 1958. (D1; Fe, Mn, AD-n)

213-D.* Removal of Sulphur From Hot Metal. A.J. Deacon, D.B. Powell and E.C. Rudolphy. Digest from "Desulphurization of Hot Metal—Production Evaluation", AIME Openhearth and Blast Furnace Conference", Apr. 1958. *Metal Progress*, v. 75, Feb. 1959, p. 148.

Reduction of sulphur from 0.053 to 0.033% (these are averages) was accomplished by pneumatic injection of a 4:1

calcium carbide-calcium oxide mixture, finely ground and conveyed by dry nitrogen. Blast furnace production increased from 2.9 to 5.5%, while coke rate decreased about 3.75%. (D11n, D1)

214-D.* Ferrous Metals. A.B. Everest. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 13-61.

Production, grading and refining of pig iron; melting and refining cast iron in cupola, electric or other types of furnace. Composition control and alloys. Effect of alloys on microstructure of cast iron. Melting and refining of steel. (D-general, E10, E25q, 2-60; CI, ST)

215-D. (Russian.) Isothermal Processes in a Blast Furnace, M.I. Kochnev. *Izvestiya Akademii Nauk. Otdelenie Teknicheskikh Nauk*, no. 11, 1958, p. 121-123.

Review of papers from 1945 to 1955 dealing with heat transmission in blast furnaces. 23 ref. (D1)

216-D. (German.) Importance of Water Supply and Waste Water Systems for the Iron and Steel Industry. Karl Hans Koch. *Stahl und Eisen*, v. 79, Jan. 22, 1959, p. 89-94.

(D-general, W10h, A8)

217-D. (German.) Direct Reduction Processes Eliminate the Blast Furnace. Jacob Willems. *Stahl und Eisen*, v. 79, Jan. 22, 1959, p. 74-80.

Krupp Renn, RN, Leramie, Sturzelberg, Basset, Hoganas, Wiberg, Lurgi, Madaras, H-Iron, A.D. Little, Shipley, Onia and Stelling processes. 17 ref. (D8j)

218-D.* (German.) Use of Oxygen in Steelmaking. W.G. Woskoboinikow. *Neue Hutte*, v. 4, Jan. 1959, p. 10-17.

Various processes with oxygen enriched air and pure oxygen with powdered limestone. Influence of S and P in the pig iron, and FeO in the slag, on steel composition. (D3b; ST, S, P)

219-D.* (Russian.) Shrinkage Phenomena of Steel Ingots During Continuous Casting. V.S. Rutes and V.A. Leites. *Liteinoe Proizvodstvo*, Dec. 1958, p. 10-12.

Quantitative change of solid and liquid phases depending upon changing temperatures; change in cooling conditions; evolution of latent heat of crystallization; phase transformations cause shrinkage. (D9q, P10c, 2-61; ST, 4-59)

220-D.* International Low-Shaft Furnace. H. Malcor. *Iron and Coal Trades Review*, v. 177, Dec. 26, 1958, p. 1507-1515.

Experimental furnace at Ougree, Belgium, cannot consume large quantities of fine ore economically. (D8n, D1, W17h)

221-D.* Thermodynamic Studies of Metallurgical Reactions. L. A. Schwarzman. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 609-625.

Distribution equilibria of elements between liquid Fe and slags of various compositions; determination of thermodynamic activity of elements dissolved in liquid Fe. 16 ref. (D11, P12, 1-59; Fe, 14-60, ST)

222-D.* (Russian.) How to Reduce Sulphur Content in Pig Iron During the Blast Furnace Process. I. I. Korobov. *Metallurg*, Jan. 1959, p. 7-9.

Temperature increased to 1300°C. or higher; improved tuyere efficiency; better regulation of slag temperature yields good results. (D1; CI-a, S)

223-D.* (Russian.) Cooling Blast Furnaces With Water Used for Slag Granulation. T. T. Nesterenko. *Metallurg*, Jan. 1959, p. 9-10.

Water is used subsequent to the granulation process. (D1h)

224-D.* (Russian.) Effect of Technological Factors on Structural Steel Quality. K. K. Prochorendo and N. P. Shchenkin. *Metallurg*, Jan. 1959, p. 11-14.

Quality can be affected by blisters, nonmetallic inclusions, cracks; ragging, which is a form of longitudinal cracks, occurring during forging. Remedies suggested in each case. (D-general, F-general; ST, 9)

225-D.* (Russian.) Desulphurization of Steel Made in Induction Furnace With Direct Current. O. A. Esin, S. I. Popel and S. G. Bratchikov. *Zhurnal Prikladnoi Khimii*, v. 31, no. 12, 1958, p. 1837-1842.

It is possible to desulphurize the metal by slag electrolysis. S content was reduced from 0.024% to 0.006%. 4 ref. (D6, D11n)

226-D. Augmenting Pig Iron Production at Houston. Carl Leinert. *Blast Furnace and Steel Plant*, v. 46, Sept. 1958, p. 953-956, 965.

Increased production with improved Fe analysis resulted with incorporated bedded, screened and sintered materials. (D1a, Fe, RM-n)

227-D. Steelmaking Reviewed. A. Noel Whiting. *British Chemical Engineering*, Feb. 1959, p. 98-99.

Notes on the conference at Liege sponsored by Centre National de Recherches Metallurgiques, the Groupement des Industries Siderurgiques Luxembourgeoises and the Groupement des Hauts Fourneaux et Acieries Belges. (D-general)

228-D. Progress in the Continuous Casting of Steel. *Engineers' Digest*, v. 20, Jan. 1959, p. 41-44.

History of continuous casting, survey of practice throughout the world. (D9q)

229-D. (German.) Automatic Charging of Low-Shaft Furnaces. Werner Schilling. *Neue Hutte*, v. 4, Jan. 1959, p. 22-28.

6 ref. (D1a, W17h)

230-D. (Russian.) Automation of Open-hearth Furnaces in USSR. V. Iu. Kaganov. *Stal'*, Jan. 1959, p. 16-24.

Automatic control systems for various stages of steelmaking; compares systems in various steel mills of USSR. 6 ref. (D-general, 18-74)

231-D.* Ironmaking Without Blast Furnaces. J. McKelvie. *British Chemical Engineering*, Feb. 1959, p. 70-74.

Low-shaft process, rotary kiln processes, sponge iron process, HyL process, fluidized bed and direct reduction processes. 27 ref. (D8)

232-D.* Measurement of the Relative Mobility of Cations in Mixtures of Oxide Melts. V. I. Malkin and L. A. Schwarzman. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 539-548.

Measurement of the transference numbers of ions in mixtures of fused oxides gives information on the relative mobility of the ions, this information being important for extending our knowledge of the structure of liquid silicates, phosphates and similar systems close in composition to metallurgical slags. 10 ref. (D11n, 1-59; RM-q)

233-D.* (French.) Recarburization of Cast Iron and Steel by Blowing With Powdered Substances. Bernard Trentini, Michel Rossi and Albert Jacquin. *Fonderie*, no. 156, Jan. 1959, p. 25-39.

Melt is contained in a barrel-shaped ladle and powdered graphite, coke, charcoal or coal blown under the bath surface by compressed air. Effect of rate of power supply and time on recarburization. 10 ref. (D2f, D9m; CI, CN, *C*)

234-D.* (German.) Continuous Casting. Reinhold Baake and Harry Rosahl. *Neue Hutte*, v. 3, Dec. 1958, p. 740-746.

Continuous casting of 200 × 300-mm. sections. Plant uses stoppers and spouts of graphite fireclay and paraffin lubricated pulsating molds with adjustable walls. (D9q)

235-D.* (German.) Nitrogen Pick-Up in Converter Refining. Gerhard Naeser and Werner Scholz. *Stahl und Eisen*, v. 79, Feb. 5, 1959, p. 137-141.

Oxygen in the gas phase, or high content of ferrous oxide in melting process limits the velocity of N pick-up. Decrease in Fe surface stress by ferrous oxide enriches O, which delays the penetration of N. 9 ref. (D3b; *O, N*)

236-D.* Source of Nonmetallic Inclusion in Steel Ingot. T. Saito and R. Shimanuki. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 362-374.

Radioisotopes CA^{45} as CaO and Zr^{95} as ZrO_2 were impregnated in the pouring refractories, which are the source of inclusions. Mild steel was melted and refined in a 150-kva. Heroult furnace, tapped into the tagged ladle and an ingot of about 90 kg. was obtained. Nonmetallic inclusions extracted from the ingot, ingot scum, slag and all other radioactive products were collected, weighed and counted. 5 ref. (D9p, 2-61, 1-59; Cn, 5-59, RM-h, 9-69, *Ca, Zr*)

237-D.* Assessment Trial of the Quality of Refractory Materials Used in a Casting Pit and the Distribution of Nonmetallic Inclusions in Steel by Means of Radioactive Tracers. Z. Bojarski, W. Orzeszko, S. Pawlowski, R. Wusatowski and Z. Ziolowski. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 388-410.

Investigation of the distribution and amount of nonmetallic inclusions originating from refractories used in a casting pit by means of Fe^{59}. The radioisotope in the form of Fe_2O_3 was introduced into the fireclay batch used for brickmaking. 6 ref. (D9, 1-59; RM-h, 9-69)

238-D.* (Russian.) Semi-Continuous Casting of Cast Iron Pipes. A. D. Popov. *Liteinoe Proizvodstvo*, Jan. 1959, p. 5-8.

New machine casts pipe 150 mm.in diameter, 10 mm.thick and 4 m. long, as well as steel slabs 150 by 150 mm. in cross section. High rate of cooling results in a fine crystalline structure. (D9q, E14, 1-52; CI-b, 4-60)

239-D.* Continuous Casting of Steel in the USSR. M. S. Boichenko, V. S. Rutes, D. P. Evteev and B. N. Katomin. *Iron and Steel Institute, Journal,* v. 191, Feb. 1959, p. 109-121.

Design of pouring equipment, molds and secondary cooling facilities. Factors affecting quality, heat exchange and solidification of steel under continuous casting conditions. Outlook for process. (D9q)

240-D.* Continuous Casting at Barrow. Iain M. D. Halliday. *Iron and Steel Institute, Journal,* v. 191, Feb. 1959, p. 121-163.

Procedures for high-speed continuous casting of small sectioned steel billets, single and twin strand operation with manual or automatic control. Features of ladles, tundish, spray nozzles, pre-heat practice, metal temperature control, reciprocating mold, product, structure and quality. (D9q)

241-D.* The Behavior of Various Elements in Vacuum Steelmaking. G. M. Gill and G. Wesley Austin. *Iron and Steel Institute, Journal,* v. 191, Feb. 1959, p. 172-175.

Small-scale vacuum melting experiments in induction and arc furnaces to determine effects of vacuum melting on Si, Mn, Ni, Mo, Cu, Ti, W, Co, Sn, Pb, As, S and V content of iron and steel. 5 ref. (D8m; Fe, ST, Si, Mn, Cr, Ni, Mo, Cu, Ti, W, Co, Sn, Pb, As, S, V)

242-D.* (French.) Thermal Balance and Coke Consumption of Blast Furnaces. A. Poos and A. Decker. *Revue Universelle des Mines, de la Metallurgie, de la Mecanique,* v. 15, Jan. 1959, p. 19-32.

Top gas analysis in relation to amount of coke charge. 15 ref. (D11k, D1)

243-D.* (French.) Blast Furnace Operation With 95% Sintered Ore. A. Firket and J. Molderez. *Revue Universelle des Mines, de la Metallurgie, de la Mechanique,* v. 15, Feb. 1959, p. 93-106.

Permeability of the furnace charge measured in relation to blast pressure, heating power of the gas, formation of dust and its characteristics; quality of Fe and of the slag. 8 ref. (D1a, B16a)

244-D.* Air Melting Iron-Aluminum Alloys. Victor F. Zackay and William A. Goering. Digest from paper presented at National Meeting of A.I.M.E. *Metal Progress,* v. 75, Mar. 1959, p. 194-195.

Procedures which will produce air-melted alloys with tensile properties equal to vacuum melted products. (D6, D9, F23; Fe-b, *Al*)

245-D.* Effect of Nozzle Shape on Pouring Stream. R. E. Stoll and E. C. Rudolphy. Digest from paper presented at 41st A.I.M.E. Openhearth and Blast Furnace Conference. *Metal Progress,* v. 75, Mar. 1959, p. 208-210.

Development of a tapered nozzle for the intermediate pouring ladle which gives a much smoother, less turbulent stream than the standard straight-sided nozzle. (D9p, W18n; RM-h, 17-51)

246-D. (Book.) Surface Defects in Ingots and Their Products. 2nd Ed. Special Report no. 63. 58 p. 1958. Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1, England. 25s.

Definition and illustration of defects and their usual causes. Surface defects present in ingots; defects in semifinished and finished products arising from ingot defects. Processing defects, defects in rolled steel strip arising from steel itself and from processing. (D9, F21, F23; ST, 9-68, 9-71)

247-D. (Translation.) Phoenix-Lance Steelmaking. H. Th. Brandi. *Journal of Metals,* v. 11, Feb. 1959, p. 118. (From *Stahl und Eisen,* June 26, 1958.)

See item 15-D, 1959. (D3f)

248-D. (Translation—BISI no. 736.) Oxygen Utilization in a 250-Ton Openhearth Furnace. S. I. Lifshits and I. F. Sochan. *Stal',* May, 1957, p. 402-405.

See item 1-D, 1958. (D2g, W18g; 1-52, ST)

249-D. (Translation—BISI no. 915.) Operational Results When Blowing Basic Bessemer Melts Using the IRSID Opacimeter. Hans vom Ende and Gustav Mahn. *Stahl und Eisen,* v. 78, Apr. 3, 1958, p. 412-418.

See item 200-D, 1958. (D3b, 1-65, 1-54; ST)

250-D. (Translation—BISI no. 1030.) Model Studies on the Flow in Openhearth Furnace Regenerators. Michael Hansen. *Stahl und Eisen,* v. 78, June 12, 1958, p. 804-812.

See item 443-D, 1958. (D2, S18q, W18r)

251-D. (Translation—BISI no. 1044.) Four-Period System of the Complex Automatic Control for a Fuel Oil Fired Openhearth Furnace. V. P. Borodin. *Stal'*, Feb. 1958, p. 114-120.

See item 206-D, 1958. (D2, RM-k30, 18-74)

252-D. (Translation—BISI no. 1056.) Tests Carried Out in the Plant for Smelting Conakry Ore. Pt. 2. Extraction of Chromium From the Pig Iron by Refining With Pure Oxygen in the Ladle. Wilhelm Wolf. *Stahl und Eisen*, v. 78, Aug. 7, 1958, p. 1100-1107.

See item 468-D, 1958. (D3, D11r; Cr)

253-D. (Trandlation—BISI no. 1062.) Hydrodynamic and Practical Examination of the Movement of the Bath in the Bottom-Blown Converter. P. Leroy and G. Cohen De Lara. *Revue de Metallurgie*, v. 55, Feb. 1958, p. 186-200.

See item 184-D, 1958. (D3b)

254-D. (Translation—Brutcher no. 4363.) Effect of Melting Practice Upon Properties of Stainless Steel. R. S. Belyakov. Paper from "Problems of the Use of Vacuum in Metallurgy", Moscow, 1958, p. 35-38.

Production of 18-8 stainless steel in vacuum induction furnaces for lowest possible carbon contents. Final furnace pressure needed to impart to 18-8, free from any stabilizing additions, complete resistance to intergranular corrosion and high resistance to corrosion in boiling 50% nitric acid. (D8m; SS)

255-D.* (French.) Effect of Openhearth Process on Quantity and Nature of Nonmetallic Inclusions. Silvia Dascalu. *Revue de Metallurgie (Bucharest)*, v. 3, no. 3, 1958, p. 87-100.

Influence of decarbutization speed, refining time, carbon content, ratio of Mn to Si, FeO content and melting practice. (D2; ST, 9-69)

256-D.* (German.) Basic Differences in Steel Refining Processes. Werner Heischkeil and Theo Kootz. *Stahl und Eisen*, v. 79, Feb. 19, 1959, p. 205-210.

Bottom blowing of air in converter and openhearth refining produce different metallurgical reactions which are dependent on the nature of the air supply. Application of oxygen blowing to steelmaking. 10 ref. (D3b, D2g)

257-D.* (Hungarian.) Metallurgy of High-Purity Iron Production. Bela Vecsey. *Kohaszati Lapok*, v. 91, Sept. 1958, p. 406-409.

Production of pure Fe in coreless induction furnaces operated in vacuum; reduction with carbon and reduction by hydrogen in induction melting. 23 ref. (D6, 1-73; Fe-a)

258-D.* (Hungarian.) Electric Furnace Steelmaking. Laszlo Szoke. *Kohaszati Lapok*, v. 91, Sept. 1958, p. 427-433.

Vacuum melting processes; comparison with openhearth technique. 22 ref. (D5, 1-73)

259-D.* (Polish.) Effect of Blast Humidity Upon Blast Furnace Operation. Marian Folfasinski. *Hutnik*, v. 25, Nov-Dec. 1958, p. 464-466.

Blast furnace control by varying temperature and moisture of blast in relation to quality and quantity of pig iron production. (D1a)

260-D.* Principles of Blast Furnace Design and Application of High Top Pressure With Oxygen-Enriched Blast. A. K. Shaha. *Institution of Engineers (India), Journal*, v. 39, Dec. 1958, p. 396-419.

Saving of coke, and increase and economy in production of iron and steel, may be obtained by the introduction of high top pressure and a blast with constant moisture enriched by oxygen. (D1h, W17g, 3-74, 17-51)

261-D.* Vacuum Melting of Steels. H. C. Child and G. T. Harris. *Blast Furnace and Steel Plant*, v. 47, Mar. 1959, p. 281-290.

Vacuum induction and consumable-electrode vacuum arc processes and equipment. 11 ref. (D5a, D6, D8m, 1-52, 1-73)

262-D.* Iron by Direct Reduction. J. Grindrod. *Mining Magazine*, v. 100, Feb. 1959, p. 73-78.

Strategic-Udy process. (D8j)

263-D.* Petroleum Techniques for Steel. F. D. Hoffert, E. A. Kelly and A. M. Squires. *Mechanical Engineering*, v. 81, Jan. 1959, p. 27-30.

H-iron process utilizing oil or natural gas and fluidized beds. (D8j)

264-D.* Sponge Iron Production. J. Grindrod. *Mining Journal*, v. 252, Feb. 13, 1959, p. 173-174.

New direct reduction process, known as the Hyl process, which produces sponge from iron ore and natural gas or petroleum without coal or limestone. (D8j; Fe, 6-74)

265-D.* (French.) Carburization and Decarburization in Low-Frequency Induction Furnaces. M. E. Calamari. *Journal du Four Electrique*, v. 6, Dec. 1958, p. 225-228.

Experimental study established possibility of attaining temperatures high enough to produce all types of alloy steels in this kind of furnace; possibility of carburization and decarburization. Life of refractory linings is good. (D6; AY)

266-D. Static Control Provides Blast Furnace Automation. Neal J. Behne, H. C. Diener, Jr., and J. Raymond Erbe. *Iron and Steel Engineer*, v. 36, Feb. 1959, p. 127-138.

Automatic charging system for single-strip furnace. Advantages of magnetic core-type static control elements. (D1a, 18-74)

267-D. Development of the British Iron and Steel Industry. Peter Cameron. *Junior Institution of Engineers, Journal*, v. 69, Pt. 5, Feb. 1959, p. 142-156.

Modern plants and processes. (D-general)

268-D. Electric Furnaces to Gain in Direct Reduction of Ore. *Steel*, v. 144, March 16, 1959, p. 122, 125-126, 128.

Electric smelting, strategic-Udy and other non-blast furnace processes. (D5, D8)

269-D.* (French.) L. D. Process. D. Flament. *Metallurgie et la Construction Mecanique*, v. 91, Feb. 1959, p. 79-82.

Chemical composition of raw materials, steel, slag and dust compared with open-hearth practice. (D10a)

270-D.* (Polish.) Pig Iron Reduction by Low Shaft Furnaces. H. J. Lux. *Hutnik*, v. 25, Nov-Dec. 1958, p. 432-440.

Chemical composition of Fe ore, slag, and coke used in low-shaft furnace production; properties of pig iron and gas. (D8n)

271-D.* LD Steelmaking in Japan. Kaname Mochizuki. *Journal of Metals*, v. 11, Mar. 1959, p. 178-180.

Plant layout, crucible lining, charging and operation; range of product and future prospects. (D10a)

272-D.* Bessemerizing the Blast Furnace Bath. Kuro Kanamori. *Journal of Metals*, v. 11, Mar. 1959, p. 184-186.

Design of small experimental blast furnaces with special tuyere for blowing oxygen-enriched air and powdered materials directly into metal bath. Effect of bessemerizing on metal temperature, and on content of carbon, Si, S and Cr. (D1h; CI-a, *C, Si, Cr*)

273-D.* (Hungarian.) Economic Aspects of Blast Furnace Operations. Ferenc Gemes. *Kohaszati Lapok*, v. 91, Oct-Nov. 1958, p. 469-476.

Role of coke; evaluation of coke consumption data based on actual plant practice; utilization of blast furnace gas; relationship between CO_2 content of blast furnace gas and hearth area. (D1)

274-D.* (Hungarian.) Corrosive Effects of Flue Gas. Klara Mayr. *Kohaszati Lapok*, v. 91, Oct-Nov. 1958, p. 504-508.

Formation of sulphuric acid during blast furnace combustion; relationship between dew point of H_2SO_4 and the rate of corrosion. 13 ref. (D1, R6g)

275-D. (French.) Effect of Sinter Charges on the Blast Furnace Performance. J. S. McLean. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 507-518.

Increase of sinter ore in the charge is followed by increased output and reduced coke consumption. (D1a)

276-D. (French.) Sintered Ores Used in the Dorman Long Blast Furnace Co., Middlesbrough, England. J. H. Patchett. Paper from "International Symposium on the Sintering of Iron Ores". v. 1 and 2. l'Institut de Recherches de la Siderurgie (IRSID), Paris, France, 1957, p. 523-546.

Effect on the use of sintered ores on coke consumption, Si and S content in the iron and on the dust produced in smelting. (D1a, B16, 2-60; Fe, *Si, S*)

277-D. (German.) Automation in the Primary Industries, With Special Reference to the VEB Eisenwerke West, Calbe (Saale), East Germany. Kurt Walter. *Freiberger Forschungshefte*, v. B32, Dec. 1958, p. 5-53.

Automation applied to blast furnace charging and cowper stoves. 23 ref. (D1a, 18-74)

278-D. (German.) How to Eliminate the Disproportion Between Charging Speed and Production Speed of Low-Shaft Furnaces. Werner Schilling. *Freiberger Forschungshefte*, v. B32, Dec. 1958, p. 55-114.

Proposals for improvements in the design of automatic equipment. 10 ref. (D8n, W17h, 18-74, 17-51)

279-D. (German.) Heat Economy of the Low-Shaft Furnace and Furnace Developments in the German Democratic Republic. Gottfried Jacob. *Neue Hutte*, v. 4, Feb. 1959, p. 75-84.

Characteristics of the process and conditions of investigation; direct and indirect reduction with regard to special conditions existing in the low-shaft furnace; heat economy and thermal characteristics; conclusions. 23 ref. (D8n, W17h)

280-D. (Russian.) Accelerated Filling of Feeder Heads in Lamellar Ingots. G. A. Chikalenko and T. I. Oleshkevich. *Metallurg*, Feb. 1959, p. 11-13.

Strip rolled from lamellar ingots poured by use of feeder heads is of improved quality and the pouring time from a 135-ton ladle is reduced by 8-10 min. (D9p)

281-D.* (Russian.) Improvements in the Surface Quality of Rimming Steel Ingots. A. G. Nikolaev, Z. I. Ryabov, P. G. Chernogrud and D. K. Pugachev. *Stal'*, Feb. 1959, p. 123-124.

Results of lining rimming steel ingot molds with a 1-mm. thick cup (sleeve) of steel. The sleeve is dissolved by the molten boiling steel and forms no inclusions in the ingot. Use of such linings decreased scab formation and increased the subsequent strip rolling capacity by 30%. (D9k, 9-71, 5-59, ST-d)

282-D.* (Russian.) Production of Generator Steel in a 200-Ton Openhearth Furnace. V. F. Agapov and I. A. Tkachenko. *Stal'*, Feb. 1959, p. 125-128.

To decrease formation of cracks during ingot casting and scabs in subsequent rolling Mn content is limited to 0.25-0.40%. Insertion of a 1-mm. strip of steel in the ingot mold sharply reduced scab formation. (D9k, 2-60; Mn, 9-71)

283-D.* (Russian.) Quality Improvements in the Production of Transformer Steel. N. V. Keis, D. G. Zhukov and A. M. Khizhnichenko. *Stal'*, Feb. 1959, p. 130-131.

Use of moisture-free oxygen at 1570-1590° C. and vacuum treatment lead to considerable increase in yield of superior grade steels and reduce sharply the surface flaws of the slabs. (D9s, 1-73; SGA-n 9-71, ST)

284-D.* (Russian.) Influence of Magnesium on Steel Quality. I. A. Andreev and A. Ya. Borisov. *Stal'*, Feb. 1959, p. 131-136.

Magnesium additions sharply reduce the quantity and dimensions of nonmetallic inclusions in steel. Use of Mg or Ca as a constituent in complex deoxidizers is advisable. Reduction of Si impurities in low-Si steel. Special reference to control of the quantity of spinel in steels containing 1.5% Si. 6 ref. (D5c, 2-60; 9-69, AD-r31, ST, *Mg, Si*)

285-D.* Billets and Bessemers. H. McC. Lawrence. *Engineer and Foundryman*, v. 24, Feb. 1959, p. 43-47.

Design, construction and operation of a small melting plant. (D3, W18q)

286-D.* (German.) Degassing of Steel Used for Rolling and Forging. Fritz Harders, Helmut Knuppel and Karl Brotzmann. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 267-272.

Process consists of ligting the melt by suction from the ladle into a vacuum vessel and repeating vacuum degassing until the hydrogen, nitrogen, oxygen and carbon content of the melt reach the desired level. (D9s, 1-73)

287-D.* (German.) Maintenance of High Temperature in Large-Scale Degassing of Steel. Helmut Knuppel, Karl Brotzmann, Karl Ruttiger and Arnulf Diener. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 272-276.

Heat losses in degassing process and methods to reduce their effect by introducing supplementary heat to degassing vessel either by electric resistance or electric arc heating. (D9s)

288-D.* (German.) Steel Degassing by Circulation Method. Herbert Thielmann and Hermann Maas. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 276-282.

Movable vessel has two pipes extending into the melt contained in the ladle. Suction produced by vacuum in the vessel, together with argon carrier gas introduced into one of the pipes, lifts the melt for degassing while the purified metal flows back into the ladle through the other pipe. 12 ref. (D9s)

289-D.* (German.) Refining Basic Pig Iron in the Trough of a Blast Furnace. Karl Ernst Mayer. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 303-304.

Preliminary refining of pig iron, particularly reduction of Si, Mn and C attained by blowing oxygen through bottom of trough made of porous cement. (D1; *Si, Mn, C, O*)

290-D.* Developments in Blast Furnace Practice. T. P. Colclough. *NML Technical Journal*, v. 1, Feb. 1959, p. 59-67.

Crushing, sizing and sintering of ores. Use of high top pressure, self-fluxing sinter, high blast temperatures, steam additions and oxygen enrichment. 7 ref. (D1a, D1h, B16a; Fe, RM-n)

291-D.* Iron Pretreatment Research. J. A. Charles. *NML Technical Journal*, v. 1, Feb. 1959, p. 68-79.

Effect of rate and continuity of oxygen introduction and of slag making additiona on the removal of Si and phosphorus under acid or basic conditions in ladle. Refinement achieved by streaming liquid Fe through atmosphere of oxygen in a refractory tower structure. Dephosphorization resulting from injection of powdered lime and other fluxes with oxygen. 6 ref. (D8n, D10)

292-D.* Blast Furnace Burden Preparation With Reference to High Ash Coke. R. F. Jennings and A. M. Frankau. *NML Technical Journal*, v. 1, Feb. 1959, p. 80-87.

Crushing and sintering of Indian ores. Experience with sinter burden and resulting improvement in production. 9 ref. (D1a, B16a)

293-D.* Experience With Los-Shaft Furnace at Ougree. H. Malcor. *NML Technical Journal*, v. 1, Feb. 1959, p. 88-104.

Layout of pilot low-shaft furnace. Performance with varying proportions of ore fines, low-grade ores, extruded ores or agglomerates, coke breezes, semi-coke and highly volatile coals in the burden. Quality of pig iron. (D8n, W17h)

294-D.* On the Bottom Blow Processes and the LD-AC Process. P. Coheur. *NML Technical Journal*, v. 1, Feb. 1959, p. 105-114.

Nitrogen, phosphorus and sulphur contents of steel obtained by blowing high and low pig irons with atmospheric air, oxygen-enriched air or oxygen-steam mixtures in basic bottom-blown converters. Slag control procedures. Composition and mechanical properties of steel produced by blowing powdered lime and oxygen into converter by means of a lance. 17 ref. (D3b, D10a)

295-D.* Steelmaking by Injection of Oxygen and Lime Powder Irsid-O.L.P. Process. B. Trentini and M. Allard. *NML Technical Journal*, v. 1, Feb. 1959, p. 115-120.

Refining low and high-phosphorus pig irons with oxygen and powdered lime injected by a lance introduced at the top of a solid-bottom basic converter. Slag control; composition and mechanical properties of steel. (D10, D3)

296-D. Four Modern Control Systems for the Steel Industry. P. A. Travisano. *Control Engineering*, v. 6, Mar. 1959, p. 122-127.

Static control, data logging, program control and director systems. (D-general, S18, X-general)

297-D. Japanese Research on Physical Chemistry of Steelmaking. Tasuku Fuwa. *Journal of Metals*, v. 11, Mar. 1959, p. 170-172.

Equilibria of carbon and oxygen, oxygen and hydrogen and sulphur and hydrogen in molten iron. Solubility of gaseous elements, solubility of carbon; slag-metal distribution; hydrogen problems; emf studies; conductivity measurements; viscosity; kinetic study; statistical-thermodynamic studies. (D11)

298-D. (Russian.) Control of Gas Flow in Blast Furnace Shaft. N. N. Babarykin. *Stal'*, Feb. 1959, p. 101-105.

With increasing gas pressure on the charge in blast furnace the amount of interparticle voids is reduced by 2.8-4.9%. (D1, S18r)

299-D. (Russian.) Conversion of 400-Ton Openhearth Furnace to Firing With Sulphurous Fuel Oil. F. D. Voronov, E. I. Dikshtein, K. A. Zuts and A. G. Trifonov. *Stal'*, Feb. 1959, p. 112-116.

Melting period was reduced from 13 hr. to 12 hr. 15 min.; brickwork withstood 274 melts instead of 174; fuel consumption was reduced. (D2h; RM-k)

300-D.* Nitrogen Content of Electric Steel: Investigations in France and Belgium. *Iron & Coal Trades Review*, v. 178, Mar. 27, 1959, p. 733-735.

Nitrogen contents of openhearth steels are slightly lower than those of electric steels when dealing with cold charges and for the same grades of steel. (D2, D5; ST-f, *N*)

301-D.* (Spanish.) Iron and Steelmaking, With Special Reference to the Use of Oxygen in the Manufacture of Steel. J. L. Harrison. *Instituto del Hierro y del Acero*, v. 11, Oct-Dec. 1958, p. 229-257.

Use of oxygen in conventional and low-shaft blast furnaces and in production of

ferro-alloys; projected line of development of blast furnace practices with oxygen. Oxygen furnace processes, techniques and results. 38 ref. (D-general, D10, D2g; *O*)

302-D.* Direct Reduction of Iron Ore. R. R. Rogers. *Canadian Dept. of Mines and Technical Surveys, Mines Branch,* IC 109, Oct. 1958, 11 p. $.10.

Status of direct reduction; review of processes. (D8j)

303-D. (Translation.) Blast-Furnace Operation at 1.5 Atmospheres. L. Y. Lenn, I. A. Kuzmin, L. D. Kailov and A. B. Shur. *Iron & Coal Trades Review,* v. 178, Feb. 13, 1959, p. 381-385. (From *Stal',* v. 18, Nov. 1958)

See item 68-D, 1959. (D1b)

304-D. (Translation.) Desulphurization of Renn "Luppen" in the Solid State. M. Wahlster and C. B. Schmidt. *Iron & Coal Trades Review,* v. 178, Feb. 29, 1959, p. 493-494. (From *Technische Mitteilungen Krupp,* v. 16, no. 2, 1958.)

Krupp-Renn process. (D8j)

305-D. (Translation-BWRA) A New Method of Producing Shaped Castings and Ingots Without Feeder Heads by Adding Electro-Slag Metal. G. S. Belous and D. A. Dudko. *Automaticheskaja Svarka,* v. 65, Aug. 1958, p. 32-34.

Molten electroslag metal, formed by fusing a thick electrode in a slag pool, is added to the top of a casting during crystallization. Current is supplied from a generator or a transformer with a flat volt-ampere characteristic. The current passes through the molten slag, which is a good conductor, and heats it to a temperature considerably above the melting point of steel. The metal electrode melts evenly, supplementing the crystallizing molten metal bath of the casting. Since metal is added continuously, homogeneity and absence of pipe in the casting are achieved. (D9k)

306-D.* Making and Treating Alloy Steel Plates. Pt. 1. R. Russell Fayles. *Industrial Heating,* v. 26, Mar. 1959, p. 515-516, 518, 520, 522.

Successful operations imply a sufficiently high carbon content at first test to permit a good heat workout prior to tapping. Slag oxide should attain levels of from 15 to 18% FeO with a lime-silica ratio above 2.8. Bath temperature should be controlled to avoid excessive pouring temperatures. (To be continued.) (D9; AY, 4-53)

307-D.* Dravo Gets American Rights to Swedish Steel Process. *Steel,* v. 144, Apr. 20, 1959, p. 92, 95.

Stora-Kaldo process using tilting, rotating oxygen converter. (D10b)

308-D. Fuel Efficiency in the Iron and Steel Industry. R. P. Towndrow. *Institute of Fuel, Journal,* v. 32, Mar. 1959, p. 106-109.

(D-general, A4, A11e)

309-D. Bessemers Used at Lorain to Make Leaded Steel. *Steel,* v. 144, Mar. 30, 1959, p. 82, 84.

Addition of Pb to melted free machining steel. (D3; ST, *Pb,* AD-q40)

310-D.* Defects in Steel: A Tentative Theory. T. F. Pearson. *Iron and Steel Institute, Journal,* v. 191, Mar. 1959, p. 219-232.

Statistical survey of the defects occurring in a total of over 1000 casts of basic semikilled plate steels. If the casts are classified according to the silica contents of their tapping slags, then the average defect values expressed quantitatively when plotted against the silica contents give rise to a characteristic and complex curve which shows a minimum average defect level at 13-14% silica. 8 ref. (D9; 9)

311-D.* Vacuum Treatment of Steel by the Bochumer Verein Stream Degassing Process. A. Tix, G. Bandel, W. Coupette and A. Sickbert. *Iron and Steel Institute, Journal,* v. 191, Mar. 1959, p. 260-265.

New degassing method reduces hydrogen content and thus produces flake-free forgings. The low total oxygen and inclusion content of the vacuum-treated steel leads to an improvement in toughness. The method can be applied to the degassing of large quantities of steel and production of small ingots of high-alloy steels. (D9s, 1-73)

312-D.* Vacuum-Induction Melting. F. N. Darmara, J. S. Huntington and E. S. Machlin. *Iron and Steel Institute, Journal,* v. 191, Mar. 1959, p. 266-275.

Basic principles of the process, with examples of improvements obtained in the physical properties of Waspaloy and 52100 steels. 13 ref. (D8m, C25, 1-69; Ni-b, AY)

313-D.* Principles of Heat Transfer in the Fuel Efficiency of Blast Furnace. B. I. Kitayev, Rajendra Kumar and S. G.

Mukherjee. *Indian Institute of Metals, Transactions*, v. 11, Dec. 1959, p. 3-20.

Mechanism of heat transfer, heat exchange zones, distribution of temperature and CO_2 concentration along height of blast furnace. Calculation of heat transfer coefficients. Effect of blast temperature and oxygen enrichment on coke consumption. 12 ref. (D1a, D1h, D11k)

314-D.* Removing S and P. N. L. Evans and Achille Lefebvre. *Iron & Steel*, v. 32, Apr. 1959, p. 133-136.

A 70-80% desulphurization can be obtained with soda ash, 90% with caustic soda. (D11n)

315-D.* LD Operations at Aliquippa. D. R. Loughrey. *Journal of Metals*, v. 11, Apr. 1959, p. 256-260.

Evaluation of performance in producing low-nitrogen steel using scrap as cooling material. (D10)

316-D.* Electric Direct-Reduction Process Produces Steel or Pig Iron. Albert de Sy. *Journal of Metals*, v. 11, Apr. 1959, p. 265-269.

Use of a double-hearth, low-frequency induction furnace for the production of pig iron or steel. (D6, D8j)

317-D.* From Iron Ore to Steel in 35 Minutes. *Steel*, v. 144, Apr. 27, 1959, p. 100-101.

Madrigal process for producing steel in small batches. (D8j)

318-D.* Chemistry of the Open-Hearth Furnace. G. Husson. *Iron & Coal Trades Review*, v. 178, Apr. 3, 1959, p. 783-787.

Role of the slag in refining and deoxidizing. 14 ref. (D2, D11n, D11q)

319-D.* Steelmaking in Small Furnaces. T. A. Cosh. *Iron & Steel*, v. 32, Apr. 1959, p. 137-141.

Experimental preparation of carbon and alloy steels. (D8)

320-D.* (French.) Improvement in Production of Openhearth Furnaces Heated With Lean Gas by Injection of Compressed Gases Through Burners. L. Septier, S. Terrat, R. Kissel and J. Moreau. *Revue de Metallurgie*, v. 56, Feb. 1959, p. 179-202.

Output of openhearth furnaces fired by low-grade fuels can be increased at least 10% by injection of various compressed gases (air, both cold and preheated, water vapor and blast furnace gas) through gas burners. (D2)

321-D.* Vacuum Melting of Steels. Pt. 2. H. C. Child and G. T. Harris. *Blast Furnace and Steel Plant*, v. 47, Apr. 1959, p. 384-392, 398.

Induction and consumable-electrode arc processes produce steels with minimum of inclusions, higher mechanical, creep, fatigue and hot working properties than air melted metals. 22 ref. (D8m, Q-general; AY, SS)

322-D.* (German.) Degassing of Rimming Mild Steel by Vacuum Boiling and Solidification. Georg Henke and Walter Hess. *Stahl und Eisen*, v. 79, Apr. 2, 1959, p. 405-407.

New vacuum degassing process decreases segregation at center of ingot. Complete elimination of sulphur and partial reduction of phosphorus is achieved. Deep drawing properties of cold rolled strips are improved. (D9s, 1-73; ST-d)

323-D.* (German.) Degassing of Rimming Steel by Projecting a Jet of Molten Steel Through a Vacuum Tunnel. Hubert Hoff, Hermann-Josef Kopineck and Gustav Opfer. *Stahl und Eisen*, v. 79, Apr. 2, 1959, p. 408-410.

Rimming mild steel is teemed into small ingot molds of 5-8 tons capacity. This process is especially recommended for the preparation of sheet semiproducts. Steel is teemed into molds which are placed in vacuum directly under the ladle. (D9s, 1-73; ST-d)

324-D.* (German.) Measuring Technique for Steel Melt Degassing in Vacuum. Karl Brotzmann, Karl Ruettiger, Klaus Foerster and Robert Heinrich. *Stahl und Eisen*, v. 79, Apr. 2, 1959, p. 410-414.

Control of quantity, pressure and chemical composition of gas extracted. (D9s, 1-73)

325-D.* (German.) Vacuum Deoxidizing of Steel and Steel Alloys. Helmut Knueppel, Albrecht Drevermann and Franz Oesters. *Stahl und Eisen*, v. 79, Apr. 2, 1959, p. 414-419.

Deoxidizing in vacuum depends on the state of equilibrium and the rate of carbon-oxygen reactions. The speed of carbon-oxygen reaction depends on the product $[C] \cdot [O]$, on the pressure and on the surface of the melt. (D11r, 1-73)

326-D.* Segregation and Non-Metallic Inclusions. G. Reginald Bashforth. *British Steelmaker*, v. 25, Apr. 1959, p. 121-123, 128-129.

Use of hot faced insulating materials in feeder-head or hot top construction. Although the tendency for nonmetallic material to segregate can be reduced by correct mold and feeder-head design the best method is to reduce the nonmetallic content of the steel to a minimum. (D9k; 9-69)

327-D.* New Openhearth Practice Links Oxygen, Sprung Basic Roof. Oscar Pearson. *Iron Age*, v. 183, May 7, 1959, p. 98-100.

New practice averaged 368 heats per campaign and 342 tons per heat. (D2g, W18r)

328-D.* Pre-Treatment of Hot Metal. Borad Develops "Tower" Process. *Iron & Coal Trades Review*, v. 178, Apr. 17, 1959, p. 901-902.

Continuous iron pretreatment in an atmosphere of oxygen in a refractory tower. Silicon and phosphorus removal takes place. (D8n)

329-D.* (French.) The Place of the Heroult-Type Acid-Lined Electric Furnace in the Steel Foundry. Maurice Viallon. *Fonderie*, Feb. 1959, p. 57-62.

For economic, high hourly production of good-pouring carbon steels, the acid-lined electric furnace is superior to the old-style converter and basic electric furnace. (D5)

330-D.* (German.) Problems and Possibilities of Iron Ore Smelting. B. Marincek. *Elektro Waerme*, v. 17, Feb. 1959, p. 29-31.

Comparison of blast furnace and electric smelting, which uses about half the quantity, and almost any quality, of coal plus 2500 to 3000 kw-hr. per ton raw iron. This can be improved by pre-reducing. (D8n, D1)

331-D.* Automation's Taking Over in the Blast Furnace. J. E. Oram. *Steel*, v. 144, May 11, 1959, p. 152, 155.

Pushbutton, paper tape or punched card programing may be used; computers, given a charge material analysis, will determine the right amounts of raw materials to be put into the furnace. (D1, 18-74)

332-D.* (Italian.) Magnetite Reduction in the Blast Furnace. R. Zoja, L. Peraldo Bicelli and G. Gianasso. *Metallurgia Italiana*, v. 51, Mar. 1959, p. 89-93.

Samples of magnetite taken at various stages of the reduction process were tested microscopically and with Debeye-Scherrer diagrams. The magnetite core of the sample is surrounded by layers of magnetite plus wustite, wustite, iron plus wustite and iron, in the sequence given. With porous ores, the reduction by CO diffusion takes place. (D1)

333-D.* (Russian.) Reduction of Sulphur Content in Pig Iron. P. M. Matveev. *Metallurg*, Mar. 1959, p. 10.

Washing down the hearth of blast furnace with sulphur-free slag or other acid materials that remove lime deposits from hearth walls produces pig iron with reduced sulphur content. (D1; RM-q)

334-D.* (Russian.) Effect of Moisture in Combustion Gases and Hydrogen Content on Openhearth Steel. K. T. Kurochkin, B. A. Baum, A. S. Konovalov and V. V. Postyka. *Metallurg*, Mar. 1959, p. 16-19.

Gaseous atmosphere in the bath area of openhearth furnaces, formed by combustion products from the firing of mazut (fuel oil), is the basic source of hydrogen in openhearth steel. Water vapor in the working area of openhearth furnaces is practically unchanged when moisture content of the fuel is from 1 to 6%. (D2; RM-k)

335-D.* The Kaldo Oxygen Steelmaking Process—Its Metallurgy and Economics. T. Olaf Dormsjo and D. R. Berg. *Iron and Steel Engineer*, v. 36, Apr. 1959, p. 67-77.

Charging, blowing and tapping operations; oxygen consumption, sinter, scrap, ore and lime additions. Heat cycle and composition control in refining high and low-phosphorus pig irons. Steel quality, process economy. 6 ref. (D10b)

336-D.* Vacuum Pouring for Large Forging Production. Henry C. Bigge and Elliott A. Reid. *Iron and Steel Engineer*, v. 36, Apr. 1959, p. 128-141.

Vacuum pouring of low-alloy steel ingots; effect on hydrogen content, tensile ductility, cleanliness and flaking of heavy forgings. Degassing equipment. (D9s, D9p, 1-73)

337-D.* (Hungarian.) Influence of Blast Furnace Operations in Steelmaking. Pt. 2. Ferenc Gemes. *Kohaszati Lapok*, v. 91, Dec. 1958, p. 548-554.

Rate of Mn reduction related to the hearth load; optimum coke charge. (D1a)

338-D. Application of Monolithic Refractories in Steel Plant Equipment. G. D. Cobaugh and C. R. Hauth. *Industrial Heating*,

v. 26, Apr. 1959, p. 791-792, 794, 796, 798. (D-general, RM-h)

339-D. (French.) Direct Reduction of Iron in Norway. *Journal du Four Electrique*, Jan-Feb. 1959, p. 26-30. (D8j)

340-D.* Use of Oxygen in a Modified Tilting Furnace. A. Jackson. *Iron and Steel Institute, Journal*, v. 191, Apr. 1959, p. 337-342.

Operation of modified tilting furnace (Ajax); refractory replacement; lance life; gas cleaning equipment; waste heat boilers. (D2g, W18r, W18g)

341-D.* Removing Sulphur and Silicon From Hot Metal. *Metal Progress*, v. 75, May 1959, p. 91-94.

A "rotary reactor" is expected to supplement or replace some of today's steelmaking processes. Hot metal, arriving from a blast furnace, is poured into a rapidly rotating drum, and spreads over the inside wall in a thin layer. Strong alkalis, iron ore and oxygen are added to reduce sulphur and silicon to low values. (D8n; ST, S, *Si*)

342-D.* Metal Processing in Russia. Arthur B. Tesmen. *Metal Progress*, v. 75, May 1959, p. 106-108.

Continuous casting of steel, ultrasonic treatment of freezing metal and vacuum rolling are all receiving attention from Russian metallurgists. The first is on its way to success; the others are only in the laboratory stage, but have interesting possibilities. (D9q, D9k, F23, 1-73; ST)

343-D.* Vacuum Melting Stainless Steels and Alloys. Digest from "Quality Improvements in Stainless Steels and Superalloys by Vacuum Melting". W. W. Dyrkacz. Paper presented at Western Metal Congress, Los Angeles, Mar. 1959. *Metal Progress*, v. 75, May 1959, p. 138, 140-142, 144.

Two vacuum melting processes which have reached production status are induction melting and consumable electrode arc melting under vacuum or protective atmosphere. The induction process gives greater improvement in mechanical properties where these improvements are chemistry-sensitive. Consumable-electrode melting has advantage of improved mechanical properties, which are segregation or structure-sensitive, improved soundness, particularly in large billet cross-sections, and lower cost. (D8m, Q-general; SS, 9-69)

344-D.* From Iron Oxide to Metallic Iron. Arnulf Muan. *Mineral Industries*, v. 28, Apr. 1959, p. 1, 4-6, 8.

Review of some equilibrium and kinetic relations important in ironmaking. 8 ref. (D8j, D11r)

345-D.* (Hungarian.) Avoidance of Cracks in Ingot Casting. Pt. 1. Jozsef Lantzky. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 13-17.

Crack development related to chemical composition; requirements for the proper preparation of the charge; preferred pouring techniques; role of mold type and wall thickness. (D9, 9-72)

346-D.* (Hungarian.) Basic Experiments With Exothermic Feeder Heads. Ivan Lipovetz and Pal Nemeth. *Kohaszati Lapok-Ontode*, v. 92, Jan. 1959, p. 1-11.

Various aluminum-base compounds used as heating substances for exothermic feeder heads. Computation of savings in melted metal and costs of heating compounds prove economic benefits derived from the process; analysis of heating compounds used. 9 ref. (D9k)

347-D.* New Melting Shop at Brymbo. "Oxygen-Electric" Steelmaking Process. *Iron & Coal Trades Review*, v. 178, May 1, 1959, p. 1021-1030.

Process at the Brymbo Works, Wrexham, England, enables hot blast furnace metal to be pre-refined and charged directly into electric furnaces. (D5a, D10, W18s, W18g)

348-D.* Use of Oxygen in Duplex and Stationary Openhearth Practice. Oscar Pearson. *Iron and Steel Institute, Journal*, v. 191, Apr. 1959, p. 305-318.

Plant facilities, current operation, use of vertical roof lances in tilting furnaces with silica roofs and high hot metal charges. Comparison with conventional duplex practice. Applications of oxygen lances in stationary openhearth furnaces. (D2g, D7a, D3, W18g)

349-D.* Some Investigations on the Treatment of Molten Iron. W. J. B. Chater and J. A. Charles. *Iron and Steel Institute, Journal*, v. 191, Apr. 1959, p. 319-328.

Effect of method, rate and continuity of oxygen introduction and slag-making additions to melt surface under both acidic and basic conditions on Si and phosphorus removal in ladle treatment of pig iron. Pretreatment with slag-making materials dispersed as powder in the oxygen; tower pretreatment process; desulphurization

and carburization of foundry iron. Oxygen lancing in cupola hearth. 14 ref. (D1d, D8p, E10a, W18g)

350-D.* Practical Aspects of Pretreatment Processes. J. L. Harrison. *Iron and Steel Institute, Journal,* v. 191, Apr. 1959, p. 328-336.

Review of iron pretreatment in blast furnace runner. Ladle, mixer or rotary vessel. Lancing with oxygen or oxygen-steam mixtures in mixer ladle practice. Effect of metalloid content of Fe on output, fuel consumption, refractory wear and operating costs of openhearth furnace. 19 ref. (D1d, D2a, D10, D8n)

351-D.* (German.) Effect of Vacuum Melting on the Gas Content of Metal. Irmtraud Pfeiffer. *Zeitschrift fur Metallkunde,* v. 49, Sept. 1958, p. 455-460.

Testing of Fe and Ni melted in air, or vacuum melted at various pressures, for the oxygen, nitrogen, hydrogen and carbon content. 13 ref. (D8m, C25, 1-52; Fe, Ni, *O, N, H, C*)

352-D. (Translation.) Blast-Furnace Smelting of Ferro-Silicon. B. M. Nosovitskii, G. A. Panev, L. V. Brodetskii and A. G. Kuzub. *Iron & Coal Trades Review,* v. 178, Mar. 27, 1959, p. 713-718. (From *Stal,* Nov. 1958.)

See item 122-D, 1959. (D1; AD-n31, Si)

353-D. (Translation—BISI no. 1153) Automatic Control of Basic Converter Heats. K. E. Mayer. *Stahl und Eisen,* v. 78, Nov. 13, 1958, p. 1670-1676.

See item 137-D, 1959. (D3b, 18-74)

354-D. (Translation—BISI no. 1167.) The Final Contents of Bath and Slag in the Basic Converter Process. Franz Weber, Theo Kootz and Karl-Heinz Obst. *Stahl und Eisen,* v. 78, Nov. 27, 1958, p. 1734-1745.

See item 78-D, 1959. (D3, D11n; O, P)

355-D. (Translation—ConBur) Deoxidizing Capacity of Carbon in Vacuum. A. M. Samarin and R. A. Karasev. *Academy of Sciences of the USSR, Proceedings, Physical Chemistry Section,* v. 119, Mar-Apr. 1959, p. 261-264.

Reactions between carbon and oxygen in liquid iron. 6 ref. (D11r, 1-73; C, O)

356-D.* Examining Continuous Steel Castings. C. Varga and J. Fodor. *Atomic World,* v. 10, Apr. 1959, p. 142-143.

A tungsten ball containing a radioactive marker is dropped into a continuous steel casting to find the lowest point where the inner metal is still molten. (D9q, N12, 1-59; ST, W)

357-D.* (German.) Vacuum Treatment of Openhearth Steel. Caspar Heinrich Pottgiesser, Hans-Jurgen Darmann and Albrecht Drevermann. *Stahl und Eisen,* v. 79, Apr. 16, 1959, p. 463-468.

Decrease in gas content and improvement of the purity degree of Ck35 and Ck45 steels. Average hydrogen content in liquid steel after vacuum treatment was considerably diminished. Average value of oxygen content of vacuum treated steel forgings amounts to 0.006% against 0.010% of untreated steel forgings. (D9s, 1-73; ST)

358-D.* (German.) Properties of Vacuum Treated Steels. Caspar Heinrich Pottgiesser, Adalbert Wicher and Ernst Klein. *Stahl und Eisen,* v. 79, Apr. 16, 1959, p. 468-472.

Comparison of several melts of Ck35 steel with and without vacuum treatment shows only slight and uniformly distributed nonmetallic inclusions in vacuum steel. After killing the steel with Al the variations of average Al content of each melt were small. A stronger growth of austenite grains was observed in Si-killed vacuum steels than in comparable untreated steels. Vacuum treated steels show good properties for deep drawing, cold pressing and machining. (D9s, Q-general; ST)

359-D.* (German.) Degassing by Pouring Molten Steel Through a Vacuum. Arthur Tix, Gerhard Bandel, Werner Coupette and Adolf Sickbert. *Stahl und Eisen,* v. 79, Apr. 16, 1959, p. 472-477.

Vacuum treated steel permits safe production of flake-free heavy forgings. Oxygen in vacuum cast ingots is both diminished and uniformly distributed. (D9s, 1-73; ST)

360-D.* (Russian.) High-Grade Steel From a Mixture of Bessemer and Electric Steels. V. Kyunche and Yan Dun. *Stal',* Mar. 1959, p. 215-221.

Manufacture of steel by means of duplexing Bessemer steel with electric furnace steel in a ladle results in 140% increase in the production of high-grade steel together with reduced costs. Nitrogen content was about 0.002-0.005% lower than in conventional electric steel. Best results are obtained with a ratio of 1.4-to-1 Bessemer to electric steel. 9 ref. (D7)

361-D.* (Russian.) Preliminary Deoxidation and the Hydrogen Content of Steel. M. A.

Druyan and V. M. Soifer. *Stal'*, Mar. 1959, p. 221-224.

Tapping of steel in rimming state from a furnace facilitates reduction of hydrogen content in the metal and improves mechanical properties of cast steel. Degassification using this procedure is very effective. 7 ref. (D2c, D9h; H)

362-D.* (Russian.) Vacuum Treatment of Bessemer Steel. A. M. Samarin, L. M. Novik and G. E. Tsukanov. *Stal'*, Mar. 1959, p. 231-238.

Vacuum treatment in a ladle sharply improves mechanical properties and extends acid Bessemer processes to low-phosphorus iron ores. Vacuum treatment for 14-15 min. produced a very deep degassification of the melt. (D8m, D9s)

363-D.* Equilibrium Between Sulphur in Molten Iron and H_2-H_2S Gas Mixture. Akira Adachi and Zen-ichiro Morita. *Osaka University, Technology Reports*, v. 8, Oct. 1958, p. 385-394.

The activity coefficient of sulphur in molten Fe decreases with the increase of its concentration. 15 ref. (D11n; S)

364-D.* Refining Pig-Iron With Pure Oxygen and Lime Powder. B. Trentini and M. Allard. *Iron & Coal Trades Review*, v. 178, May 8, 1959, p. 1073-1082.

Recent developments of IRSID-OLP process. 7 ref. (D8n)

365-D. (French.) Saint-Jacques Steelmills. *Aciers Fins & Speciaux*, no. 31, Mar. 1959, p. 87-92.

Equipment and layout at Monlucon, France. (D-general)

366-D. (French.) Pilot Operation of a Blast Furnace With 20-40 Coke and 10-50 Mm. Ore. A. Firket. *Revue Universelle des Mines*, v. 15, Mar. 1959, p. 140-153.

(D1)

367-D. (Russian.) Radiometric Control of Stock Line in a Blast Furnace. I. G. Polovchenko, G. A. Vasil'ev and V. I. Afranas'ev. *Stal'*, Mar. 1959, p. 204-205.

Use of radiometric control of blast furnace stock line rather than mechanical stock line indicators eliminates furnace overcharging. (D1a)

368-D.* (Hungarian.) Avoidance of Cracks in Ingot Casting. Jozsef Lantzky. *Kohaszati Lapok*, v. 92, Feb-Mar. 1959, p. 60-64.

Factors influencing the susceptibility of crack formation; mold temperature; casting speed; top and bottom pouring. 12 ref. (D9; 9-72, 5-59, ST)

369-D.* A Radioactive Tracer Study of Steel Surface Defects. T. W. Crosta. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 193-206.

Investigation of hot top lining and refractory-type stool coatings as source of slag and surface defects on ingots and billets of AISI 1012 fully killed steel. Effect of hot top properties and pouring practice. (D2k, 1-59, D9p, W19c; CN-g, 4-52, 9-71)

370-D.* Engineering Thermochemistry of Oxygen Steelmaking Processes. W. O. Philbrook. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 382-398.

Calculation of heat and material balances and oxygen requirements of basic oxygen processes. Effect of Si content of Fe on heat available for melting scrap. 20 ref. (D10, D11k)

371-D.* Comparison of Dephosphorization and Desulphurization in the Open Hearth Slag-Metal System and in the Oxygen Process Slag-Metal System. F. W. Luerssen. Paper from "Proceeding of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 398-411.

Distribution of sulphur and phosphorus between slag and metal phases for basic openhearth and oxygen processes. Equilibrium data. 7 ref. (D2b, D10, D11n)

372-D.* Manufacture of Sheet Steel for Porcelain Enameling. P. A. Reynolds. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 4-7.

Composition, processing, characteristics. (D2, Q-general, L27, 2-60; ST-d, 4-53)

373-D.* Refining Liquid Pig Iron in Electric Arc Furnaces. R. Durrer and G. Heintze. *Iron and Steel Institute, Journal*, v. 192, May 1959, p. 13-25.

Trials using up to 70% total charge-weight of low and high phosphorus pig irons in 12 and 40-ton capacity arc furnaces, with ore as the main refining agent. Considerable increases in hourly output

of electric arc furnaces are possible by the "pig iron plus ore" process compared with all-scrap charging. 22 ref. (D5b)

374-D.* Recent Developments in Oxygen Steelmaking in North America. J. M. Gaines. *Iron and Steel Institute, Journal*, v. 192, May 1959, p. 55-60.

Most signigicant applications are evolution of a workable practice for open-hearth heats using oxygen through the roof; growth of the basic oxygen steel process; use of oxygen in electric arc furnaces; potentialities of oxygen enrichment to produce more hot metal from existing blast furnaces. 19 ref. (D1h, D2g, D5g, D8p)

375-D.* Vacuum Casting of Steel. J. Levaux and M. Nepper. *Iron and Steel Institute, Journal*, v. 192, May 1959, p. 77-80.

Vacuum casting in conjunction with the Perrin desulphurization process enables a steel of a very low sulphur, oxygen and hydrogen content to be obtained. The heat treatment of forgings made from ingots treated in this manner can be reduced to the minimum. Forgings do not flake and nonmetallic inclusions are few and dispersed in such a manner that the penetration of ultrasonics is very easy. (D9, 1-73, D11m, J-general; 4-51, ST)

376-D.* Defects in Low-Carbon Steel for Flat Rolled Products. I. A. Sirel. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 143-162.

Defects on slabs and cold reduced sheets of rimmed, capped or killed steels. Causes of scabs, sponge and burned steel, ingot cracks, thermal cracks, pipe and slivers. (D9p, F21b, F23; ST, 4-52, 4-53, 5-59, 9-71)

377-D.* Use of Exothermic Ferromanganese. R. W. Farley. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 162-174.

Ladle additions of exothermic Mn in steel production. Control achieved; efficiency of Mn recovery. (D9m; ST, AD-n32, *Mn*)

378-D.* A Study of Wall Erosion in Wide Slab Molds. R. W. Joseph and L. J. Trilli. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 175-192.

Interface erosion in open-top mold used for casting low-carbon rimming steel ingots. Relation between degree of erosion and surface quality of ingots, slabs and cold rolled sheets. (D9k, W19c; CN-g, ST-d, 4-52, 4-53, 9-71)

379-D.* Effect of Nozzle Size on Pouring Rates and Slab Surface of Rimming Steels. A. T. Peters. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 309-319.

Influence of lable-nozzle size on heat pouring time, pouring rate and surface defects of ingot slabs and sheets. (D9p; ST, 4-53, 5-59, 9-71)

380-D.* Carbon Black in Fuel Oil for Open Hearth Furnaces. E. H. Swett. Paper from "Proceedings of the 41st Conference Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 324-337.

Effect of carbon additions on flame temperature, emissivity and furnace output. (D2h; RM-k, RM-m35)

381-D.* (Russian.) Improvement of Blast Furnace Performance With a Uniform Flux Agglomerate. S. K. Trekalo, N. M. Yakubtsiner and A. B. Shur. *Metallurg*, v. 4, Apr. 1959, p. 3-6.

Coarseness of flux agglomerate affects the coke consumption and consequent productivity. Too fine flux hinders the uniform distribution of the charge and hinders the penetration of the ascending gases through the charge column. (D1b; RM-q)

382-D.* One Hundred Years of Progress in Making Open Hearth and Other Steels in the United States. L. F. Reinartz. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 4-57.

Early plants and their production. Development of Bessemer, Siemens Martin and basic openhearth processes. Trends in refractory use in openhearth design and construction; hot metal operation;

charging; tapping; fuels; oxygen injection; metallurgical control. Electric arc furnaces and L-D processes. 37 ref. (D-general, A2)

383-D.* Lukens Cement Hot-Top Practice. Robert L. Bunting, Jr. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 338-347.

Production and use of cement hot-top in steel ingot casting. (D9k, W19c)

384-D.* Rapid Method of Bath Recarburization. Walter Mann and R. G. Waite. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 347-351.

Air gun injectionof powdered graphite and carbon derivatives into openhearth bath. (D2f)

385-D.* Continuous Waste-Gas Analysis for Automatic Fuel Control in the Open Hearth Furnace. C. J. McElhaney and W. V. McNiece. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 352-365.

Theory of combustion control. Continuous sampling and analyzing of oxygen in waste gases and automatic control of fuel. (D2h, X7j, X13f)

386-D.* Sponge Iron as a Source of Metallics in the Steel Industry. P. Ulf Gummeson. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 366-381.

Use of sponge iron in charge of electric arc furnace, high frequency induction furnace and acid and basic openhearth furnaces. Influence on steel composition. 12 ref. (D2a, D5a, D6; Fe, 6-74)

387-D.* Experimental Hot Metal Pretreating Tower. J. M. Gaines and D. C. Hilty. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 411-421.

Elimination of carbon and Si achieved by dropping molten Fe through oxygen atmosphere in refractory tower. 7 ref. (D1b, D10)

388-D.* Continuous Oxygen Analysis for Combustion Control in Open Hearth. E. W. Hunziker and J. W. Bain. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41" American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 461-475.

Continuous waste gas analyzer and fuel control system. (D2h, X7j, X13f)

389-D.* (Russian.) Titanium Scrap Replaces Ferro-Titanium as an Addition Agent. Khryukina, M. G. Bryunetkin, E. I. Korablev and L. A. Kamkina. *Metallurg*, v. 4, Apr. 1959, p. 15-17.

Ti-containing scrap (turnings, fillings, strip trimmings) substituted as an addition agent in steels 30T and 18-40 KHGT (Cr-Mn-Ti) in preference to FeTi, increased the yield, decreased rejects and improved tensile strength, yield point and impact strength. (D2c, Q-general; AD-n32, RM-p, Ti, AY)

390-D.* (German.) Manufacture and Properties of LD-Steel. Helmut P. Weitzer and Hubert Hauttmann. *VDI-Zeitschrift*, v. 101, May 1, 1959, p. 514-520.

Refining process; effect of cold drawing on mechanical properties; fatigue resistance of weldments. 12 ref. (D10a, Q-general; CN-g, 7-51)

391-D.* (Russian.) Use of Silicon-Chromium Alloy Additions in Chromium Steels. V. E. Sokolov, B. I. D'yachkov, A. E. Sokolov and I. G. Fadeev. *Metallurg*, v. 4, Apr. 1959, p. 12-14.

In deoxidation and alloying of steels 15KH, 20 KH, (low Cr steels) 20KHN3A, 20KH2N4A (Cr-Ni alloys) SiCr successfully replaced the usual deoxidizing and alloying compounds FeSi and FeCr. This substitution considerably reduced the amount of addition agents for these steels. (D2c; AD-n32, AY, *Cr, Ni*)

392-D.* (Rumanian.) Nonmetallic Inclusions in Steel. Niculae Parau. *Metalurgia si Constructia de Masini*, v. 10, Nov. 1958, p. 947-952.

Types of nonmetallic inclusions and their origin; formation of oxides, sulphides and silicates during steelmaking.

Distribution, shape and size of inclusions; influence on crack initiation and mechanical properties of steel. 10 ref. (D2c, Q26, 9-69; ST)

393-D.* (Czech.) Desulphurization of Basic Openhearth Steel. Jiri Mocek. *Hutnicke Listy*, v. 14, May 1959, p. 405-409.

Ratio of the concentration-of-sulphur/activity-of-sulphur is influenced by the melt composition and the slag. Desulphurization is conditioned by the reactivity of slag and a slag composition which provides both fluidity and adequate basicity. 28 ref. (D11n, D2d)

394-D.* (German.) Vacuum Degassing. *Stahl und Eisen*, v. 79, Apr. 30, 1959, p. 634-638.

Critical analysis and literature review. 14 ref. (D9s, 1-73)

395-D. Ironmaking in Australia. S. Klemantaski. *Iron & Coal Trades Review*, v. 178, May 22, 1959, p. 1195-1199.

Blast furnace practice and the scope for research. (D1, A9)

396-D. Ingotrol--a System for Pouring Ingots of Uniform Size Automatically. W. A. Black. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 206-209.

(D9p)

397-D. Gas Flow in an Open Hearth Model. R. H. Jones and D. F. Brion. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical and Petroleum Engineers, New York, 1958, p. 449-461.

Flow of room temperature air in 1/12th scale model of 270-ton openhearth furnace. Comparison with results in operating furnace. 6 ref. (D2h, W18r, 17-51)

398-D. (Croatian.) Blast Furnace Operation With Steam Enriched Blast. Dragan Rejc and Miran Gorup. *Rudarsko-Metalurski Zbornik*, no. 4, 1958, p. 429-439.

Increase of production and decrease of coke consumption results from steam enriched blast. (D1b)

399-D. (Czech.) Terminology and Metallurgy of Acid Melting Processes. Frantisek Kinsky. *Hutnicke Listy*, v. 14, May 1959, p. 391-393.

Processes without or with full or partial Si reduction and under slags containing more than 25% MnO. (D2, D3, D5; CN, *Si*, RM-q)

400-D. (Russian.) Carbon Control by Electromotive Force of Converter Melted Cast Iron. B. M. Lipinskich and O. A. Esin. *Zhurnal Prikladnoi Khimii*, v. 32, no. 2, 1959, p. 313-317.

In melting cast iron in a converter, the galvanic element is so constructed that when air is blown through cast iron with varying carbon concentrations the element serves as an electrode, the graphite acts as a potential and the solid slag as an electrolyte. 8 ref. (D3b; CI)

401-D.* (Russian.) Acceleration of Electric Steelmaking Process. A. M. Levin, L. I. Teder and V. Ya. Monastyrskii. *Stal'*, Apr. 1959, p. 323-327.

Increased productivity and quality of structural steel made in an electric arc furnace obtained by blowing oxygen into the metal bath thereby reducing the quantity of burned-out carbon. The final melting period is combined with the beginning of the oxidizing period and a thorough processing of the slag with the metal during tapping. 11 ref. (D5; ST-f)

402-D.* (German.) The Behavior of Iron Heats With Phosphorus and Arsenic Content in High Vacuum. Wilhelm Anton Fischer and Alfred Hoffmann. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 199-204.

Melting of Fe containing 1% P-0.2% As and 0.001 to 3% carbon, in high vacuum. Changes in phosphorus content are influenced by dissolved oxygen. Below 0.015% O the phosphorus content increases in proportion to melting time, while above 0.03% of oxygen phosphorus content decreases. Arsenic content decreases with increasing melting time. 23 ref. (D8m; Fe-b, *As, C, P*)

403-D.* (Russian.) New Method of Making Finished Products Directly From Molten Metal, Eliminating Rolling Operations. Pt. 1. A. V. Stepanova. *Zhurnal Tehnicheskoi Fiziki*, v. 29, no. 3, 1959, p. 381-393.

Experimental solidification under controlled conditions of molten metal yielded finished products, such as strips, rods and pipe. (D-general, C5q, F-general, A9)

404-D.* Vacuum Pouring of Ingots for Heavy Forgings. Pt. 1. H. H. Stoll. *Industrial Heating*, v. 26, May 1959, p. 949-951, 954, 956, 960, 962, 964, 966.

Experience at Bethlehem Steel in hydrogen removal. An average of 60% of hydrogen was removed, as indicated in a molten metal sample taken from the sinkhead of the ingot and compared to the pony ladle analysis. (To be continued) (D9p, 1-73)

405-D. Predicting Steelmaking Cost by Computer. D. C. Hilty, R. W. Taylor and R. H. Gillespie. Digest of "Predicting Minimum Materials Cost for Stainless Steel". Paper presented at the A.I.M.E. Electric Furnace Conference, Dec. 5, 1958, Detroit. *Metal Progress*, v. 75, June 1959, p. 140, 142-143.

Prices listed by 30 different sources of Cr, Fe and Si were considered as well as the cost of oxygen and lime. Effect of cost on such melting variables as bath temperature before and after the oxygen blow, oxygen blowing rate and slag basicity. (D-general, A4s)

406-D. (French.) The Soviet Steel Industry. *Metallurgie et la Construction Mecanique*, v. 91, Apr. 1959, p. 237-247.

(D-general)

407-D. (Russian.) Determination of Active Charge Weight in an Operating Blast Furnace. N. N. Babarykin, A. A. Agashin and F. A. Yushin. *Stal'*, Apr. 1959, p. 289-291.

Experimental and theoretical determination of vertical pressure of charges at different levels. (D1b)

408-D. (Russian.) Control of Blast Furnace Operation by Radioactive Isotopes. P. L. Grusin, V. N. Afanas'ev and S. V. Zemskii. *Stal'*, Apr. 1959, p. 291-297.

Review of Soviet techniques. 27 ref. (D1h; 1-59)

409-D. (Russian.) Thermo-Technical Study of Openhearth Furnace Parts During the Injection of Compressed Air Into the Gas Ports. N. I. Kokarev, A. G. Kapichev and V. G. Lisienko. *Stal'*, Apr. 1959, p. 306-311.

Injection of preheated compressed air reduces melting time and increases productivity. (D2h)

410-D. (Russian.) Automation in Blast Furnace Practice. V. Yu. Kaganov. *Metallurg*, May 1959, p. 7-11.

(D1, 18-74)

411-D. (Russian.) Ultrasonic Measurement of the Charge Level in Blast Furnaces. Yu. Ya. Treister. *Metallurg*, May 1959, p. 11-13.

(D1a, S14g)

412-D. (Russian.) Automation of a Rotating Distributor in a Blast Furnace. N. V. Mozhaev. *Metallurg*, May 1959, p. 14-15.

Ore is loaded at maximum furnace temperature, while the coke is charged at a minimum temperature. Nonuniform flow of gases is almost eliminated. (D1a, 18-74)

413-D. (Russian.) Deoxidation and Alloying of Low-Alloy Steels. B. Kh. Khan. *Metallurg*, May 1959, p. 19-20.

Steel tapped from an openhearth furnace at 1620-1640° C. was completely deoxidized and alloyed by introducing Fe alloy or FeCr alloys into the ladle when the metal was in a liquid state. (D11r; AD-n31, AY, Fe-b, *Cr*)

414-D.* (Russian.) Experience With the Accelerated Pouring of Steel. E. V. Verkhovtsev and S. P. Bakumenko. *Stal'*, Apr. 1959, p. 314-317.

Accelerated (2 to 2½ times faster) pouring of steel into the bottom of ingot molds improves macrostructure of the upper part of the ingot. Corrugated mold forms prevent crack formation. Low-carbon and Cr-Ni steels are more susceptible to crack formation than medium-carbon and Cr sheet. 6 ref. (D9p, W19c; CN, AY)

415-D. (Book.) Steel in the Soviet Union. 376 p. 1959. American Iron and Steel Institute, 150 E. 42nd St., New York 17. $5.

Report of the American Steel and Iron Ore delegation's visit to the Soviet Union, May and June 1958. (D-general)

416-D. (Book.) Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41, 502 p. 1958. American Institute of Mining, Metallurgical, and Petroleum Engineers, 29 W. 39th St., New York 18, N. Y.

Papers abstracted separately. (D2, W18r)

417-D. (Book.) Surface Defects in Ingots and Their Products. Special Report no. 63. 58 p. Dec. 1958. Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1, England.

(D9; 9-71, 5-59, ST)

418-D. (Translation—BISI no. 1134.) Investigation on Slab Molds of More Than Three Tons. Jean Duflot and S. Derot. *Fonderie*, no. 153, Oct. 1958, p. 467-474.

See item 46-D, 1959. (D9, W19c; ST)

419-D. (Translation—BISI no. 1140.) Metallurgical Problems Encountered in the Pouring

and Solidification of Rimming Steel. Heinrich Rellermeyer and Rudolf Hammer. *Stahl und Eisen,* v. 78, Oct. 30, 1958. p. 1505-1513.
See item 40-D, 1959. (D9, D11h; ST-d)

420-D. (Translation—BISI no. 1141.) Observations and Experiments in the Reduction of Iron Ores. Gerhard Heynert. *Stahl und Eisen,* v. 78, Oct. 30, 1958, p. 1493-1505.
See item 39-D, 1959. (D1, D11r)

421-D. (Translation—BISI no. 1169.) Life of the Openhearth Furnace Refractory Lining When Using Oxygen. E. I. Koval'chuk and G. I. Popov. *Stal',* Oct. 1958, p. 890-893.
See item 65-D, 1959. (D2g, W18r; RM-h)

422-D. (Translation—BISI no. 1194.) Oxygen Practice in the Openhearth Process. V. H. Kornfel'd. *Stal',* Dec. 1959, p. 1095-1102.
See item 203-D, 1959. (D2g)

423-D. (Translation—Brutcher, no. 4500.) Changes in Blast-Furnace Process When Working on Fluxed Sinter. N. N. Babarykin and F. A. Yushin. *Stal',* v. 18, Dec. 1958, p. 1057-1065.
See item 164-D, 1959. (D1a)

424-D. (Translation—Brutcher, no. 4519.) Desulfurization of Liquid Iron With Magnesium. V. I. Lakomskii. *Liteinoe Proizvodstvo,* v. 10, no. 11, 1958, p. 18.
(D11n; Fe, 14-60, Mg)

425-D. (Translation—Brutcher no. 4550.) Air Cooling of Bottom of No. 2 Blast Furnace. N. V. Krepyshev. *Metallurg,* v. 3, Nov. 1958, p. 3-9.
See item 79-D, 1959. (D1, W17g, 17-51)

426-D. (Translation—Brutcher, no. 4552.) Practical Fundamentals of Large-Scale Degassing of Rolling and Forging Steels by the Vacuum Lifter Process. F. Harders, H. Knuppel and K. Brotzman. *Stahl und Eisen,* v. 79, Mar. 5, 1959, p. 267-272.
See item 286-D, 1959. (D9s; 1-73)

427-D. (Translation—Brutcher no. 4554.) Shrinkage Phenomena in Continuous-Cast Steel. V. S. Rutes and V. A. Leites. *Liteinoe Proizvodstvo,* v. 9, Dec. 1958, p. 10-12.
See item 219-D, 1959. (D9q, P10c, 2-61; ST, 4-59)

428-D. (Translation—ConBur.) The Equilibrium Distribution of Sulphur Between Metal and Slag in Openhearth Furnaces. L. A. Shvartsman, A. I. Osipov, V. E. Surov, M. L. Sazonov, S. A. Telesov and A. M. Ofengenden. *Proceedings of the Academy of Sciences of the USSR,* v. 120-121, May-Aug. 1958, p. 89-91.
For successful desulphurization of steel it is essential to maintain the slag in such a state that a combination of favorable thermodynamic and kinetic condtions is insured. (D11n, D2d)

429-D.* (German.) Production of Pig Iron and Steel by the Direct Reduction of Iron Ore With Hard Coke in Shaft Furnaces. Mstislaw Kurtschatow and Svat Cernoch. *Bergakademie,* v. 11, Apr. 1959, p. 228-233.
Principles and technology of a new shaft furnace process where reduction of iron ore is achieved by the use of hard coke provided a separation between reduction and combustion process is maintained. 19 ref. (D8j, D8n)

430-D.* Use of Oxygen in a Modified Tilting Furnace. A. Jackson. *Iron & Steel,* v. 32, May 22, 1959, p. 254-268.
Problems involved in redesigning an all-basic furnace of a British mill for oxygen injection; instrumentation, controls, operating conditions. Ingot output is high compared to that of standard furnaces in plant, but improvements are needed to increase metallic yield, extend roof life and to design suitable lances. (D2g)

431-D.* The Use of Oxygen in a Modified Tilting Furnace. A. Jackson. *Iron & Steel,* v. 32, May 22, 1959, p. 268-270.
Results of one year's experience with a basic roof openhearth furnace with reference to refractory life, gas cleaning system, lance life, waste-heat boiler performance, sulphur removal, slag analyses, gases in steel and rejects. (D2g)

432-D.* The Use of Oxygen in Duplex and Stationary Openhearth Practice. Oscar Pearson. *Iron & Steel,* v. 32, May 22, 1959, p. 271-276.
Recent developments in use of oxygen in U. S. Steel Corp. furnaces include use of sprung, suspended basis roof with holddowns and vertical oxygen roof lancing. (D2g)

433-D.* Some Investigations on the Treatment of Molten Iron. W. J. B. Chater and J. A. Charles. *Iron & Steel,* v. 32, May 22, 1959, p. 276-280.
Iron pretreatment processes prior to steelmaking operations; ladle treatment

methods with normal methods of slagmaking material addition; pretreatment with powdered slagmaking materials; Borad tower pretreatment process. Treatment of foundry iron; desulphurization; increasing the carbon content of foundry melts; oxygen lancing in the cupola hearth. (D11m, E10a; AD-a)

434-D.* Practical Aspects of Pretreatment Processes. J. L. Harrison. *Iron & Steel*, v. 32, May 22, 1959, p. 281-284.

Desiliconization and dephosphorization in blast furnace runners, transfer ladles, Kaldo and Oberhausen rotors and active mixers. Removal of Cr as part of ladle pretreatment. (D11h, D10)

435-D.* Development and Present State of L-D Process. O. Cuscoleca and K. Rosner. *Iron & Steel*, v. 32, May 22, 1959, p. 284-296.

Flexibility of process and ability to produce high-purity steels regardless of pig iron analysis, with special reference to Austrian, American, West European and Asian plants. (D10a)

436-D.* Comments on the O.L.P. Process. B. Trentini, P. Vayssiere and M. Allard. *Iron & Steel*, v. 32, May 22, 1959, p. 286-288.

Oxygen-lime-powder process for refining high-phosphorus hot metal; factors controlling impurities in final steel; evolution of slag composition; phosphorus and sulphur problems. (D8n)

437-D.* Refining Liquid Pig Iron in Electric Arc Furnaces. R. Durrer and G. Heintze. *Iron & Steel*, v. 32, May 22, 1959, p. 289-294.

Full-scale tests were conducted in 12 and 40-ton arc furnaces in which charges contained large proportions of liquid pig iron, with ore being used as the refining agent. Rich ore fines are particularly suitable for this purpose. Proportion of steel obtained directly from ore can be considerably increased by additional reduction of ore fines by coke fines. (D5b).

438-D.* Further Experience With the Kaldo Process. B. Kalling and Folke Johansson. *Iron & Steel*, v. 32, May 22, 1959, p. 295-298.

Process control, steel yield, lining life, steel quality. Special fields of application include prerefining of pig iron for openhearth and electric furnaces and transformation of high-phosphorus pig iron into hematite cast iron. (D10b)

439-D. Recent Developments in Oxygen Steelmaking in North America. J. M. Gaines. *Iron & Steel*, v. 32, May 22, 1959, p. 252-254.

(D-general, D10)

440-D. Vacuum-Cast Steels; an Improved Engineering Material. *Precision Metal Molding*, v. 17, June 1959, p. 27.

Features of vacuum casting in a consumable-arc melting furnace. (D8m)

441-D.* (Russian.) Effective Use of Sinters and Briquettes of Iron Ore and Lime in Openhearth Furnaces. A. G. Derfel, Yu. G. Dubina, N. I. Myshenkov, S. L. Sologub, E. V. Tretyakov, V. I. Khipov, F. A. Cheknenko and Ya. A. Shneerov. *Stal*, v. 19, May 1959, p. 400-407.

Use of sinters and briquettes speeded up melting period by 40-45 min., increased productivity of a 370-ton furnace by 6-7%; aided dephosphorization and desulphurization capacity of slag and increased basicity during melting. Total content of FeO at the beginning of the melting period was reduced while FeO was increased at the conclusion of the melting period. 6 ref. (D2a, D11n; Fe, 6-73)

442-D.* (Russian.) Firing of Openhearth Furnaces With Natural Gas. B. N. Kurochkin, E. I. Simonov, L. A. Kalashnikov, L. K. Emets and V. D. Zelenskii. *Stal'*, v. 19, May 1959, p. 407-413.

Change-over from fuel oil to high-pressure (3 at. gage) natural gas fuel, carburized with liquid fuel up to about 30% of total fuel requirements, reduced fuel consumption while maintaining the same furnace productivity. (D2h, W18r)

443-D.* (Russian.) Quality of 13 Ton Ingots of 14KHGS Steel. V. K. Barzit, M. I. Vainshtok and V. P. Gamazov. *Stal'*, v. 19, May 1959, p. 456-459.

Nature of chemical heterogeneity of the ingot and distribution of nonmetallic inclusions, such as sulphides of Mn and Fe, complex compounds of silicates, nitrites and alumina, which affect the homogeneity of the steel in various parts of the ingot. (D-general; 5-59, SS, 9-69)

444-D.* (German.) Phosphorus-Oxygen Equilibrium Between Liquid Iron and Calcareous Phosphate Slag. Helmut Knueppel, Franz Oesters and Heinrich Gruss. *Archiv fur das Eisenhuttenwesen*, v. 30, May 1959, p. 253-265.

Equilibrium between Fe with P and O content and iron (II)-oxide-calcium-phosphate lime slag in a lime crucible is measured at 1600° C., while slags with 4% SiO_2 and MnO are added. 20 ref. (D11n)

445-D. (Russian.) Causes of Charge Hanging in a Blast Furnace Using Oxygen Enriched Blast. *Stal'*, May 1959, p. 292-296.

Main cause of charge hanging is due to the formation, above the tuyere level, of a layer of charge materials causing a poor gas penetration, (resulting from lowering of the slag formation zone) and the condensation vapors of SiO and SiO_2 compounds. Methods of eliminating hanging are suggested. 4 ref. (D1a)

446-D.* Deoxidation of Steel in Vacuum. A. M. Samarin. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 255-265.

Carbon is an effective deoxidizer of liquid metal in the production of steel and alloys in vacuum inducation furnaces. The interaction of molten metal with the furnace lining causes increased penetration of oxygen into the metal. The use of a deoxidizer such as hydrogen, as well as autocrucible furnaces, results in steels and alloys of very low oxygen content. 10 ref. (D6, 1-73; AD-r31)

447-D.* Effect of Liquid Steel Treatment in Vacuum on the Composition and Properties of Some Steels. A. M. Samarin. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 255-265.

Method of subjecting liquid steel produced in any steelmaking furnace to vacuum treatment in a ladle placed in a special chamber, or during casting in molds. Owing to the mixing of metal with slag, vacuum treatment of liquid steel in a ladle provides additional purification of steel from sulphur. 4 ref. (D9m, D9s, 1-73)

448-D.* Ferrous Base Alloys. A. M. Aksoy. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 309-325.

Comparison of the mechanical properties of air melted and vacuum melted Ni-Cr stainless steels. Vacuum melting techniques result in lower gas content, improved gas content, improved cleanliness, ingot structure relatively free from segregation and controlled composition. 14 ref. (D8m, Q-general; SS)

449-D. Steelmaking/U.S.A. Pt. 3. Leo F. Reinartz. *Journal of Metals*, v. 11, June 1959, p. 403-406.

Furnace developments; improvements during the last few decades in fuels; instrument control. (D-general, W18)

450-D. Instant Steel: Will It Revolutionize Metalworking. James Joseph. *Western Metalworking*, v. 17, June 1959, p. 37-40.

Madrigal "instant steel" process bypasses blast furnace, eliminates scrap and coke. (D8j)

451-D.* Selective Smelting of Lateritic Ores. Marvin J. Udy and Murray C. Udy. *Journal of Metals*, v. 11, May 1959, p. 311-314.

Application of Strategic-Udy smelting techniques to treatment of lateritic ores for production of ferronickel, chromium-iron and refined steel. (D8j, D8n; ST, *Ni, Cr*, AD-n32)

452-D.* Sponge Iron by the HYL Process. F. Weston Starratt. *Journal of Metals*, v. 11, May 1959, p. 315-318.

Rich Fe ore reduced in retorts by hot reformed natural gas. Control of carbon of sponge. Utilization of sponge iron in electric furnace steelmaking in Mexico. (D8j, D5a; Fe, 6-74)

453-D.* Nitrogen in Steels. Karl G. Speith and Hans vom Ende. *Journal of Metals*, v. 11, May 1959, p. 333-338.

Solubility of nitrogen; introduction, absorption and removal of nitrogen during melting and refining in openhearth and electric furnaces or in converters. Effect of processing conditions on nitrogen content. Influence of nitrogen content on properties of killed and rimming steels. 19 ref. (D2, D3, D5, N15; ST, *N*)

454-D. Steelmaking/U.S.A. Leo F. Reinartz. *Journal of Metals*, v. 11, May 1959, p. 329-333.

Historical account of working conditions, openhearth furnace operation and developments during last 80 years. (To be continued). (D2; A2, ST)

455-D.* The Role of High-Purity Oxygen in Metallurgical Processes. H. B. Emerick. *Blast Furnace and Steel Plant*, v. 47, May 1959, p. 463-477.

Metallurgical applications of high-purity tonnage oxygen in iron and steel operations. 26 ref. (D-general; O)

456-D.* Making Steel by the Stora-Kaldo Process. *Blast Furnace and Steel Plant*, v. 47, May 1959, p. 490-492, 495-497, 520-523.

Operation, characteristics, capabilities and limitations. Process compared with similar techniques. (D10b)

457-D.* (Hungarian.) Manufacture of Steel by the Rotor Process. I. Balsay. *Kohaszati Lapok*, v. 14, May 1959, p. 177-185.

Advantages claimed include high proportion of scrap iron, good heat economy and desulphurizing action. Current developments of the process. (D10c)

458-D.* (French.) Desulphurization of Cast Iron by the Blowing of Lime Powder According to the T.W.A. Process Developed by IRSID. B. Trentini, J. Raguin and M. Dannewald. *Revue de Metallurgie*, v. 56, May 1959, p. 487-507.

The T. W. A. process consists of blowing highly concentrated lime powder into a bath of molten iron through tuyeres fixed at the bottom of a tilting vessel. Effect of quantity of lime injected, initial sulphur and Si content of cast iron and thermal losses. 20 ref. (D3, D11n)

459-D.* Electric Arc Steelmaking Using Hot Metal Process. *Metallurgia*, v. 59, June 1959, p. 265-268.

Method of pre-refining molten pig iron so that the Si and phosphorus are removed without reduction of carbon. Comparison with other melting processes. (D5g, D8n)

460-D. Experience With Self-Fluxing Sinter at the Steel Company of Canada, Ltd. J. S. McMahan. *Blast Furnace and Steel Plant*, v. 47, July 1959, p. 695-705, 713.

Development of a self-fluxing sinter and blast furnace practice for self-fluxing sinter. (D1a)

461-D. Automation in Iron and Steel Making. J. E. Oram. *Blast Furnace and Steel Plant*, v. 47, July 1959, p. 716-724.

Aspects of automating blast furnace, openhearth, sintering plant and soaking pit processes. (D-general, 18-74)

462-D. (French.) The Soviet Steel Industry. Pt. 2. (Concluded.) *Metallurgie et la Construction Mecanique*, v. 91, May 1959, p. 351-359.

(D-general)

463-D. (German.) Viscosity of Synthetic Slags as a Function of Composition and Temperature. Erich E. Hofmann. *Stahl und Eisen*, v. 79, June 1959, p. 846-854.

(D11, 2-60, 2-61; RM-q)

464-D. (Hungarian.) Metallurgy of Low-Shaft Furnaces. M. Szele. *Kohaszati Lapok*, v. 14, May 1959, p. 193-196.

Design operation of low-shaft furnaces in relation to low-grade Fe ores. Grain size of ore and coke, shaft height, blast enrichment with oxygen and mixture preparation. (D8n)

465-D.* (French.) Converter Blowing With Powdered Substances. B. Trentini, P. Vayssiere, R. Alleyrac and J. Legrand-jacques. *Revue de Metallurgie*, v. 56, June 1959, p. 13-22.

Control of blowing behavior, temperature and final composition of steel by powdered lime additions and ores to the blow in a basic bessemer converter. 4 ref. (D3b, D3f, 1-65)

466-D.* Analysis of the Carbon Elimination Process in the Open-Hearth Furnace. R. G. Ward and N. Birks. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 10 p.

Oxygen activity gradients in open-hearth baths; factors governing oxygen transfer from slag to metal during refining in basic and in acid openhearths. 12 ref. (D2b, D11n, D11r)

467-D.* (French.) New Methods Applied in American Steel Mills. *Metallurgie et la Construction Mecanique*, v. 91, June 1959, p. 435-438.

Steel and cast iron manufactured from ores as starting materials. Strategic Udy process in which the ore is pre-reduced by roasting it together with the powdered fuel and a flux in a rotary kiln. (D8j)

468-D.* (Polish.) Desulphurization of Iron After the Blast Furnace. A. Maslanka and M. Kowalewski. *Hutnik*, v. 26, May 1959, p. 202-212.

Desulphurization by blowing with powdered substances. Effects of initial sulphur content, blowing speed and Fe temperature on desulphurization. 17 ref. (D3b)

469-D. Natural Gas Can Improve Blast Furnace Operations. T. F. Baily. *Iron Age*, v. 184, July 16, 1959, p. 104-105.

Natural gas used with coke lowers coke consumption. (D1)

470-D. Selective and Automatic Blast-Furnace Charging. *Iron & Coal Trades Review*, v. 178, June 12, 1959, p. 1367-1369.

Automatic charging distributes material evenly across the furnace cross-section. (D1a)

471-D. Automatic Control of Ingot Weights. Robert G. Watson. *ISA Journal*, v. 6, May 1959, p. 72-74.

Automatic pouring produced steel ingots of uniform weight and reduced hazards accompanying manual pouring. (D9p, 18-74)

472-D. The Use of Nuclear Energy in the Steel Industry. P. Bergognon, R. Bourion and R. Gibrat. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy." United Nations, Geneva, 1958, p. 286-292.

Possible use of a nuclear reactor as a source ow power to heat air for blast furnaces. (D-general, W11p)

473-D. (French.) The Iron and Steel Industry Considered on a Worldwide Basis. Achille G. Lefebvre. *Revue de la Societe Royale Belge des Ingenieurs et des Industriels*, April 1959, p. 157-202.

14 ref. (D-general)

474-D. (French.) Steelmaking Without Coke. Pierre Epron. *Revue de Metallurgie*, v. 56, June 1959, p. 3-11.

Ways to replace coke, as a heat producer and as a reduction agent, by other fuels. (D-general; RM-j)

475-D. (Czech.) Relationships Between the Specific Coke Consumption and Melting Intensity in Blast Furnaces. Antonin Bichler. *Hutnicke Listy*, v. 15, June 1959, p. 476-478. (D1)

476-D. (Czech.) Investigation of the Origin of Nonmetallic Inclusions in Steel by Means of Ca^{45} Isotopes. Josef Cadek, Theodor Myslivec, Miroslav Mandl, Jaroslav Vrsek and J. Fiala. *Hutnicke Listy*, v. 15, June 1959, p. 478-484.

12 to 19% of nonmetallic inclusions are caused by contact with refractories. 23 ref. (D-general, 1-59; ST, 9-69)

477-D. (Translation--Brutcher No. 4470.) Semicontinuous Casting of Stainless Steel. M. S. Boichenko. *Stal'*, v. 18, Nov. 1958, p. 983-987.

See item 69-D, 1959. (D9q; SS, 4-53)

478-D. (Translation—Brutcher No. 4600.) Stream Degassing of Unkilled Low-Carbon Steel. Pt. 2. Vacuum Degassing of Low-Carbon Unkilled Steel During Pouring or Solidification in Mold. H. Hoff. *Stahl und Eisen*, v. 79, Apr. 2, 1959, p. 408-410.

See item 323-D, 1959. (D9s, 1-73; ST-d)

479-D. (Translation--Brutcher No. 4602.) Elimination of Oxygen in Vacuum Treatment of Liquid Steel. H. Knuppel, A. Drevermann and F. Oeters. *Stahl und Eisen*, v. 79, Apr. 2, 1959, p. 414-419.

See item 325-D, 1959. (D11r, 1-73)

480-D.* (Russian.) Melting of Steel in Basic 1.5-Ton Electric Induction Furnaces. A. F. Kablukovskii, T. P. Solodikhin, Ya. S. Lejserov and S. D. Skorokhod. *Metallurg*, June 1959, p. 11-16.

New basic refractory crucible lining lasted for at least 40 melts of high-alloy steels. Alloys produced can withstand temperatures of 1250-1300° C. while other melts are suitable for welding purposes. (D6; SS, RM-h38, SGA-h)

481-D.* (French.) Power for Metallurgical, Chemical and Allied Industries. Marc Allard. *World Power Conference, 11th Sectional Meeting, Transactions*, v. 7, no. B.5, 1958, p. 187-192.

Present experience with low-shaft furnaces shows that they might be substituted for blast furnaces only under special conditions. Extended use seems to be sharply limited by the fact that the process does not provide any significant economy in power consumption. 9 ref. (D8n)

482-D.* (German.) Electricity in Iron and Steel Production. H. Walde. *World Power Conference, 11th Sectional Meeting, Transactions*, v. 7, no. B.5, 1958, p. 121-132.

Quality factors in the production of iron and steel by electric low-shaft furnaces and electric arc furnaces. 5 ref. (D8n, D5g)

483-D. (German.) Slag Explosions in Openhearth Steel Mills. Hermann Tetzner. *Neue Hutte*, v. 4, June 1959, p. 352-359.

13 ref. (D2d)

484-D. (Russian.) Reducing the Feeder Head in Killed Steel. Ya. M. Levitasov, A. M. Ofengenden and V. I. Danich. *Metallurg*, June 1959, p. 16-19.

A blanket of Lunkerite (Al, Fe-Si, coke and slag compound) over the cast metal produced a porous incandescent crust of low heat conductivity. This blanket and improved feeder head design, together with a newly developed exothermic mixture for heating the lateral surface of the feeder head, reduced the size of the head. (D9k)

485-D.* (Russian.) Some Aspects of Side-Blowing in the Bessemer Process. L. K. Grakhov and V. A. Fuklev. *Liteinoe Proizvodstvo*, June 1959, p. 20-22.

Side blowing results in maximum utilization of oxygen and reduction of heat losses by escaping gases and radiation. It must, however, be carried out under conditions of intensive oxidation of carbon and removal of CO gas bubbles. 9 ref. (D3f)

486-D.* Predicting Minimum Materials Cost for Stainless Steels. D. C. Hilty, R. W. Taylor and R. H. Gillespie. *Journal of Metals*, v. 11, July 1959, p. 458-464.

Mathematical method of linear programming applied to stainless steelmaking using Type 430 as the example makes it possible to handle the numerous complex relations among the many variables of charge and practice to arrive at the optimum compromise to secure minimum cost of materials consistent with both the fundamental chemistry and the practical considerations controlling the melting process. 21 ref. (D-general, A4s; SS)

487-D.* (Russian.) Measurement of Hot Blast Temperature Drop in Blowpipes of Blast Furnaces. A. V. Chentsov, B. A. Feldman and S. V. Shavrin. *Stal'*, June 1959, p. 495-496.

Use of special thermocouples with an air outlet to reduce the heat transfer due to radiation from the thermocouple to the walls of the blowpipe. 6 ref. (D1, S16, X9q)

488-D.* (Russian.) Effect of Hot Blast Temperature on the Size of the Oxidation Zone in a Blast Furnace. A. F. Koval'. *Stal'*, June 1959, p. 497-500.

Experiments with a model blast furnace showed that an increase in the hot blast temperature always produces a higher hearth temperature. This causes the contraction of the combustion zone as a result of accelerated interaction of CO_2 and oxygen with the carbon of the coke. (D1h, 2-61)

489-D.* (Russian.) Natural Gas at High Pressures in Openhearth Furnaces. A. I. Urinskii. *Stal'*, June 1959, p. 504-508.

Use of natural gas at 10 atm. pressure instead of petroleum residue at 3 atm. pressure increases furnace productivity. (D2)

490-D.* (Russian.) Study of Parts in Gas-Fired Openhearth Furnaces While Feeding Compressed Air and Oxygen. S. M. Adon'ev, O. V. Filip'ev and E. V. Popova. *Stal'*, June 1959, p. 509-512.

Oscillographic studies of hydraulic models of various types of doghouses in openhearth furnaces, revealed flame characteristics, quality of fuel-air mixture, effect of excess air and additions of compressed air and oxygen. 10 ref. (D2g, W18r)

491-D.* (Russian.) Thermal Performance of Openhearth Furnace During the Blowing of Oxygen and Oxygen-Steam Mixtures Into the Molten Iron Bath. V. N. Cornfl'd, A. O. Voitov, V. I. Koshelev, A. F. Shorin and B. K. Dimov. *Stal'*, June 1959, p. 513-520.

Although the sooner blowing starts the more heat is absorbed by the metal in a given time, there exists a most favorable point at which to begin blowing. Unit consumption of fuel during the melting of low-carbon steel was reduced to 87 kg. per ton by improved selection of blowing time. 4 ref. (D2g)

492-D.* (Russian.) Thermal Problems in the Operation of Large Capacity Openhearth Furnaces. M. A. Glinkov and G. M. Glinkov. *Stal'*, June 1959, p. 568-572.

Conditions of heat exchange during the melting period are improved by enlarging the hearth area in the furnace and coordination of the simultaneous performance of both fuel parts (whether fired with mazut or high calorific value gas). 9 ref. (D2h)

493-D. Steelmaking—U. S. A. Leo F. Reinartz. *Journal of Metals*, v. 11, July 1959, p. 444-448.

History of electric steel and the L-D process. Future trends predicted. 37 ref. (D-general, D5, D10a, A2)

494-D. (Russian.) Primary Slag Formation in the Use of Fluxed Sinter in Blast Furnace. Yu. M. Potebnya and T. I. Litvinova. *Stal'*, June 1959, p. 485-494.

Investigation at the Metallurgical Institute of Drepropetrovsk shows that fluxed sinter, when used instead of raw Fe ore, completes primary slag formation above the furnace bosh and keeps the slag more stable. An increase in the basicity of the sinter contracts the slag formation area, thereby improving conditions for forced furnace performance. 13 ref. (D1b, RM-q)

495-D. (Russian.) Reduction of Iron Ore by Carbon Monoxide in a Fluidized Bed. I. S. Roginskii. *Stal'*, June 1959, p. 500-501.

Review of foreign practice in the direct reduction of Fe ores. (D8j, B15q; Fe)

496-D. (Russian.) Mechanization of Slag Removal From Slag Pockets of Openhearth Furnaces. M. P. Sabiev, E. A. Ploshchenko and B. P. Mikhno. *Stal'*, June 1959, p. 521-523.

(D2d)

497-D.* (Hungarian.) Metallurgy of Low-Shaft Furnaces. Pt. 1. M. Szele. *Kohaszati Lapok*, v. 42, Apr. 1959, p. 121-126.

New technique in blast furnace design and operation promises various advantages, requires strict control of charge composition, the speed of the process being 3 to 5 times as fast as in conventional blast furnaces. (D8n)

498-D. The Materials We Use. A Basic Study of Steel. Pt. 1. Donald E. Wood. *Automatic Machining*, v. 20, Aug. 1959, p. 40-44.

Fundamentals of steelmaking. (D-general)

499-D.* (German.) The Physico-Chemical Aspects of Desulphurization in the Openhearth Furnace. K. Speith, H. Ende and F. Bardheuer. *Stahl und Eisen*, v. 79, June 25, 1959, p. 926-933.

Influence of reactivity of lime and ferrous oxide on desulphurization. An evaluation of optimum conditions and limits on the basis of melts is obtained. (D2, D11n)

500-D.* Vacuum Pouring of Ingots for Heavy Forgings. Pt. 3. J. H. Stoll. *Industrial Heating*, v. 26, July 1959, p. 1363-1370.

Vacuum pouring eliminates the necessity of aging and improves ductility through a higher degree of cleanliness. Silicate-type inclusions are fewer and the effect on segregation is beneficial. (D9p, 1-73, 9-69)

501-D. (German.) Rapid Determination of the Basicity of Openhearth Slag. Hans vom Emde and Friedrich Bardenheuer. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 391-396.

7 ref. (D2d)

502-D. (German.) Calculation of Ore, Limestone and Coke Consumptions per Ton of Iron. Robert Gorgen. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 381-390.

Blast furnace practice. 10 ref. (D1)

503-D. (Portuguese.) Electrical Reduction—Oxygen Refining Versus Sponge Iron—Electrical Furnace. Anchyses C. Lopes. *Engenharia, Mineracao e Metalurgia*, v. 29, June 1959, p. 323-324.

Comparison of the procedures with reference to the economy of the Brazilian northeast. (D8, D6, D3)

504-D.* The Nonmetallic Constituents of Steel. Clarence E. Sims. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 367-393.

Origin, modes of formation and characteristics of nonmetallic inclusions. Exogenous inclusions, those formed by mechanical entrainment or heterogeneous reaction, have their principal source in ladle refractories. Endogenous inclusions, resulting from homogeneous reactions, are formed mainly during cooling and freezing. 69 ref. (D-general; ST, 9-69)

505-D. (Pamphlet.) Steelmaking in the Soviet Union. Francis M. Rich. 27 p. 1959. American Iron and Steel Institute, 150 E. 42nd St., New York 17, N. Y.

Preprint of paper presented before General Meeting of American Iron and Steel Institute, New York, May 27, 1959. (D-general; ST)

506-D. (Translation—BWRA.) Effect on Ingot Properties of Electro-Slag Heating of the Riser by a Graphitized Electrode. D. F. Chernega, V. A. Molotkov, N. N. Kisel and K. G. Trofimova. *Avtomaticheskaya Svarka*, v. 66, Jan. 1959, p. 99-106.

Electroslag heating of riser during solidification of 3-ton ingots of 60 KhN steel. Macrostructure, texture, mechanical properties and gas saturation of heated and unheated ingots. 10 ref. (D9, M28h, Q27a; ST, 5-59, 9-68, 9-69)

507-D.* Comments on the OLP Process. B. Trentini, P. Vayssiere and M. Allard. *Iron and Steel Institute, Journal*, v. 192, June 1959, p. 143-147.

Refining high-phosphorus pig iron by oxygen-lime powder blowing. Factors controlling nitrogen, phosphorus and sulphur in steel. (D3f; ST)

508-D.* Development and Present State of the LD Process. O. Cuscoleca and K. Rosner. *Iron and Steel Institute, Journal*, v. 192, Juen 1959, p. 147-153.

History of Linz-Donawitz process of oxygen top blowing at pioneer Austrian plants. Vessel linings; properties of LD steels; experience in other countries; lime

powder injection; compacities and costs. 12 ref. (D10a)

509-D.* Preliminary Studies on the Evolution of Fumes From Iron at High Temperatures. E. T. Turkdogan and L. E. Leake. *Iron and Steel Institute, Journal*, v. 192, June 1959, p. 162-170.

Fume emission from molten iron and iron alloys when exposed to oxygen, air, carbon dioxide, oxygen-steam mixtures or ferrite oxide. Relationship between fume evolution and oxidation of carbon. X-ray and microscopic examination of fumes. Fume formation mechanisms. 10 ref. (D11j, N16n; Fe-b, *C*)

510-D. (Russian.) Pig Iron and Slag Temperatures During Smelting of Conversion Iron. I. S. Kulikov, G. A. Sokolov, I. I. Gul'tyai, V. M. Zudin and A. L. Galatonov. *Metallurg*, July 1959, p. 4-7.

Difference in temperature between the upper slag and the pig iron during tapping is an indication to some degree of a uniform blast furnace process. The more uniform the process is, the less will be the temperature differential. (D1, 2-61; RM-q)

511-D. (Russian.) Selection of Temperature for Tapping of Steel. Yu. G. Gurevich and O. F. Antropov. *Metallurg*, July 1959, p. 13-14.

Suggested temperature ranges for liquid steel in the ladle to secure optimum steel quality. The maximum temperature drop between the furnace and the ladle is 30-40° C. (D9n, 2-61; AY, CN)

512-D.* Low-Temperature High-Impact Steels. W. A. Koppi. Digest of "Some Aspects of Melting Low-Temperature High-Impact Steels". Paper Presented at the A.I.M.E. Electric Furnace Steel Conference, Pittsburgh, Dec. 1957. *Metal Progress*, v. 76, Aug. 1959, p. 188, 190.

To minimize inclusions in the production of clean steels, clean furnace bottoms, low FeO content in the final slag, a high residual Mn, proper deoxidation, a good refractory program and a well-adapted pouring practice are recommended. (D-general; CN, AY, 9-69)

513-D. Steel Strip From Ore Without Melting. *Metal Progress*, v. 76, Aug. 1959, p. 86.

New Republic process consists of three major steps. First, Fe ore is purified and then reduced to Fe powder. The powder is funneled between four rolls where it is compressed into a semisolid strip with sufficient "green" strength to hold together. The compacted strip is heated to 2200° F. in a furnace with a reducing atmosphere and is passed through a series of hot rolling mills. Hot rolling brings the compacted powder up to full density and gives hot rolled steel which has the same quality as conventionally made steels. (D8j)

514-D. Bubbling Helium Helps Degas Steel. *Steel*, v. 145, Aug. 17, 1959, p. 106, 110.

Vacuum degassing process with the gas injected into the ladle to increase turbulence. (D9s, 1-73)

515-D. (Polish.) Continuous Casting of Steel. Stanislaw Kawinski. *Przeglad Techniczny*, no. 19, May 1959, p. 8-9.

Equipment, speed and control in continuous casting of steel; Polish installations for continuous casting. (D9g)

516-D.* H-Iron. Nat Wood. *Western Metalworking*, v. 17, July 1959, p. 37-39.

Pilot plant bypasses blast furnace by reduction of iron ore fines with hydrogen in fluidized beds at low temperatures and elevated pressure. (D8j)

517-D.* (Italian.) Results Obtained in Manufacture of Steel With 6-Ton "D.V.H. Lincar" Basic-Lining, Naphtha-Heated Rotary Furnace. A. Bargone and E. A. Hanne. *Fonderia Italiana*, v. 8, Mar. 1959, p. 101-104.

Furnace design; operating and consumption data, and production costs relating to the manufacture of about 2000 tons of steel in 400 melts. Trial runs to determine possibility of producing pig iron by reduction of iron ores also gave satisfactory results. (D8p, W18b)

518-D.* Oxygen Desiliconizing Provides Hot-Metal Electric Steelmaking. H. W. A. Waring and Emrys Davies. *Journal of Metals*, v. 11, Aug. 1959, p. 515-517.

In place of the conventional duplex process a new process for pre-refining with oxygen produces a metal with sufficient carbon to make final decarburization in the arc furnace (using the oxygen lance) simple and rapid. (D5g)

519-D.* Oxygen Open-Hearth Practice in the USSR. *Journal of Metals*, v. 11, Aug. 1959, p. 521-523.

Direct oxidation of the bath with oxygen is used in making low-carbon steel grades

(less than 0.12% C). Oxygen is also injected into the bath during the refining period when converting phosphorus pig iron in tilting furnaces. (D2g)

520-D.* (English.) Research on the Activity of Components in Fundamental System in Iron Blast Furnace Slag. Pt. 1. Measurement of the Activity of Silica in the System of $CaO-SiO_2$ and $CaO-SiO_2-Al_2O_3$. Koji Sanbongi and Yasuo Omori. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 244-263.

Electromotive force at 1630° C. of double cell consisting of Fe-Si alloy electrode, $CaO-SiO_2$ or $CaO-SiO_2-Al_2O_3$ experimental slags, intermediate oxygen electrode, $CaO-SiO_2-Al_2O_3$ reference slag and Fe-Si alloy electrode. Calculation of activity of silica from emf values. 16 ref. (D11n)

521-D. U. S. Steel Reveals Pilot Facilities. *Journal of Metals*, v. 11, Aug. 1959, p. 510-511.

Consumable-electrode melting, vacuum stream degassing, oxygen steelmaking, direct reduction at U. S. Steel's South Chicago Works. (D-general, A9)

522-D. Revolution in Steel. *Luria Letter*, July 1959, 4 p.

Review of research trends, with special reference to oxygen in steelmaking. (D-general, A9)

523-D. Hopkins Process Upgrades Metals for Critical Uses. *Steel*, v. 145, Aug. 24, 1959, p. 94-95.

Electrodes are melted under a controlled slag, at a controlled rate, in a water-cooled mold. The molten slag blanket protects metal from the atmosphere. It keeps undesirable elements out of the metal, desirable ones in. The process eliminates inclusions and prevents segregation. (D5b)

524-D.* Vacuum Method Works in Ladle to Boost Degassing of Steel. *Iron Age*, v. 184, Aug. 13, 1959, p. 86-87.

Advantages of this method include efficient removal of hydrogen, oxygen and nitrogen; degassed steel can be poured into one or more molds; the ladle can be moved from one mold to another. (D9s, 1-73)

525-D.* Oxygen Methods of Steel Production. D. L. Bryant. *Castings*, v. 5, June 1959, p. 9, 11, 13, 15, 17.

L-D, Kaldo and Rotor processes. (D10)

526-D.* Ultrasonics Cuts Grain Growth During Casting of Forging Ingot. E. B. Wright, D. R. Carnahan and J. H. Kelley. *Iron Age*, v. 184, Aug. 6, 1959, p. 84-87.

Influence of ultrasonic vibration during vacuum arc casting on the macrostructure of forging steel ingots. (D9, 1-73, 1-74, M28h; ST, 5-59)

527-D.* Russian Steelmaking. *Iron and Steel Engineer*, v. 36, July 1959, p. 63-66.

Impressions on coking, sintering, blast furnace, openhearth and rolling mill operations in the Soviet Union. (D-general)

528-D. (German.) Influence of High Metallurgical Loads and Increased Solid Iron Charges on the Work of a Maerz Openhearth Furnace. Karl-Friedrich Ludemann. *Neue Nutte*, v. 4, Apr. 1959, p. 198-207.

Effects on capacity, decarbonization velocity and refining-process. 13 ref. (D2a)

529-D.* Determination of the Cerium Habit in Carbon Steel. R. H. Singleton. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 675-679.

Vacuum-refined carbon steel melts containing specified amounts of sulphur were exposed to various specified amounts of oxygen and nitrogen after which Ce was added. The resultant metal was examined metallographically, and samples were extracted electrolytically in an attempt to isolate inclusions. With the aid of these techniques, together with the metal compositional data, it was determined that the Ce habit was predominantly a cerium sulphide. 9 ref. (D11s, D6, 2-60, 1-73; CN, *Ce, S, O, N*, 9-69)

530-D. Degassed Die-Block Steel. *American Machinist*, v. 103, Aug. 24, 1959, p. 87.

Vacuum ladle-degassing differs from vacuum steam-degassing and vacuum arc-furnace degassing in that, after pouring, the filled ladle is placed in a vacuum chamber. (D9s, 1-73)

531-D.* (German.) Degassing Steel by the Vacuum Stream Degassing Method. W. Coupette. *Vakuum Technik*, v. 8, May 1959, p. 101-103.

An extremely rapid degassing process is guaranteed even at pressures of 1 torr or below, with the hydrogen content remaining within the required limits. This is achieved by the enlargement of the surface-contact area of the steel. In this way low pressures can be achieved with the same pumping capacity and more intensive forces can be activated for the metallurgical reactions. (D9s, 1-73)

532-D.* Applying the Digital Computer to Openhearth Operations. *Control Engineering*, v. 6, Aug. 1959, p. 94-100.

Integration of various procedures and control of variables. (D1, X14)

533-D.* Low Shaft Furnace Pilot Plant. *Indian and Eastern Engineer*, v. 101, Apr. 1959, p. 255-258.

Construction and flow diagrams for Jamshedpur plant in India. The low-shaft furnace process achieves reduction in effective height which widens the choice of raw materials and allows the utilization of furnace gas of high thermal value. (D8n, W17h)

534-D.* Continuous Casting. Development of a Horizontal Process for Cast Iron and Non-Ferrous Bar. Z. Stokowiec. *Iron & Steel*, v. 32, June 1959, p. 323-326, 332.

Influence of C, Si, P and Mn on microstructure and tensile strength of continuously cast iron bars. Importance of temperature and speed of withdrawal. Mechanism of solidification in vertical and horizontal processes. (To be concluded.) (D9q, N12, M27, Q27a; CI, *C, Si, P, Mn*)

535-D. (Russian.) Influence of Calcium Oxide on the Distribution of Tungsten Between Melt and Slag. B. M. Mogutnov, N. N. Perevalov and L. A. Shvartsman. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 22-28.

Determination of the oxidation temperatures for tungsten in the presence of slags containing 0 to 34% CaO. Effect of slag basicity on the oxidation of tungsten. 7 ref. (D11r, D2d; 14-60)

536-D. (Russian.) Oxides in Metallurgical Activity of Slags. N. M. Chuiko. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 29-36.

Active concentration of FeO in the system $FeO-SiO_2$, in lime-silicate slags and in $FeO-SiO_2$-MnO-MgO systems as a function of the basicity of slag. 8 ref. (D11n, P12b; RM-q)

537-D. (Russian.) The State of Slag-Forming Substances in the Oxidizing Zone of a Blast Furnace. M. Ya. Ostroukhov, A. V. Rudneva and L. M. Tsylev. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 37-43.

Specimens were taken from the oxidizing zone at varying distances from the tuyeres. Composition of combustion gases, Fe oxides and slags forming in the zone as a function of distance. A part of the slag-forming substances was found to be present in the solid or plastic state. 9 ref. (D1, D11n; RM-q)

538-D. Iron and Steel in India. Pt. 1. G. Reginald Bashforth. *British Steelmaker*, v. 35, July 1959, p. 222-225.

Origins, growth and future development plans. (D-general)

539-D. (Book.) The Manufacture of Iron and Steel. v. 2. Steel Production. G. Reginald Bashforth. 390 p. 1959. Chapman & Hall Ltd., 37 Essex St., W. C. 2, London, England. 40s.

Description and main features of the production of blister, shear and crucible steels; converter, openhearth and electric furnace processes. Other topics include ingot casting, modified and special processes, physical chemistry of steelmaking. 150 ref. (D-general)

540-D. (Translation—Brutcher no. 4365.) On the Technology of Vacuum Melting of Metals and Alloys. A. V. Emyashev. *Primenenie Vakuuma v Metallurgii*. Moscow 1958, p. 54-61.

(D8m, C25)

541-D. (Translation—Brutcher no. 4603.) Operating Experience in the Vacuum Treatment of Openhearth Steels. C. H. Pottgiesser, H. J. Daermann and A. Drevermann. *Stahl und Eisen*, v. 79, no. 8, 1959, p. 463-468.

See item 357-D, 1959. (D9s, 1-73; ST)

542-D. (Translation—Brutcher no. 4604.) Properties of Vacuum-Treated Steels. C. H. Pottgiesser, A. Wicher and E. Klein. *Stahl und Eisen*, v. 79, no. 8, 1959, p. 468-472.

See item 358-D, 1959 (D9s, Q-general; ST)

543-D. (Translation—Brutcher no. 4606.) Commercial Vacuum Treatment of Steel for Rolling and Forging Ingots and Castings.

K. Brotzmann. *Stahl und Eisen*, v. 79, no. 9, 1959, p. 634-638.
(D9s, 1-73)

544-D. (Translation—Brutcher no. 4613) Experimental Operation of a New Blast-Furnace Top Distributor. N. S. Shchirenko. *Stal'*, v. 8. no. 12, 1958, p. 1066-1071.
(D1, W17g)

545-D.* Results Obtained From 165-Ton Electric Furnace. Gaston Stassin. *Blast Furnace and Steel Plant*, v. 47, Aug. 1959, p. 862-864.
Furnace characteristics; operating conditions; consumption and capacity; furnace life. (D5, W18s)

546-D.* Vacuum Pouring of Ingots for Heavy Forgings. Pt. 2. J. H. Stoll. *Industrial Heating*, v. 26, June 1959, p. 1163-1164, 1166-1168, 1170-1171, 1174.
Pouring operation used at Bethlehem Steel. Pressure surges and drops; purging tanks with inert gases to guard against explosion; hydrogen removal to 60% based on pony ladle tests. Comparative data show hydrogen content during processing of forgings from conventional and vacuum cast ingots. (To be continued.) (D9p, 1-73)

547-D. (Russian.) Production of Steel From High-Phosphorus Cast Iron in a Side-Blown Converter. V. I. Bantuzmanskii, Yu. A. Dubrovskii, V. I. Lapitskii, A. M. Poyarkov, S. T. Rostovtsev, G. S. Sesyuk and E. M. Ogryzkin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 25-27.
Oxygen and air are blown onto the surface or into the top layer of melt. Slag formation and dephosphorization are influenced by the angle formed by the air-oxygen blast with the bath surface and by the ratio of air to oxygen. 10 ref. (D3b)

548-D. (Russian.) Production of Steel From High-Phosphorus Cast Iron in a Top-Blown Converter. V. I. Bantuzmanskii, Yu. A. Dubrovskii, V. I. Lanitskii, A. M. Poyarkov, S. T. Rostovtsev, G. S. Sesyuk and E. M. Ogryzkin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 28-33.
Importance of the quantity of iron oxide present in the primary slag, the quantity of oxygen and method of introduction, condition and composition of fluxes, thickness of solid phase layer during the first time of blowing and the temperature of melt for slag formation and desulphurization. (D3b)

549-D. Basic Oxygen Steelmaking Installation at Fontana Plant of Kaiser Steel Corp. *Industrial Heating*, v. 26, Aug. 1959, p. 1563, 1564, 1566, 1568.
(D10a, 1-52)

550-D. Oxygen Steel Passes Its Tests; More, Bigger Units Planned. G. J. McManus. *Iron Age*, v. 184, Sept. 24, 1959, p. 67-68.
(D10)

551-D. Automated Ladle Additions Up Steelmaking Efficiency. *Steel*, v. 145, Sept. 1959, p. 172, 176.
(D2c)

552-D. (Russian.) Processing of Blast Furnace Slags Containing Aluminum Oxide. V. D. Ponomarev and V. S. Sazhin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 65-68.
(D1g)

553-D. (Russian.) Aerodynamics of the Flame in an Openhearth Furnace. V. I. Mitkalinnyi and Ni Suye-tszy. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 73-79.
(D2h)

554-D.* (German.) Improved Heat Conductivity in Siemens-Martin Furnaces by the Use of Oxygen. L. M. Jefimow. *Freiberger Forschungshefte Eisenhuttenwesen*, v. B-40, June 1959, p. 5-24.
The strong oxygen jet creates a permanent flame above the melt. The large differential in velocities between the oxygen and gaseous stream produces a good mixing effect in the furnace. The decrease in nitrogen content in the gaseous mixture improves the heat exchange, increases the combustion temperature and considerably reduces thermal losses. (D2g)

555-D.* (German.) Remelting of Pig Iron in Oil-Fired Hearth-Type Furnaces. R. Baake. *Freiberger Forschungshefte Eisenhuttenwesen*, v. B-40, June 1959, p. 25-39.
The combination of the hearth-type furnace and the blast furnace in one unit is compared with oil-fired hearth-type furnaces. Control of Si content is achieved by regulation of combustion. (D2h)

556-D. (Russian.) Kinetics of Reactions Occurring in a Rotating Induction Furnace Between Melt and Oxidizing Blast. S. I. Filippov, V. V. Yakovlev and L. M. Chelyadinov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 15-19.

A mixture of CO_2 and O is blown against and under the melt surface, while the furnace rotates. Effect of blowing time on composition of melt. Oxidation of carbon takes place at temperatures above 1500° C. Changes in the manner of blowing or of the rotation speed caused no measurable effects. (D10c, W18a, 2-61, 3-67)

557-D. (Russian.) Oxygen Content in the Melt of a Steel Furnace With Recirculating Heat. E. A. Kazachkov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 20-26.

Correlation between carbon and oxygen content. Oxygen in the melt as a function of FeO concentration in slag and of the rate of carbon oxidation. 11 ref. (D2h, D11)

558-D. (Russian.) Assimilation of Lime and Slag Forming Substances by Basic Slags Containing Chromium. A. L. Klein, P. V. Umrikhin and V. A. Startsev. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 27-31.

Influence of FeO and Al_2O_3 present in the slag on its basicity and assimilation properties. 6 ref. (D2d, D11n)

559-D. (Russian.) Variations of Melt Temperature During the Final Openhearth Process With a Charge Containing Phosphorus. E. A. Kazachkov and F. F. Sviridenko. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 38-42.

Rate of temperature increase as a function of the rate of carbon oxidation and of the reduction in height of the slag layer. 5 ref. (D2, 2-60, 2-61; CI, *P*)

560-D. (Russian.) The Overheating of Steel in a Tropenas Converter. V. A. Fuklev and L. K. Grakhov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 78-83.

Heat development in the oxidation of Si and carbon. (D3b, D11k)

561-D.* Continuous Casting. Present Horizontal Process for Cast Iron Bar. Z. Stokowiec. *Iron & Steel,* v. 32, July-Aug. 1959, p. 375-378.

Continuous horizontal casting method for producing Fe or phosphor bronze bars by drawing through a horizontal water-cooled die from liquid metal supplied by a holding furnace. Metal temperatures and automatic drawing mechanisms are shown and explained. Method makes possible 24-hr. continuous operation, so that die damage due to restarting is lessened. (D9q)

562-D. (Russian.) Heat Emission During the Second Forced Cooling Process in the Continuous Casting of Steel. A. D. Akimenko and A. A. Skvortsov. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 123-130.

Effect of heat emission rate in second forced cooling on surface temperature and liquid pool. Temperature emission as a function of cooling method and time. 6 ref. (D9q, P11k; ST, 5)

563-D.* Self Diffusion of Iron in Iron Silicate Melt. L. Yang, Ch. Chien and G. Derge. *Journal of Chemical Physics,* v. 30, June 1959, p. 16-27.

Electrochemical properties of Fe-O-SiO_2 melts and the mobility of Fe ions in a melt containing 61% by weight of FeO measured at 1250° C. by radiotracer techniques. (D11n, N1d, 1-59; Fe, *Si*)

564-D.* Potential for Oxygen in Steelmaking. E. C. Wright. *Metal Progress,* v. 76, Sept. 1959, p. 101-107.

Companies using the oxygen converter process and those experimenting with oxygen in blast furnace and openhearth report economies and increased production rates. (D-general, D10; O)

565-D.* Vacuum Degassing in Ladle—a New Technique in Steelmaking. *Metal Progress,* v. 76, Sept. 1959, p. 111-114.

Hydrogen and other gases removed from molten steel in the ladle. By purging with helium while the vacuum is being drawn, hydrogen is reduced to less than 2 ppm. in 15 min. Technique permits steel from one heat to be poured into several ingots. (D9m, 1-73)

566-D.* Radio-Isotopes and Soviet Steel. Arthur B. Tesmen. *Metal Progress,* v. 76, Sept. 1959, p. 115-120.

Studying steelmaking processes with radio-isotopes. Blast furnace techniques include ways to measure stock feeds, wear on furnace bottoms and charge levels. In the refining process, work has been done on dephosphorization, desulphurization, scrap melting and slag formation. (D-general, 1-59)

567-D. (Russian.) Effect of the True Surface of Melt in an Openhearth Furnace on the Quantity and Flow of Heat Received. B.

L. Markov. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 90-93. 3 ref. (D2, P11k)

568-D. (Russian.) Charging an Openhearth Furnace for the Scrap Process. B. L. Markov. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 117-122. 5 ref. (D2a)

569-D. (Russian.) Instrument Allowing Investigations on the Kinetics of Reactions. V. I. Korofich and V. K. Gruzinov. *Nauchnye Doklady Vysshei Shkoly— Metallurgiya,* no. 2, 1959, p. 250-251.

Control of metallurgical processes by exposing samples to bend stress and measuring changes in conductivity. (D-general, S18)

570-D.* Vacuum Degassing of Steel in the Ladle. *Foundry,* v. 87, Oct. 1959, p. 130.

Nature and effectiveness of process. Steel can be poured freely into several molds which need not be in a vacuum. Very slight heat loss results during degassing. (D9s, 1-73)

571-D.* (German.) Effects of Small Silicon Contents on the Equilibria of Carbon and Oxygen in Liquid Iron. Hermann Schenk and Karl Heinz Gerdom. *Archiv fur das Eisenhuttenwesen,* v. 30, Aug. 1959, p. 451-460.

Relationship between the carbon, Si and oxygen contents and the CO_2 content in the gaseous phase at 1600-1680° C. and under a SiO_2 saturated slag. CO_2 content of the $CO-CO_2$-gaseous phase as a function of the carbon present in the melt. 36 ref. (D11h, 2-60, 2-61; Fe, 14-60, *C, O, Si)*

572-D.* (German.) Equilibria Between an Iron Melt and a Phosphate Slag Containing Calcium. Gerhard Tromel and Hans Werner Fritze. *Archiv fur das Eisenhuttenwesen,* v. 30, Aug. 1959, p. 461-472.

Melting of Armco iron and slag additions in a calcium phosphate crucible and holding at 1550-1700° C. Correlation between slag composition and composition of melt. 10 ref. (D11n; Fe, 14-60)

573-D. Vacuum Melting at the Works of Jessop-Saville, Ltd. *Foundry Trade Journal,* v. 107, Sept. 17, 1959, p. 179-182.

Two methods adopted by Jessop-Saville, Ltd., Sheffield, are the consumable electrode arc melting and high-frequency induction melting processes. (D8m)

574-D. (German.) Distribution of Materials During Charging of a Blast Furnace. R. Baake. *Neue Hutte,* v. 4, Aug. 1959, p. 461.

Influence of charging on the distribution of ore and coke layers in the furnace. 18 ref. (D1a)

575-D. Removes 60% of Hydrogen From Steel in Ladle. *Chemical Processing,* v. 22, Oct. 1959, p. 80-81.

Vacuum degassing improves the quality of high-alloy steels for die-block and hot work die steel. (D9s)

576-D.* (Russian.) Melting of Low-Manganese Pig Iron. L. M. Freidin and L. Ya. Porthoi. *Stal',* July 1959, p. 587-589.

For successful melting in blast furnaces of the southern region pig iron poor in Mn, it is essential to improve the uniformity of the composition of the raw materials, especially of fluxes, and to introduce dolomite-limestone into the charge to obtain an active magnesium slag. (D1a)

577-D.* (Russian.) Alloying of Steel With Nitrogen by Means of Organic Agents. Pin'es and Zezulova. *Stal',* July 1959, p. 625-626.

Alloying is achieved by melting in an electric arc furnace and increasing the nitrogen content to tenths of 1%. The function of the nitrogen is to replace the deficient Ni, nitrogen entering into solid gamma-solution. 6 ref. (D5c; *N*)

578-D.* (Russian.) The Process of Formation of Outer Cracks in Ingots During Hot Deformation. I. T. Baruzdin. *Stal',* July 1959, p. 649-652.

Development of microfissures in ingots into large ones is related to teeming temperatures and rates. A reduced temperature will produce a denser structure and decrease the number and depth of surface microcracks. (D9r, 2-61; 5-59, 9-72)

579-D. Casting in Argon Lowers Ingot Inclusion Count. *Iron Age,* v. 184, Oct. 1, 1959, p. 73-75.

Method of blanketing molten metal with argon during teeming to avoid formation of inclusions. (D9p; 5-59, 9-69)

580-D. Will New Iron-Making Methods Cut Blast Furnace Operations? G. J. McManus. *Iron Age,* v. 184, Oct. 8, 1959, p. 114-117.

New methods include fluid beds, shaft furnaces, electric furnaces, kilns and retorts. (D8n)

581-D. Vacuum Process for Die-Block Steel. *Tooling & Production,* v. 25, Oct. 1959, p. 48.

Removal of hydrogen from molten steel after it is tapped from the furnace into the ladle. (D9s, 1-73; TS)

582-D.* (Polish.) Mechanism and Kinetics of the Reduction of Iron Ores. Emilian Iwanciw. *Archiwum Hutnictwa,* v. 4, no. 2, 1959, p. 133-159.

Reduction of Fe_2O_3 and natural magnetite in the presence of charcoal by $Co + CO_2$ at temperatures ranging from 700 to 1200° C. Effect of temperature on reduction rate. Computation of the activation energy of reduction. Effect of pressure. 20 ref. (D11g, D8j, 2-61, 3-74, P13a; RM-n, *Fe*)

583-D. Blast Furnace Is Updated With Nuclear Stock Gages. *Steel,* v. 145, Oct. 12, 1959, p. 120, 124.

Stock level in a blast furnace determined by radioactive sources and detectors built into the furnace well. (D1a, 1-59)

584-D. (Russian-Book.) Vacuum Treatment of Steel. N. D. Shadrina. 68 p. 1958. Izd-vo VTsSPS Profizdat, Moscow. (Available from Library of Congress, Washington, D.C.)

Review of the most commonly used methods of treating steel in a vacuum including vacuum treatment of the molten metal in the ladle before pouring, and vacuum treatment by the method of pouring metal from one ladle to another. (D9, 1-73)

585-D. (Translation—Brutcher no. 4683.) Kinetics of the Reduction of Iron Oxides Forming a Stratum by Hydrogen. S. T. Rostovtzev and A. P. Em. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 9-14.

Reduction process as a function of temperature, time and of the velocity of gas flow. (D11, 2-61, 3-67)

586-D. (Translation—Brutcher no. 4692.) Mechanism of the Reduction of Iron Oxides. S. T. Rostovtsev, L. N. Rudenko and V. K. Simonov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 5-8.

Theoretical considerations on the reduction by CO or hydrogen. 5 ref. (D11g)

587-D. (Translation—Brutcher no. 4695.) Changes in the Amount of Oxide Inclusions Present in the Metal During the Openhearth Process. S. L. Levin and I. P. Kazachkov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 2, 1959, p. 43-47.

Effect of the speed of carbon oxidation during the second boiling process on the quantity and composition of oxide inclusions. Changes caused by deoxidizers and Al added. (D2; ST, 9-69)

588-D.* (French.) Determination and Recording of the Temperature in a Basic Bessemer Converter by Optical Pyrometry. J. Galey, L. Beaujard, P. Vallet, G. Urbain, J. Tordeax and P. Villette. *Revue de Metallurgie,* v. 51, July 1959, p. 69-99.

Description and use of the instrument. Melt temperature as a function of the initial temperature, the amount of air consumed in blowing and the composition of melt and slag. Cooling rates during solidification with and without addition of pure iron. Effects of carbon and phosphorus on nucleation during cooling. 10 ref. (D3, 1-65, S16a, P12, 2-60, N2g; ST, 14-60)

589-D.* (German.) The Low Shaft Furnace at Ougree Used as a Small Pilot Furnace. E. Bonnaure. *Stahl und Eisen,* v. 79, Aug. 6, 1959, p. 1105-1119.

The significance of the applied higher gaseous pressure at the top of the furnace, the specific coke rate, effects of grain size and lime flux. Gas and temperature conditions in the furnace; theoretical presentation of the critical coke rate; sinter composition analysis. (D8n)

590-D.* (German.) Nitrogen Used as an Alloying Element in the Production of Manganese-Vanadium Structural Steels in Openhearth Furnaces. H. Joachim Wiester, H. A. Vogels and H. Ulmer. *Stahl und Eisen,* v. 79, Aug. 6, 1959, p. 1120-1129.

Experiments with thick sheets proved that nitrogen used as an alloying element condiderably improves structural properties. Perfectly weldable steels with elongation limits from 35 to 45 kg.per sq. mm. were obtained with ST 52-3 steel with the addition of vanadium up to 0.27% and with nitrogen up to 0.025%. (D2c; *Mg, V, Ni,* SGB-s)

591-D.* A New Direct Iron Process in Relation to Ore and Steel Production. Horace Freeman. *Canadian Mining and Metallurgical Bulletin,* v. 52, Aug. 1959, p. 529-531.

Rotary kiln process. (D8j)

592-D.* An Outline of Exothermic Feeding. B. G. Pidermann. *Engineer and Foundryman,* v. 24, Apr. 1959, p. 97-103.

Methods of increasing production of castings and ingots per ton of metal melted by means of various types of exothermic compounds. (D9k, E23; ST)

593-D.* Oxygen in the Iron and Steel Industry. J. L. Harrison. *Engineer and Foundryman,* v. 24, Apr. 1959, p. 110-114.

Use of oxygen as an additive to solid, liquids and gaseous fuels and in electric arc furnaces. A smaller percentage of nitrogen in the blast, higher combustion temperature, increased melting rate and lower coke consumption are achieved. (D-general; O)

594-D.* Instant Steel—Will It Aid Maintenance? *Plant Engineering,* v. 13, July 1959, p. 92-95.

Madrigal process converts raw iron and alloys directly to steel in less than 40 min. Pulverized Fe ore is mixed with an "alloying" compound and is heated to about 3000° F. for 35 min. (D8j)

595-D.* Recent Trends in Iron and Steel Technology. B. R. Nijhawan. *Blast Furnace and Steel Plant,* v. 47, Oct, 1959, p. 1057-1060.

Advantages of using oxygen injection in steelmaking as achieved by different methods in various countries. Oxygen injection reduces nitrogen and phosphorus contents, improves the mechanical properties and reduces the tendency to work hardening and strain-age embrittlement. (D2g, D3f, D10)

596-D.* Use of Oxygen in Duplex and Stationary Open Hearth Practice. Oscar Pearson. *Blast Furnace and Steel Plant,* v. 47, Oct. 1959, p. 1063-1070.

Economic use of oxygen by varying the design of the openhearth furnaces to suit different methods. Types of furnaces considered are the openhearth furnace with suspended basic roof, modern stationary 380-ton openhearth furnace and 190-ton tilting furnace with oxygen roof lance. (D2g, W18r)

597-D.* Increased Production Obtained From Automatic Regulation of Blast Furnace. *Blast Furnace and Steel Plant,* v. 47, Oct. 1959, p. 1081-1082.

Hagan top pressure control system installed at Alan Wood Steel Co. controls the blast furnace top pressure automatically. This results in increased gas pressure and increased production without loss of additional burden particles as flue dust. (D1h, S18r)

598-D. Electric Melting Economics. J. G. Contant. *Blast Furnace and Steel Plant,* v. 47, Oct. 1959, p. 1073-1078.

Comparison with openhearth furnaces with respect to capital and production costs and output. (D5, D6, A4s)

599-D. Application of Data-Logging and Programming Techniques to Steel Mill Processes. R. W. Barmitz and G. E. Terwilliger. *IRE Transactions on Industrial Electronics,* July 1959, p. 24-31.

(D-general, X14j)

600-D.* A Review of Steelmaking Processes. T. P. Colclough. *Iron and Steel Institute, Journal,* v. 192, July 1959, p. 201-213.

Basic bessemer process, acid bessemer process, OH process and the hot metal process from the point of view of ingot yield by percentage of metals charged, byproducts, waste, radiation and other losses. (D-general)

601-D. (Russian.) Effect of Potassium Oxide on the Viscosity of the System CaO-SiO_2-Al_2O_3 With Special Reference to the Composition Ratio Corresponding to the Analysis of Prima.y Blast Furnace Slags. I. I. Gul'tyai, N. L. Zhilo, A. V. Rudneva, G. A. Sokolov and L. M. Tsylev. *Isvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo,* no. 2, 1959, p. 3-7.

Determination of the temperature at which various composition ratios show the same viscosity coefficient and also of their viscosity values at various temperatures. With the Al_2O_3 content kept constant, addition of K_2O caused increased viscosity and higher crystallization temperatures. 9 ref. (D11n)

602-D. (Russian.) Dephosphorization of Cast Iron Using Solid Additions. O. V. Travin and L. A. Shavartsmann. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo,* no. 2, 1959, p. 8-12.

To a cast iron melt containing 0.005-0737% phosphorus, pressed tablets containing CaO (50%) and Fe_2O_3 (50%) were added to study the transition of phosphorus from the melt into the tablets by means of the radioactive isotope P^{32}. Effects of time and temperature on dephosphorization. (D11n, 3-67, 2-61)

603-D.* Standard Steel's Vacuum Pouring Stream-Degassing Installation. *Industrial Heating*, v. 26, Sept. 1959, p. 1754-1756, 1758.

New facility allows production of low-hydrogen steel rings, shafts, pinions, gears and other forgings for critical high-stress applications in rotating machinery. (D9s, 1-73)

604-D.* New Electric Direct Reduction Process Produces Steel or Pig Iron. *Industrial Heating*, v. 26, Sept. 1959, p. 1772, 1774, 1776.

Use of special design double-hearth low-frequency induction furnace for the production of either rimming-type liquid steel or a carbon-rich alloy similar to pig iron by direct reduction of rich Fe ore through reaction with carbon. (D8j)

605-D.* Application of Special Refractory Materials in the Iron and Steel Industry. J. D. McCullough. *Iron and Steel Engineer*, v. 36, Sept. 1959, p. 172-178.

Gunned castable refractories for packing and building up linings of blast furnaces; roof materials for patching billet and slab furnaces. (D-general; RM-h)

606-D.* Nuclear Energy Applications for Steel Plant Operations. Patrick J. Selak and Rudolph Tietig, Jr. *Iron and Steel Engineer*, v. 36, Sept. 1959, p. 179-184.

Use of radioisotopes for automation, process and quality control. Isotopes are used to determine the characteristics of material movements and reactor kinetics. (D-general, 1-59)

607-D.* L-D Process for Making Basic Oxygen Steel. E. J. Prince. *Iron and Steel Engineer*, v. 36, Sept. 1959, p. 185-186.

Blowing of high-purity oxygen onto molten pig iron contained in a suitable refractory curcible. Sufficient Si, C, Mn and P dissolved in the molten pig acts as the fuel and combustion by the oxygen provides the heat necessary to melt scrap, metal and fluxes to a required tapping temperature. (D10a)

608-D.* Vacuum Degassing-in-Ladle Improves Alloy Steels. *Plant*, v. 20, Sept. 1959, p. 48-49.

Process removes hydrogen gas from molten metal and produces cleaner, stronger steel. (D9s, D9n, 1-73; AY)

609-D. Open Hearth Slag Handling. G. R. Morgan. *Iron and Steel Engineer*, v. 36, Oct. 1959, p. 129-132.

The handling and disposing of open-hearth slag previously a bottleneck to openhearth operations was eliminated by using tractor-trailer units to transport slag from the pit pouring tables to the dump site. (D2d; RM-q)

610-D. Regulation of Blast Furnace Pressure Gives Increased Iron Production. *Iron and Steel Engineer*, v. 36, Oct. 1959, p. 167.

Production gains are achieved by increasing the weight of gas per cubic foot within the furnace, thus permitting more oxygen to come into contact with the burden. Increased gas pressure is preferable to higher velocity, since this results in the loss of less burden particles as flue dust. (D1b, S18r)

611-D.* Further Experience With the Kaldo Process. Bo Kalling and Folke Johansson. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 330-338.

Melting and refining by Kaldo process with particular reference to high-phosphorus pig iron, Fe losses in slag, Fe yield, desulphurization, composition and refractory life. 8 ref. (D10b)

612-D.* (English.) Activity of Components in Fundamental System of Iron Blast Furnace Slag. Pt. 2. Measurement of Activity of Alumina in the $CaO-SiO_2-Al_2O_3$ System. Koji Sanbongi and Yasuo Omori. *Tokoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 339-351.

Equation for the activity of alumina in a given slag. The e.m.f. is the calculated value obtained by measuring the e.m.f. of the $CaO-SiO_2-Al_2O_3$ cell at 1630° C. with the reference slags CaO 45.2%, SiO_2 2.2% and Al_2O_3 53.7%, respectively. (D1; RM-q)

613-D.* (Italian.) Use of Oxygen in Open-hearth Furnaces. M. Foresi and G. Massobrio. *Metallurgia Italiana*, v. 51, July 1959, p. 257-278.

Results obtained in existing six-furnace mill producing low-carbon steel with experimental introduction of oxygen techniques for decarburization and improvement of combustion. Limitations of use of oxygen with silica roof; trials with basic roof. (D2g)

614-D.* (Italian.) Report on the First Campaign of a New-Type All-Basic Open-hearth Furnace. M. Signora and G. Soddu. *Metallurgia Italiana*, v. 51, July 1959, p. 279-288.

Furnace with streamlined "over-hearth" (Marz-Boelens hearth furnace) and automatic controls was tapped 968 times during first campaign. Operating life, hourly output, flame characteristics and speed of repairs using prefabricated elements were all satisfactory; fuel consumption was normal. (D2, W18r)

615-D. Vacuum Arc Melting Method Upgrades Low-Alloy Steels. *Steel*, v. 145, Oct. 26, 1959, p. 179, 182.
(D5a, 1-73; AY)

616-D. (Russian.) Refinement of Steel in an Oxidizing Gas Current. S. I. Filippov, M. M. Klyuev and V. I. Simonov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 64-78.

Effects of the velocity of gas current and temperature on decarburization. Velocity of the process depends on the supply of oxidizing gas and is not influenced by the quantity of carbon present in the metal. (D2, D3, 3-67)

617-D. (Russian.) Intensification of the Decarburization of Iron With a High Phosphorus Content During the Period of Melting. E. A. Turkebaev and G. N. Oiks. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 88-111.

By increasing the oxygen in the blast, the melting period in an openhearth furnace is shortened. Iron loss, dephosphorization and bath temperature as functions of the oxygen quantity used. 8 ref. (D2b, D11h)

618-D. (Russian.) Heat Absorption of the Melt in an Openhearth Furnace Used as a Basic Characteristic for the Regulation of Heat. G. M. Glinkov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 112-133.

Thermodynamic calculations. 10 ref. (D2h, P12)

619-D. (Russian.) Heat Exchange in the Melt of an Electric Furnace at a Steady Flow of Supplied Heat. N. V. Okorokov and L. A. Mal'tsev. Paper from "Production and Further Processing of Steel and Alloys. Collection of Paper no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 173-184.

8 ref. (D5, E10r, C21d, P11k, 14-60)

620-D.* Vacuum Desulfurization of Liquid Iron Alloys. T. P. Floridis. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 870-871.

Sulphur can be removed from liquid Fe alloys by vacuum treatment. Desulphurization is enhanced by the presence of Si, carbon and Al, while all these elements increase the activity of sulphur dissolved in liquid Fe; the pronounced effect of Si indicates that probably a volatile Si sulphide is formed. 5 ref. (D11n, 1-73, 2-60; Fe-b, *Si*, *C*, *Al*, AD-a, 14-60)

621-D.* (Japanese.) The Desulphurization Product Resulting From Manganese. Pt. 3. Studies on the Desulphurization of Molten Pig Iron by Manganese. Kokichi Sano and Michio Inouye. *Tetsu to Hagane*, v. 45, Jan 1959, p. 9-15.

Desulphurization product is a slag composed of Mn, Fe and S, probably FeS or Fe-FeS dissolved in MnS. MnS equilibrium in C-saturated iron melts. 8 ref. (D11n; CI-a)

622-D.* (Japanese.) Ball Bearing Steel Made With a Vacuum Induction Furnace. Manabu Ueno and Hirooki Nakazima. *Tetsu to Hagane*, v. 45, May 1959, p. 506-510.

The gas contents and nonmetallic inclusions are very low in comparison with the air-melted steel. (D6, 1-73; SGA-c, ST, 9-69)

623-D.* (Japanese.) Operation of the Water-Colled Converter. Pt. 2. Study on a Permanent-Wall-Type Furnace With Forced Cooling. Ryozo Sato and Nofu Tabata. *Tetsu to Hagane*, v. 45, July 1959, p. 699-705.

Low-carbon, high-quality steel can be produced from various kinds of pig iron with the aid of pure oxygen blowing in a water-cooled converter. (D3b)

624-D.* (Japanese.) Special Features of Vacuum Ingot-Casting Process. Pt. 1. Comparison of Vacuum With Air-Cast Steel. Tonoya Suzuki and Toshihiko Asakuma. *Tetsu to Hagane*, v. 45, Aug. 1959, p. 793-799.

Oxidation of the pouring stream and surface of the steel is prevented, while scum and nonmetallic inclusions are floated by the violent boiling and bubbling. 13 ref. (D9p, 1-73)

625-D.* (Russian.) Melting 3KP Steel With Reduced Amounts of Manganese. A. I.

Vasil'ev and S. I. Bogachev. *Metallurg*, Aug. 1959, p. 13-14.

Melting, pouring and rolling with a Mn content of 0.25-0.35% as contrasted to the standard 0.40-0.60%. The quality of the steel's surface is as good as the standard steel while mechanical properties are improved. (D9p, 2-60, Q-general; ST, *Mn*)

626-D. Refractories Usage in Steelmaking Abroad. C. S. Hedley. *Refractories Journal*, v. 35, June 1959, p. 194-198, 200.

(D-general; RM-h)

627-D. (Japanese.) Oxygen Potential in Basic Openhearth Furnaces. Pt. 1. Takehiko Fujii. *Tetsu to Hagane*, v. 45, Aug. 1959, p. 788-793.

Kinetics of decarbonization in molten steel. 15 ref. (D2g)

628-D.* Effect of the Rate of Rise of Rimming Steel in Molds on the Surface Quality of Slabs. A. T. Peters. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 877-878.

Increases of nozzle sizes were generally followed by improvements of slab surface quality. Pouring rates are correlated with the metallurgical performance of steels. (D9p; ST, 4-52, 9-71)

629-D.* Die Steels Improved With New Vacuum Degassing Process. *Precision Metal Molding*, v. 17, Nov. 1959, p. 68-69.

Steel is skimmed to remove almost all the slag and then poured into a ladle. The molten steel, at about 3000° F., is then moved to a vacuum chamber. Both ladle and contents are placed in the chamber, which is then closed and sealed. The air is evacuated from the chamber and when the pressure has been sufficiently reduced, helium is bubbled through the melt. Helium acts as a scavenger to help remove dissolved hydrogen, nitrogen and oxygen. (D9s, 1-73)

630-D. The Use of Oxygen in Duplex and Stationary Open Hearth Practice. Oscar Pearson. *Blast Furnace and Steel Plant*, v. 47, Sept. 1959, p. 947-954, 961.

Equipment design and arrangement at No. 2 Open Hearth Shop, Gary Steel Works, U. S. Steel Corp. (D-general)

631-D. (Japanese.) A Study on the Dephosphorization Equilibrium in an LD Converter. Motozo Maeda, Kikuo Tajima and Eturo Homma. *Tetsu to Hagane*, v. 45, July 1959, p. 694-699.

Analysis of formulae. (D10a)

632-D. (Japanese.) Measurement of the Travel Time of Blast Furnace Burden by Means of Co^{60}. Arihiro Tominaga, Takeo Yatsuzuka, Shiro Shono and Jun Sawamura. *Tetsu to Hagane*, v. 45, July 1959, p. 689-694.

Measurements carried out by counting the radioactivity of samples taken from the molten pig iron on tapping with a scintillation counter. 8 ref. (D1, 1-59)

633-D. (Polish.) Desulphurization of Iron in a Basic Ladle. Tadeusz Hejnar and Stanislaw Pietrkiewicz. *Przeglad Odlewnictwa*, v. 9, May 1959, p. 153-160.

Desulphurization carried out with 1.5% $Na2CO_3$; procedures used in an acid ladle. (D11n; Fe)

634-D. Utilization of By-Product Fuels. R. W. Worley and R. H. Gherst. *Iron and Steel Engineer*, v. 36, Aug. 1959, p. 67-71.

Use of blast furnace and coke-oven gases as boiler and oven fuels. (D1; RM-m39)

635-D. (Polish.) Tendency of Hadfield Steel to Form Hot Cracks During Casting. Gabriel Kniaginin and Wladyslaw Longa. *Przeglad Odlewnictwa*, v. 9, July 1959, p. 197-206.

Chemical composition and method of melting influence the formation of cracks. (D9, 2-60; 9-72)

636-D.* Firing Open Hearth Furnaces With Burners Through the Roof. Andrew Labat-Camy. *Blast Furnace and Steel Plant*, v. 47, Sept. 1959, p. 965-969.

Thermal efficiency of openhearth furnace is much higher when novel technique of firing with groups of mobile burners entering through roof is used. (D2, W18r)

637-D.* Vacuum Stream Degassing Reaches Commercial Acceptance. K. C. Taylor. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 185-191.

Review of the process as practiced today; metallurgical results; vacuum requirements for this process. (D9s, 1-73)

638-D.* Some Properties of Vacuum-Treated Bessemer Steel. A. M. Samarin. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, L 1959, p. 198-203.

Use of vacuum offers the possibility of reviving pneumatic methods of steel production; changes in oxygen and hydrogen content in Bessemer rail steel due to vacuum treatment; effect of vacuum treatment, composition, strain aging and normalization on impact value of Bessemer rail steel; evolution of gases from liquid steel during vacuum treatment. 9 ref. (D3f, 1-73)

639-D.* A Penny a Pound Knocks the H_2 Out of Steel. *Modern Castings*, v. 36, Nov. 1959, p. 45.

Ladle vacuum degassing by injecting the gas takes 12 min. to remove 60% of the hydrogen in a 75,000 lb. heat of electric furnace steel. (D9s, 1-73)

640-D.* Cast Low Alloy Steels Ductility and Toughness. John Zotos. *Modern Castings*, v. 36, Nov. 1959, p. 698-704.

Basic-electric arc furnace melting practice was employed to produce low sulphur and low phosphorus 1040, 4140, high Ni 4325, 4330 and high Si 4340 type steel castings. A decrease in the sulphur content resulted in a significant increase in the reduction in area, impact strength and elongation. A decrease in both the phosphorus and sulphur content also resulted in a significant improvement in ductility and impact resistance. 19 ref. (D5c, 2-60; ST, *P, S*)

641-D.* (French.) Cupola Metal in Openhearth Charges. S. T. Jazwinski. *Metallurgie et la Construction Mecanique*, v. 91, Sept. 1959, p. 631-639.

Fifty heats of two furnaces were charged with liquid metal from a hot blast cupola in proportions ranging from 16 to 50% of total charge. Optimum operating conditions were obtained with charge containing 40% cupola metal. (D2a, D8m)

642-D.* (Japanese.) Corrosion Mechanism in Refractories Used in a Zebra Roof in a Basic Openhearth Furnace. Takeo Ao and Takeji Oyama. *Tetsu to Hagane*, v. 45, Feb. 1959, p. 93-99.

Silica brick adjoining metal-encased unburned chrome-magnesia brick with relation to slagging reaction, interaction between the bricks and changes in the steel casing. Microscopy and chemical analysis of the minerological structure and content of the brick samples. (12n, W18r; RM-h)

643-D. (Swedish.) Electric Steel by Direct Reduction. Piero Nigri. *Teknisk Tidskrift*, v. 89, Oct. 9, 1959, p. 973-976. (D8j)

644-D.* (Japanese.) Experiments and Thermodynamic Considerations on Desulphurization of Fe-S and Fe-C-S Alloys in Vacuum-Melting. Pt. 1. Reiichi Ohno. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 489-493.

Extent and rate of desulphurization of 0.02-0.19% S, 0-4% C, Fe alloys in graphite and alumina crucibles. 11 ref. (D8m, D11n, W18h; CI-q, *C, S*)

645-D.* (Japanese.) Experiments and Thermodynamic Considerations on Desulphurization of Fe-Si-S and Fe-C-Si-S Alloys in Vacuum-Melting. Pt. 2. Reiichi Ohno. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 493-497.

Extent and rate of desulphurization of 0-4% C, 0.027-1.25% S, 1.9-3.18% Si, Fe alloys. (D8m, D11n; CI-q, *C, Si, S*)

646-D. (German.) Stainless Steel for Bright Polishing. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 527.

Reduction of the slag content by vacuum degassing, vacuum ingot casting and vacuum melting in electric furnaces. (D8m, D9s, D5, D6, 1-73; SS)

647-D. Computers as a Means Toward Improving Openhearth Efficiency. Fred C. Schneider. *ISA Proceedings, 1959 Conference*, v. 9, 1959, p. 35-41.

Data processing of the furance variables and a systematic analysis is possible. (D2, X14k)

648-D. Control and Instrumentation of Continuous Casting at Atlas Steels. Harry L. Brien. *ISA Proceedings, 1959 Conference*, v. 9, 1959, p. 51-66.

Operation of a continuous casting machine. (D9q, 1-53, S18)

649-D.* Automatic Ingot Weight Control. Robert G. Watson. *ISA Proceedings, 1959 Conference*, v. 9, 1959, p. 67-71,

Installation of load cells in supporting structure of a hot metal crane allowed development of an instrument system for pouring ingots in a loss-in-ladle-weight basis. (D9, C5, S14)

650-D. Vacuum Metallurgy in the United States. D. E. Franks. *Vacuum*, v. 7-8, Apr. 1959, p. 59-74.

As used in steelmaking. (D-general, 1-73)

651-D. (Hungarian.) Automation in Soviet Blast Furnaces. Basov. *Kohaszati Lapok*, v. 92, Aug. 1959, p. 362-368.
(D1, 18-74)

652-D. (Polish.) Influence of Vacuum Casting on the Structure and Forgeability of High-Nickel Steel Ingots. K. Radzwicki. *Hutnik*, v. 26, no. 7-8, 1959, p. 262-267.
(D9s, 1-73, F22, 17-52; SS, 5-59)

653-D. (Russian.) Diffusion of Calcium, Iron, Nickel and Sulphur in Liquid Slags. A. C. Vanyukov, I. Montil'o. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 59-68.
34 ref. (D11n)

654-D. (Russian.) Improving the Performance of Some Components of a Blast Furnace. I. D. Kordabhev. *Stal'*, Aug. 1959, p. 684-687.
Use of novel charging equipment. (D1a, W17g)

655-D. (Russian.) Inductive Stirring of Metal in Electric Arc Melting Furnaces. M. G. Resin, E. K. Kochnev, Ya. I. Drobinin and N. S. Gowbev. *Stal'*, Aug. 1959, p. 713-714.
(D5f)

656-D. (Swedish.) Automatic Control of Production Processes in Steelworks. S. Edling. *Jernkontorets Annaler*, v. 143, no. 8, 1959, p. 457-486.
Application of computer control. (D-general, X14j, 18-74)

657-D. The Iron and Steel Industry in India. G. R. Bashforth. *Iron and Coal Trades Review*, v. 179, Oct. 23, 1959, p. 639-645.
Characteristics of Indian blast furnace and steelmaking practices as influenced by available materials, transportation and power supplies. (D-general)

658-D. A Visit to the Soviet Exhibit in New York. Arthur B. Tesmen. *Metal Progress*, v. 76, Nov. 1959, p. 100-107.
Many technological innovations were featured at the recent Soviet Exhibition. The show included elaborate models of Russian steel mills and continuous casting machines, and demonstrations of electroslag and magnetic "walking" and welding machines. Also shown was an interesting method for building large gas tanks with huge sheets of plate prewelded in the shop. (D-general, K-general)

659-D. (Russian.) Adaption of Natural Gas Fuel in Industrial Iron Melting. M. B. Dolginova and P. M. Alexenko. *Liteinoe Proizvodstvo*, Sept. 1959, p. 16-18.
(D2a, W18r)

660-D.* Vacuum Degassing in Ladle Cuts Hydrogen in Nickel Alloy Forging Steels. *Canadian Machinery*, v. 70, Nov. 1959, p. 92-93, 139.
Ni alloy steel is discharged into a ladle and transferred into a vacuum degassing chamber. Suction pumps allow hydrogen, oxygen and nitrogen to boil out. Injected He gas increases circulation and exposes more metal to the surface. Removal rates as high as 60% are achieved. (D9s, 1-73)

661-D. (Translation—Brutcher no. 4720.) Ways of Reducing the Top Discard of Heavy Rimmed Steel Ingots. M. P. Sabiev. *Stal'*, v. 18, 1958, p. 1089-1095.
See item 205-D, 1959. (D9p, D11r; AD-r30)

662-D. (Book-Russian.) Prospects for the Development of the Blast Furnace Industry. Nikolay Ivanovich Krasavtsev. 558 p. 1958. Metallurgizdat, Moscow. (Available from Library of Congress, Washington, D. C.)
Development of modern practice; control of operating variables for optimum output; processes for pig iron and iron sponge production other than by the blast furnace. (D1, D8p, A2)

663-D. (Book-Russian.) Metallurgy of the USSR, 1917-1957. v. 1. I. P. Bardin, G. V. Popova and O. G. Bekker, Editors. 745 p. 1958. Metallurgizdat, Moscow. (Available from Library of Congress, Washington, D. C.)
Review articles on ore and metal-working in the USSR, describing development of methods presently used. (D-general, A2, 10-54)

664-D. (Book-Russian.) Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute. I. N. Kidin. 602 p. 1958. Metallurgizdat, Moscow. 25 R. 45 K.
Metallurgical and thermodynamic processes in openhearth and electric furnaces. Structure and properties and heat resistance of various alloys. Effect of heat treatment on shear modulus and internal friction of carbon steel. (D-general, Q-general; ST)

665-D. (Book-Russian.) Use of Vacuum in Metallurgy. A. M. Samarin. *Akademiya Nauk, SSSR*, Moscow, 1958. 166 p.
Collection of papers on ferrous and nonferrous vacuum melting and ingot casting and vacuum extraction and refining of nonferrous metals. Papers abstracted separately. (D8m, D9, C25, 1-73)

666-D. (Translation.) Vacuum Degassing of Liquid Steel. H. Thielmann and Hermann Maas. *Iron & Coal Trades Review*, v. 179, Sept. 25, 1959, p. 391-396. (From *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 276-282.)
See item 288-D, 1959. (D9s)

667-D. (Translation—Brutcher no. 4361.) Problems of the Use of Vacuum in Metallurgy. A. M. Samarin. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 3-12.
Vacuum melting, pouring, equipment. 9 ref. (D8m, D9s, 1-73)

668-D. (Translation—Brutcher no. 4362.) Production of Transformer Steel in Vacuum Furnaces. G. A. Garnyk and A. M. Samarin. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 14-34.
(D6, 1-73; SGA-n, AY)

669-D. (Translation—Brutcher no. 4363.) Effect of Melting Practice on the Properties of Stainless Steel. R. S. Velyakov. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 35-38.
11 ref. (D6, 1-73)

670-D. (Translation—Brutcher no. 4364.) Some Theoretical Questions About Vacuum Metallurgy. D. S. Kamentskaya. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 49-53.
(D8m, C25)

671-D. (Translation—Brutcher no. 4369.) Vacuum Treatment of Liquid Steel in the Ladle and Pouring in a Protective Atmosphere. L. M. Novik. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 81-94.
(D9m, D9p, 1-73)

672-D. (Translation—Brutcher no. 4370.) Vacuum Treatment of Steel and Pouring in a Protective Atmosphere. V. G. Speranskii. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 95-102.
(D9m, D9p, 1-73; EG-m)

673-D. (Translation—Brutcher no. 4371.) Vacuum Pouring of Alloy Steel. K. I. Gostev. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 103-106.
(D9m, D9p, 1-73)

674-D. (Translation—Brutcher no. 4372.) Design of a Vacuum Installation for Pouring Ingots Up to 120 Tons. V. K. Novitskii. Paper from "Use of Vacuum in Metallurgy". Akademiya Nauk, SSSR, Moscow, 1958, p. 107-111.
(D9p, 1-73, 1-52)

675-D. (Translation—Brutcher no. 4423.) Vacuum Treatment of Alloy Steel. G. A. Sokolov. *Metallurg*, Oct. 1958, p. 10-14.
Ladle degassing of a structural and a bearing steel. Percentage of gases removed and effect of treatment on structure and mechanical properties. (D9s, Q-general, 2-60, 1-73; AY, CN)

676-D. (Translation—Brutcher no. 4425.) Continuous Casting of Steel Into Square-Section Billets. V. S. Rutes and N. A. Nikolaev. *Metallurg*, Oct. 1958, p. 15-18.
(D9g)

677-D. (Translation—Brutcher no. 4440.) Behavior of Liquid Iron and Steel in High Vacuum. W. A. Fischer and A. Hoffmann. *Archiv fur das Eisenhuttenwesen*, v. 29, no. 6, 1958, p. 339-349.
Behavior of various component elements of Fe during vacuum melting. (D8m, 2-60)

678-D. (Translation—Brutcher no. 4473.) Kinetics of Steelmaking. L. von Bogdandy, W. Dick and I. N. Stranski. *Archiv fur das Eisenhuttenwesen*, v. 29, no. 6, 1958, p. 329-337.
Carbon elimination, dephosphorization and control of formation of brown fumes. (D11; ST)

679-D. (Translation—Brutcher no. 4498.) Use of Oxygen in Production of Pig Iron in Low-Shaft Furnaces. K. Sauberlich, H. Grohmann and G. Richter. *Neue Hutte*, v. 3, no. 4, 1958, p. 225-232.
(D8n)

680-D. (Translation—Brutcher no. 4499.) Direct Processes for Production of Iron. J. Willems. *Stahl und Eisen*, v. 79, no. 2, 1959, p. 74-80.
(D8j)

681-D. (Translation—Brutcher no. 4511.) Stirring of Openhearth Steel Baths With a Rotating Magnetic Field. G. A. Ostroumov. *Stal'*, v. 18, Nov. 1958, p. 990-1002.
See item 125-D, Feb. 1959. (D2g)

682-D. (Translation—Brutcher no. 4561.) Heating Problems in Industrial-Scale Degassing of Liquid Steel. H. Knuppel, K. Brotzmann, K. Ruttiger and A. Diener. *Stahl und Eisen*, v. 79, no. 5, 1959, p. 272-276.
Heating the degassing vessel during vacuum treatment. (D9s, 1-73)

683-D. (Translation—Brutcher no. 4598.) Decomposition of Nonmetallic Inclusions in Liquid Steel During Vacuum Treatment. A. F. Vishkarev and V. V. Kondakov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 196-208.
Increase of reducing efficiency of carbon in vacuum treated melt. Decomposition of metal oxides, silicates and aluminates. Disintegration and equal distribution of remaining inclusions. 7 ref. (D8m; ST, 14-60, 9-69)

684-D. (Translation—Brutcher no. 4599.) Boiling of Unkilled Low-Carbon Steel Under Vacuum. Pt. 1. "Vacuum Degassing of Low-Carbon Unkilled Steel During Pouring or Solidification in Mold". *Stahl und Eisen*, v. 79, no. 7, 1959, p. 405-407.
Effect of solidification upon content of slag inclusions in bottom-poured ingots. Segregation in ingot tops. (D9s, 1-73, N12; CN-g, 9-69)

685-D. (Translation—Brutcher no. 4601.) Control Measurements in Degassing of Liquid Steel in Vacuum. K. Brotzmann, K. Ruttiger, K. Rorster and R. Hentrich. *Stahl und Eisen*, v. 79, no. 7, 1959, p. 410-414.
Equipment for measuring the volume, pressure and composition of gases drawn off and quantity of steel sucked up into degassing vessel at each lift. (D9s, 1-73)

686-D. (Translation—Brutcher no. 4605.) Experience With Vacuum Stream Degassing of Steel. A. Tix, G. Bandel, W. Coupette and A. Sickbert. *Stahl und Eisen*, v. 79, Apr. 16, 1959, p. 474-477.
See item 359-D, 1959. (D9s, 1-73; ST)

687-D. (Translation—Brutcher no. 4620.) Production of Steel by Mixing and Reducing-Alloying Processes, and Treatment of Hot Metal With Slag. H. J. Eckstein. *Neue Hutte*, v. 4, no. 4, 1959, p. 250-252. (D2c)

688-D. (Translation—Brutcher no. 4626.) Degassing of Steel in the Ladle and Ingot Mold by Means of Direct Current. V. I. Yavoiskii, D. F. Chernega, S. A. Telesov, Ya. L. Troskunov, A. M. Ofengenden and I. I. Bekker. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 209-225.
Effect of direct current passed through the liquid metal on segregation of hydrogen, macrostructure and liquation of nitrogen. 11 ref. (D9s, M28; ST, *H, N*, 14-60)

690-D. (Translation—Brutcher no. 4648.) Amount and Nature of Oxide Inclusions Suspended in Openhearth Steel Baths. K. Born and H. Wittstruck. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1514-1525.
See item 41-D, 1959. (D2, ST, 9-51; NM-a34)

691-D. (Translation—Brutcher no. 4667.) Production of Various Steels in Basic Converters by Top Blowing With Oxygen. S. I. Lifshits. *Stal'*, v. 18, no. 11, 1958, p. 980-983.
See item 124-D, 1959. (D3, 1-65)

692-D. (Translation—Brutcher no. 4674.) Movement of Metal and Temperature Compensation in the Melt During Electromagnetic Stirring. N. V. Okorokov and L. A. Mal'tsev. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 185-195.
7 ref. (D5f)

SECTION E

FOUNDRY

1-E.* How to Test and Evaluate Core Oil. Rodney L. Boyes. *Modern Castings*, v. 34, Aug. 1958, p. 24-25.

Four tests consider baking time, tensile strength, bakeability, and cost per ton of core sand mix in evaluating the oil. (E18r; NM-h)

2-E.* Solidification and Risering of Gray Iron Castings. Clyde M. Adams, Jr., Merton C. Flemings and Howard F. Taylor. *Modern Castings*, v. 34, Aug. 1958, p. 31-41.

Shrinkage accompanying the cooling of gray iron is due to a chemical reaction; but size and location of the resulting voids which influence the movement of the casting surface are partially dependent on the following factors: size and shape of the casting, action of atmospheric or ferrostatic pressure, characteristics of molding material, and size, shape, location and thermal treatment of gates and risers. Expansion from graphite precipitation may accentuate solidification shrinkage. 11 ref. (E22q, E25n; CI-n)

3-E.* Effects of Foundry Variables Upon Porosity of 85-5-5-5 Bronze. Richard A. Flinn and Chester R. Mielke. *Modern Castings*, v. 34, Aug. 1958, p. 53-58.

Four important variables upon pressure tightness are: pouring temperature, moisture content of green sand, chilling, depth of machining. Pressure tightness decreases progressively when varying the pouring temperature from 1900-2300° F. Leakage increases slightly when moisture of dry sand is increased to 5.5% of max. Chilling decreased leak rate and shifted location of porous zone. Porosity increased with depth, with maximum porosity at the center. 6 ref. (E25n; Cu-s, 9-68)

4-E.* The Effect of Size of Scrap on the Tapping Temperature of a Cupola. N. H. Keyser and W. L. Kann, Jr. *Modern Castings*, v. 34, Aug. 1958, p. 59-60.

With coke charge and blast rate maintained at a fixed level, a change from light scrap, 1 in. or less thick, to heavy scrap, 1-4 in. thick, lowered tapping temperature 150° F. When blast rate was held constant, the tapping temperature could be maintained constant if the change from light scrap to heavy scrap was accompanied by a large increase in weight of coke charge. Graph shows effect of size and weight of cast scrap on tapping temperature and cost of coke for a particular 54-in. cupola operated with a blast rate of 4000 cu. ft. per min. (E10a; RM-p, 3-73)

5-E.* Shell Molding for Steel Castings. R. G. Powell and H. F. Taylor. *Modern Castings*, v. 34, Aug. 1958, p. 65-70.

Usual surface defects on low-carbon and low-alloy steel castings in shell molds can be eliminated with the use of chill-type shell molds which are made with forsterite or a blend of granulated limestone and silica sand. The chilling effect depends on the high conductivity of forsterite, endothermic dissociation of limestone plus the endothermic reaction of CO_2 with carbon from the resin binder. 6 ref. (E19c; CN-g, AY-b)

6-E.* The Use of Oil-Bentone Sand for Higher Quality Finish in Brass and Bronze Castings. O. E. Johnson. *Modern Castings*, v. 34, Aug. 1958, p. 77-79.

Compares use of bentonite-water bonded sand with oil-bentone bonded sand. Shrinkage becomes more visible when using oil-bentone sand, but can be corrected by changing the gating and risering. Green strength and mold hardness vary with amount of oil and bentone used and permeability decreases as mold hardness and quantity of oil increases. Permeability is not important with oil-bentone sand. Highly finished cast surfaces provide reduction in polishing, tumbling and other finishing costs. (E18r)

7-E.* Packing Characteristics of Typical Foundry Sands. L. J. Pedicini. *Modern Castings*, v. 34, Aug. 1958, p. 83-86.

Vibrated and rammed densities of 11 Subang-type dry sands. Rammed density changed when moisture and bentonite were added and number of rams varied. Density, hardness, green strength and permeability of sands having 5% western bentonite and 2% moisture with varied number of rams. Other sand packing characteristics compared for proper selection of raw sand for green-sand moldings. (E18r)

8-E. How Flame Washing Replaces Hand Grinds. *Canadian Metalworking*, v. 21, Oct. 1958, p. 68.

(E24; L10g)

9-E. (German.) Resin Core Binder K7 and Its Use. Gerhard Blumel. *Giessereitechnik*, v. 4, no. 8, 1958, p. 191-192.

(E21; NM-d, NM-f45)

10-E. (German.) Precision Investment Casting. Herbert Bode. *Giessereitechnik*, v. 4, no. 8, 1958, p. 197-200.

Metals suited for the process. Dies used in the manufacture of wax patterns and die materials such as steel, bismuth alloys. Machines and process for pattern casting; lifetime of dies. (E15)

11-E. (Japanese.) Sampling of Molding Sand. Pt. 1. Katumi Oshima, Akira Yoshida and Kiyokazu Sasaki. *Japan Foundrymen's Society, Journal*, v. 30, July 1958, p. 536-541.

New method of sampling green sand based on statistical concepts reduced casting defects due to sand variation. (E18r, S12h)

12-E. (Japanese.) Report on Investigation of Molding Sand Used in Europe and America. H. Tanimura and S. Mukae. *Japan Foundrymen's Society, Journal*, v. 30, Aug. 1958, p. 619-632.

(E18r; NMf-45)

13-E.* Malleable Iron Castings. *Automobile Engineer*, v. 48, Aug. 1958, p. 316-320.

English foundry produces automotive castings with close metallurgical control annealing with accuracy of ± 5° F., high production rate. (E11, T21; CI-s)

14-E.* Investment Casting With Frozen Mercury. *Engineering*, v. 186, Aug. 8, 1958, p. 177-178.

Use of frozen mercury in standard "lost-wax" casting operation permits highly accurate casting, with excellent surface finish. (E15, Hg)

15-E.* When Melting Aluminum. John J. Stobie. *Modern Metals*, v. 14, Nov. 1958, p. 40, 42, 45-46.

Requirements for sound melting practices; inherent characteristics of Al that influence melting and holding. Comparison of densities of die-casting alloys and some nonmetallic impurities; physical properties of pure Al. (E10; Al)

16-E.* (German.) Use of Calcium Carbide in the Cupola Furnace. Helmut Timmerbeil. *Giesserei*, v. 45, Aug. 28, 1958, p. 513-516.

Good results were obtained with a low-melting calcium carbide with 28% CaO in acid cold blast cupolas in the production of premelted iron for steel, malleable and gray iron castings. When 1.75 to 2% (of the weight of the Fe charge) calcium carbide is added, 20 to 50% of the coke can be spared; the sulphur in the Fe is lowered, furnace capacity increases; higher melting temperature improves carbonization. 9 ref. (E10a; CI, ST)

17-E.* (German.) Patterns and Core Boxes in Shell Molding. Walter Birke. *Giessereitechnik*, v. 4, no. 8, 1958, p. 179-187.

Materials for pattern plates and patterns such as Al, red brass, steel, cast iron. Formula for computing shrinkage allowance for different materials. Master

patterns of Al suggested because of accuracy. Patternmaking and fastening to the pattern plate, gating, design of pattern plates, molding machines, design of core boxes. 7 ref. (E16c, E17, E21; ST, CI, Cu-n)

18-E.* (German.) Pressure Cast Bearing Linings. Heinrich Backof. *Giessereitechnik*, v. 4, no. 8, 1958, p. 188-191.

The lining alloy is cast into the bearing box under pressure, using an adjustable core. Linings 2 mm. thick can be cast to size or with a minimum of finishing necessary. By pressure polishing with rollers, a perfect surface is established without destroying the casting skin, and strength of the lining is improved. (E-general, L10b, T7d, 3-74)

19-E.* (German.) Combined Melting Process for Producing Steel in the Foundry. S. J. Karmasin, W. M. Schestopal and J. L. Dodin. *Giessereitechnik*, v. 4, no. 8, p. 192-194.

Combination of a basic cupola furnace, an acid converter and an arc furnace with acid lining. Oxidation during melting in the cupola is retarded by proper atmospheres, oxidation of impurities in the converter takes place under optimal conditions, refining under an acid silica slag in the arc-type furnace where any quantity of steel used in production can be collected. (E10a, E10r, D3f; ST)

20-E.* (Dutch.) Influence of Heating on Strength of Sodium Silicate. H. G. Levelink. *Matalen*, v. 13, Sept. 30, 1958, p. 326-333.

Compressive strength after heating and also after subsequent cooling of bonded sand. Influence of rate of heating, duration of CO_2 treatment, powder additions, drying and the SiO_2 - Na_2O ratio of the sodium silicate. (To be continued.) (E18r)

21-E.* Economics of Precision Casting. R. G. Nicholas. *British Foundryman*, v. 51, Nov. 1958, p. 541-548.

Applications, tooling and costs of the Investment X, Mercast, Glascast, Shaw, Croning and Dietert processes. (E15, 1-52)

22-E. Towards Automation. G. C. B. Lamb. *British Foundryman*, v. 51, Nov. 1958, p. 549-559.

In molding, sand preparation, shakeout, and pouring, semi-automatic machines are a useful starting point for foundry not equipped to accept some of limitations imposed by fully automatic operation. (E11, 18-74)

23-E.* (Japanese.) Rapid Moisture Measurement of Foundry Sand by Means of Hot Blast Type Dryer. Kenji Hashimoto. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Sept. 1958, p. 73-78.

The minimum time necessary for removing moisture was almost in proportion to a logarithm of moisture content. In a binder content from 4 to 16% the drying time depended only on moisture content. The drying time for coarser sand was shorter than for finer sand. Drying time was not dependent on the tempering time up to 150 hr. Critical moisture content appearing in the ordinary drying process at constant temperature not found in this experiment, since drying temperature was not constant in this method. (E18)

24-E. The Centrispinning Process as Applied to the Manufacture of High-Duty Components in High-Alloy Steels. A. E. Thornton. *British Foundryman*, v. 51, Nov. 1958, p. 559-569.

(E14; SS)

25-E. High-Strength Cast-Steel Chains. Maurice Flour. *Foundry Trade Journal*, v. 105, Oct. 30, 1958, p. 535-538.

Endless chains formed by casting connecting links around previously cast ones. Molding, pattern-making, casting procedures. (E16c, T7e; ST)

26-E. Plastics-Bonded Moulding Sand for Aluminium and Magnesium Castings. *Light Metals*, v. 21, Nov. 1958, p. 356-357.

(E19a, E18n; Al, Mg)

27-E.* Designing for Die Casting — Tolerances. Richard A. Parker. *Precision Metal Molding*, v. 16, Nov. 1958, p. 28, 50-51.

Factors influencing tolerances include shrinkage of the piece as it cools. While this can be calculated it will vary somewhat due to variations in section thickness and holes cast through the piece. Closer tolerances can be held with higher original tooling costs. (E13; 17-56)

28-E.* (German.) Trends in Pressure Casting in U.S.A. A. F. Bauer. *Aluminium*, v. 34, Nov. 1958, p. 647-648.

Because of improved quality, this method used increasingly for Zn, Al, Mg and brass alloys. For Al, it now surpasses production by sand or permanent mold casting. Parts up to 34 kg. in Al, and 90 kg. in Zn can be cast in machinery with closing pressures up to 2000 tons. (E13, A4; Al, Cu-n, Mg, Zn)

29-E.* (German.) Temperature Control in Pressure Die Casting. A. F. Bauer. *Aluminium*, v. 34, Nov. 1958, p. 648-651.

Over or underheating leads to lowered quality of products and increased wear of machinery. Measuring instruments (radiation bolometer recorder, contact pyrometer, thermochrome pencils, pocket radiation pyrometers) so far are inadequate and too expensive. (E13, S16, X9)

30-E.* (German.) Pressure Resistant Impregnation of Porous Castings. H. Schlegel. *Fertigungstechnik*, v. 8, no. 10, 1958, p. 460-461.

Cast iron component with fine porous structure is rendered pressure resistant by impregnation with synthetic resin. Process involves combined application of heat, vacuum, sealant and pressure. (E26)

31-E.* (German.) Progress in Production Methods for Precision Castings. A. Hohmann. *Giesserei-Praxis*, no. 19, Oct. 10, 1958, p. 383-387.

Comparative analysis of different systems based on concise description of procedures. (E15)

32-E.* (German.) Gaseous Porosity and Segregation in Sand Castings of Remelted Aluminum Alloys. Hans Reiniger. *Giesserei-Praxis*, no. 20, Oct. 25, 1958, p. 404-408.

Primary as well as remelted Al alloys release H which leaves typical pores in castings. Quantity of pores depends on the volume of H. As in other castable alloys, segregation appears also in remelted Al alloys. However, its appearance is insignificant and does not affect the quality. 12 ref. (E25q; Al-b, 9-68, 9-69)

33-E.* (German.) Origin of Pinholes in Steel Castings. Josef Pribyl. *Giesserei Technik*, v. 4, Sept. 1958, p. 216-222.

Pinholes originate from supercritical content of FeO in surface layers of castings. They are located in a zone (4-6 mm.) under entire casting surface or under greater part. Safety measures against creation of pinholes. 15 ref. (E25q, 9-68; ST)

34-E.* Some Developments in the Fettling of Steel Castings. Idris J. Thomas. *British Foundryman*, v. 51, Sept. 1958, p. 416-420.

Problems in trimming large steel castings. Removal of large risers with oxygen lance formed by packing mild steel tube with steel rods. Powder washing process in which an iron powder is introduced by compressed air into an oxygen-gas flame containing excess oxygen. Application of powder washing process to the removal of riser stub-ends, scabs, fins and adherent sand. Equipment for powder washing. (E24h, E24j; ST)

35-E.* Some Physical Factors Influencing Shrinkage and Porosity in Grey-Iron Castings. E. E. L. Nicholas and I. C. H. Hughes. *British Foundryman*, v. 51, Sept. 1958, p. 428-435.

Influence of mold rigidity, pouring temperature and inoculation upon porosity and associated defects arising from solidification volume changes in gray irons. Relation between porosity of castings and expensive dilation in green sand molds. Improvement in soundness of nodular graphite castings with the use of sufficiently rigid molds. Increase in shrinkage with inoculation and high pouring temperatures in green sand molds. Promotion of soundness with high pouring temperatures in rigid molds. 16 ref. (E25n, 2-60, 2-61; CI-n, CI-r)

36-E.* Modern Techniques for the Production of Heavy Steel Castings. C. J. Dadswell. *British Foundryman*, v. 51, Sept. 1958, p. 435-444.

European and American techniques. Production planing, patternmaking, molding, coremaking, mold and core materials, drying and closing molds, casting, feeding, cooling, head removal, heat treatment, machining. 4 ref. (E11; ST)

37-E.* A Shrinkage Test for Cast Iron. A. Wittmoser, H. A. Krall and L. Huetter. *Foundry*, v. 86, Nov. 1958, p. 74-78.

Development of test specimens. Significance of precipitated carbide in the eutectic solidification range on shrinkage behavior. Preparation of standard mold; pouring procedure; evaluation. Experimental results showing reproducibility of tests and effect of eutectic graphite value on shrinkage. 8 ref. (E25n, E11, 1-54, 2-60, 2-61; CI, 9-67)

38-E.* Shell Molding Solves Casting Problem. Edwin Bremer. *Foundry*, v. 86, Nov. 1958, p. 82-85.

Shell molding provides answer to control of porosity, surface appearance and dimensional tolerances in production of bronze and Al castings. (E16c; Al-b, Cu-s)

39-E.* Shrinkage Prevention in Bronze Castings. Clyde L. Frear. *Foundry*, v. 86, Nov. 1958, p. 96-101.

Casting design changes, location of risers and use of padding and chills to minimize or prevent shrinkage in bronze castings. Techniques for producing sound horizontal cylinders, sharp corners, and L, T or X-section castings. (E25n; Cu-s, 9-68)

40-E.* (French.) Foundry Practice in the Automobile Industry and Its Auxiliaries. Jean Fauquembergue. *Fonderie*, no. 153, Oct. 1958, p. 449-465.

Higher dimensional accuracy of molds, application of statistical methods of control, use of metallic molds for static and dynamic casting, progress in silica and molding and coremaking and some more recent methods of quality control. (E-general, T21)

41-E. Synthetic Resins for Shell Molding. R. V. Keen. *Adhesives & Resins*, v. 6, Nov. 1958, p. 132-137.

4 ref. (E19c)

42-E. Soundness of Grey and Nodular Iron Castings. A. G. Fuller. *British Cast Iron Research Association, Bulletin and Foundry Abstracts*, v. 14, Nov. 1958, p. 569-574.

Influence of composition variables; effect of variations in the solidification sequence of the iron; influence of the mold; production of sound castings by the application of feeders. 19 ref. (E25n; CI-n, CI-r)

43-E. Two Interesting Castings. An Account of the Production of a Heavy Planing Machine Side and of a Large Turbine Blade-Ring. N. Charlton and C. J. W. Hayhurst. *British Foundryman*, v. 51, Sept. 1958, p. 411-415.

(E11; CI)

44-E. Precision Sand Casting. J. S. Turnbull. *Foundry Trade Journal*, v. 105, Nov. 20, 1958, p. 621-631.

Paper presented at 1958 Conference on Technology of Engineering Manufacture, Institution of Mechanical Engineers. 9 ref. (E11; CI, ST)

45-E. Why Investment Castings? William H. Shuman. *Machine Design*, v. 30, Nov. 27, 1958, p. 99-101.

Advantages of investment castings are in flexibility of process in casting almost any shape and in broad alloy selection. When and where to specify investment castings. (E15)

46-E. Mercury Patterns for Precision Castings. Mercast Process in Operation at Crawley. *Metallurgia*, v. 58, Sept. 1958, p. 130-134.

(E15, E17; Hg, ST)

47-E. The Ideal Foundry Cupola. Thomas Lohr. *Wisconsin Engineer*, v. 63, Nov. 1958, p. 18-20, 55.

Combining hot blast and water cooling yields optimum results. (E10a)

48-E. (German.) Sealing of Porous Aluminum Castings by Impregnation. *Aluminium*, v. 34, Nov. 1958, p. 651-652.

Moguloid method using solution of colloidal metal powder. (E26; Al)

49-E. (German.) Riser Technique. J. Tanner. *Giesserei Praxis*, no. 20, Oct. 25, 1958, p. 409-410.

Effect of riser technique on elimination of cavitation in wheel castings. (E22q)

50-E. (German.) Chilled Gray Iron Castings. Gerhard Schwarz and Dieter Junghans. *Giessereitechnik*, v. 4, Sept. 1958, p. 225-233.

Summary of East German experience. (E11; CI, 5-66)

51-E. (Book-Russian.) Metallurgical Fundamentals in Casting Light Alloys. J. H. Fridlyandera and M. V. Tchukhrova. 423 p. 1958. Oborongiz, Moscow, USSR. 23 R, 90 K.

Papers dealing with heterogeneous microstructures in Al and Mg alloys; causes for cracks; means of elimination; structure modifications in light alloy castings; recommendations for achieving high-quality castings. (E-general; Al, Mg)

52-E. (Book-Russian.) Selected Works on Light Alloys. S. M. Voronov. 545 p. 1957. Oborongiz, Moscow, USSR. 22 R, 80 K.

Investigation of Al and Mg alloy castings; technology of making Mg pipe; heat treatment of light alloy castings. (E-general, J-general; Al-b, Mg-b)

53-E. (Translation—SLA, 58-1763.) New Methods for Treatment of Aluminum Melts. H. Kalpers. *Giesserei-Praxis*, v. 75, Aug. 10, 1957, p. 345-345.

See item 552-E, 1957, (E25s; Al)

54-E.* Feeding Systems for Permanent Mold Castings. D. Miller. *Foundry*, v. 86, Dec. 1958, p. 70-72.

Correct design of runners, risers and feeding systems for permanent molds can control shrinkage holes, shrinkage marks, cracking and the resultant effects of solidification shrinkage. (E12, E22, 9-68)

55-E.* Use of Oxygen in the Coal-Fired Furnace. J. B. Lapota. *Foundry*, v. 86, Dec. 1958, p. 84-85.

Advantages include reduced coal consumption, increased melting rate, better control of the metal bath temperature, reduced oxidation of the readily oxidized elements, improved slag and metal fluidity. (E10s)

56-E.* Gray Iron Chemistry.—How It Affects Casting Quality. Frank L. Arnold. *Foundry*, v. 86, Dec. 1958, p. 86-89.

Influence of C, Si, S, Mn and P on shrinkage, internal porosity, hot tearing, cold shuts and other defects. Strict control of metal charge and use of ladle additions recommended. (E25, 2-60; CI-n, 9-68; *C, Si, S, Mn, P*)

57-E.* (French.) Removal of Cores Bound With CO_2 and Sodium Silicate. Michel Jeancolas and Xavier Virolle. *Fonderie*, no. 154, Nov. 1958, p. 495-504.

Cores were easy to remove in copper parts up to 12.5 mm. thick, in aluminum parts, up to 7.5 mm. With mixtures of sawdust, molasses, graphite, mineral black, ferric oxide, mineral oil, commercial mixtures and core silicates, cores were removable up to approximately 25 mm. for light metal castings and 12 mm. for iron castings. (E21g; NM-f45)

58-E.* (French.) Influence of Fluxes on the Gas Porosity of Aluminum Alloy Castings. Bernard Chauvelier. *Fonderie*, no. 154, Nov. 1958, p. 505-514.

Samples taken during melting and casting; degassing effect of nitrogen. 6 ref. (E25s; Al-b, 9-68)

59-E. V-4 Motor Block Is Diecast in Aluminum. Jack C. Miske. *Foundry*, v. 86, p. 62-65.

Production line now in operation at Johnson Motors Div., Outboard Marine Corp. (E13, T21b; Al-b)

60-E. Automatic Molding System. Edwin Bremer. *Foundry*, v. 86, Dec. 1958, p. 118-124.

Four complete molds a minute are produced at the Brillon Iron Works Inc., Brillon, Wis. (E19, 18-74)

61-E. Die Casting Electrical Components. The Practice of Metropolitan-Vickers Electrical Co., Ltd., Manchester. *Machinery (London)*, v. 93, Nov. 26, 1958, p. 1245-1254. (E13, T1; 18-67)

62-E. Welding Repair. L. D. Richardson. *Modern Castings*, v. 34, Dec. 1958, p. 26-28, 54-55.

(E26, K1)

63-E.* (Russian.) Formation of Seams on Large and Heavy Castings. Ya. I. Medvedev. *Liteinoe Proizvodstvo*, Aug. 1958, p. 12-15.

Study of kinetics of filling mold and cooling process of metal and accompanying conditions. Use of lamillar-flow thermal method for calculating rate of mold filling. Aim of study to eliminate seams, gas bubbles and other defects. (E25n, 9-68, 9-71)

64-E.* (Russian.) Thermal Stress Reduction in Structures Cast in Green Molds. Ya. A. Smolyanitskii. *Liteinoe Proizvodstvo*, Aug. 1958, p. 16-18.

Thermal stresses in casting rise with increase in cooling rate. The cooling rate depends on the thermophysical

properties of the mold materials. The process of heat exchange between casting and mold is fully determined and regulated by the process of heat distribution in the mold. Green molds, by virtue of their higher moisture content, slow the cooling rate and lessen thermal stresses. (E19a, Q25p)

65-E.* (German.) Manufacture and Use of Centrifugal Iron Castings. Gerd Engler. *Giessereitechnik*, v. 4, Oct. 1958, p. 250-253.

Comparison with static castings shows finer grain, absence of gas bubbles and impurities in main bulk of material; much better physical properties. Manufacture of cast iron bushings. (E14; CI)

66-E.* (Russian.) Greater Precision in Large Iron Castings. S. E. Rozenfel'd and S. A. El'bert. *Liteinoe Proizvodstvo*, Oct. 1958, p. 1-4.

Major factors in variation of measurements are production of patterns, assembly of forms, shrinkage of mold. Variations in shrinkage caused by pliability of cores, the unevenness in cooling of different parts and other retarding factors. Formula for determining deviations in measurement taking into consideration four or more factors. Mechanization of assembly of complex forms increases precision. 5 ref. (E11; CI)

67-E.* (Russian.) Precision Casting of Large Steel Parts. V. K. Baradan'yants. *Liteinoe Proizvodstvo*, Oct. 1958, p. 4-6.

Precision investment casting makes possible pouring at 900-1500° and production of large, complex, thin-walled castings. With wax patterns practically no machining was required. Efforts to pour large steel castings in ceramic molds resulted in cracking. While investment casting has eliminated these shortcomings, it has not yet overcome formation of microcracks. (E15; ST)

68-E.* (Russian.) Automated Equipment for Shell Mold Casting. A. I. Korotkov. *Liteinoe Proizvodstvo*, Oct. 1958, p. 18-22.

NIITA Institute has perfected several automatic shell molding machines: a mechanized sand-resin mixer, a machine for preparation of shell mold semiforms, equipment for making shell cores and for knocking out castings. Also machine for regeneration of silica sand. To dispel gases and fumes work is now progressing on ventilation system with thermocouple and monometer controls. (E16c, 1-52, 18-74)

69-E.* (Russian.) New Theoretical Problems in Casting High Alloys. Yu. A. Nekhendzi. *Liteinoe Proizvodstvo*, Oct. 1958, p. 23-28.

Casting heat resistant alloys for use in gas turbines, airplanes, atomic energy installations and rockets. Technological conditions of casting are more important than proper selection of alloying elements. Most important are cooling rate and solidification. Tests made on gamma alloys with same carbon content (0.12 and 0.35%), 20% Cr and variable Ni content from 0 to 80%. 9 ref. (E-general; Fe-b, Ni-b, SGA-h)

70-E.* Use of Exothermic Feeding Compounds in the Production of Steel Castings. D. H. Snelson. *British Foundryman*, v. 51, Oct. 1958, p. 486-501.

Relationships between casting soundness and section of casting, volume, height and diameter of feeding head, thickness of exothermic lining and mode of solidification. Graphical system for calculation of head dimensions for efficient and economic exothermic feeding for plain carbon steel castings of simple shape. System for complex castings, influence of gating, pouring temperature and running distance on directional solidification. Properties of exothermic materials. 6 ref. (E22, E25, 3-73, 9-67; CN-g)

71-E.* Recent Advances in Magnesium Casting Alloy Technology. E. F. Emley. *British Foundryman*, v. 51, Oct. 1958, p. 501-527.

Reviews literature on influence of Zr, Zn, rare earth metals and Th on creep and tensile properties, grain size, microporosity, cracking, solidus temperature, weldability and founding characteristics of Mg alloys. Recent developments in melting, pouring, gating and running. Corrosion resistance and protective surface treatments; application of Mg castings. 117 ref. (E-general; Mg-b, *Zn, Zr, EG-g*, 11-65)

72-E.* (Japanese.) Production of Cast Iron With Steel Inserts. Effect of Casting Temperature and Surface Conditions. T. Usui and Y. Yamamoto. *Metropolitan Technical College, Memoirs*, no. 4, Mar. 1957, p. 13-28.

Behavior of metal plated, oil coated and rusted inserts compared with polished inserts. Effect of various diameters and volume ratios of the cores. (E-general, 2-61; CI, *ST, Ni*, 8-62)

73-E.* (Swedish.) Elutriator. Th. Wilkins. *Gjuteriet*, v. 48, Oct. 1958, p. 149-153.

Laboratory apparatus for separating silt and clay from foundry sand samples. (E18r, 1-53)

74-E. Study of Technique for Refinement of Cast Structures in Aluminum. Massachusetts Institute of Technology. *U. S. Office of Technical Services*, PB 131688, July 1955, 73 p. $2.25.

Rapid, accurate procedure for quantitatively measuring hydrogen in molten Al. Several methods of degassing compared. Effect of chilling castings of alloys 195 (1% Si), 220, 356 and Ternalloy 8. (E25s, S11r; Al-b, *H*)

75-E.* Kolcast Investment Castings Vacuum Melt and Vacuum Cast Alloys. F. W. Dischinger and M. Goldenberg. *Thompson Products Engineering Bulletin*, v. 3, Mar. 1958, p. 12-15.

Kolcast Industries uses both the frozen mercury process and a variation of the Lost Wax process to make production quantities of high-grade aircraft castings of Ti, Al and superalloys. (E15; Ti-b, Al-b)

76-E.* (Rumanian.) Pipe in Cast Iron. L. Sofroni and R. P. Todorov. *Studii si Cercetari de Metalurgie*, v. 3, no. 2, 1958, p. 131-149.

Volume of pipe was smaller as more graphite was precipitated during the eutectic transformation, a process governed mainly by the C and Si content. 13 ref. (E25n, 9-67, 2-60; CI-n, CI-r)

77-E. Cast Miniatures by the Ton. J. H. Cadieux. *Machine Design*, v. 30, Dec. 11, 1958, p. 27-28.

Cold sizing and automation are combined in a new investment casting technique. (E15, 18-74)

78-E. (Russian.) Formation of Shrinkage Cavities in Cast Iron. L. Sofroni and R. P. Todorov. *Revue de Métallurgie (Bucharest)*, v. 3, no. 2, 1958, p. 41-57.

In cooling, the volume changes of castings usually depend upon degree of graphitization in liquid or solid state. For reducing the size of cavities and surface shrinkage, it is necessary to change the quantity of eutectic graphite by corresponding selection of carbon and silica contents. 12 ref. (E25n; CI)

79-E. (Russian.) Use of Hot Blast Basic Cupola Furnace at Integrated Iron and Steel Works. S. I. Lebedev. *Stal'*, v. 18, Nov. 1958, p. 996-997.

(E10a, W18d)

80-E. (Swedish.) Gating of Valve Housings From Cast Steel. *Gjuteriet*, v. 48, Oct. 1958, p. 156-157.

(E22p; ST)

81-E.* Close Control Produces High-Property Aluminum Castings. Merton C. Flemings and Howard F. Taylor. *Foundry*, v. 87, Jan. 1959, p. 80-81.

Control requirements include strict attention to alloy analysis, melting variables, gating, sand and molding practices, chilling and risering and heat treatment; 356 Al alloy sand castings can be produced with guaranteed tensile strengths 50 to 100% greater and elongation as much as 700% greater than required by federal specification. 9 ref. (E11, Q-general; 5-60, Al-b)

82-E.* Casting High-Property Aluminum. Robert Herrman. *Foundry*, v. 87, Jan. 1959, p. 82-85.

Production of high-strength, high-ductility 356 alloy castings for use in aircraft and missiles. Sand preparation and molding, coremaking, castings cleaning and inspection, plaster molding. (E-general; Al-b)

83-E.* High Quality Aluminum Castings. William B Corcoran, Jr. *Foundry*, v. 87, Jan. 1959, p. 86-91.

Molding, melting, degassing and pouring methods for producing chilled Al alloy castings in 355 and 356 alloys which average as high as 45,000 psi. tensile strength, 32,000 psi. yield strength, and 7 to 8% elongation. (E11, Q-general, 5-60; Al-b)

84-E.* Economic Design of Light-Alloy Castings. P. A. Broadbent. *Foundry Trade Journal*, v. 105, Dec. 18, 1958, p. 737-744.

Special light-alloy foundry techniques, heat treatment and other processes, and the free-cutting properties of light alloys as related to design and costs of production. Test-bar specifications for a number of Al and Mg alloys in relation to strength and weight of castings, and to the cost of a machined casting in cast iron and various light alloys. (E-general; 5-60, 17-51, Al-b, Mg-b)

85-E.* Air Furnaces. K. H. Wright. *Iron & Steel*, v. 31, Dec. 24, 1958, p. 639-642.

General design, refractories, fuel, chemistry of melting, operation, charging, slagging, use of ferro-alloys and oxygen. (E10s, 1-56, 17-51; CI)

86-E.* Foundries Can Produce Their Own Cast Iron Directly From Ore. H. W. Lownie, Jr., and A. J. Stone. *Modern Castings*, v. 34, Jan. 1959, p. 47-54.

Direct-reduction processes replace the conventional cupola facilities and other melting auxiliaries. Costs, advantages and disadvantages. (E10b; CI)

87-E.* Some Foundry Problems in the Development of a New Marine Propeller Alloy. A. J. Smith. *Modern Castings*, v. 34, Jan. 1959, p. 55-70.

Material, melting, molding, refractories, fluxes, gas and feeding as applied to Ni-Al bronze. Comparison of engineering properties and service performances of Mn bronze propeller alloy and Ni-Al bronze. 10 ref. (E-general, T22h; Cu-s, *Ni, Mn, Al*)

88-E. Aero-Metallurgical Engineering Production in Australia. L. J. Stone. *Australasian Engineer*, v. 50, Oct. 7, 1958, p. 49-55.

Investment casting applied to turbine blade production. 5 ref. (E15, T7h, 17-57)

89-E. Hollow Die Casting Process. *Australasian Manufacturer*, v. 43, Nov. 8, 1958, p. 54-58.

Metal is forced into the cavity under pressure and excess withdrawn under a partial vacuum. The die cavity can also be evacuated immediately before the metal is injected. (E13)

90-E. Aluminum Diecasting and Permanent Mold Foundry. *Foundry*, v. 87, Jan. 1959, p. 64-69.

Modern casting facility at Ford Motor Co.'s Sheffield, Ala., plant converts molten Al received from nearby Reynolds reduction plant into 67 different parts for use in engines and transmissions. (E13, E12, T21b)

91-E. Quality Control in the Foundry. W. K. Bock. *Foundry*, v. 87, Jan. 1959, p. 70-73.

Application of statistical techniques. (E-general, S12)

92-E. What Foundrymen Should Know About Casting Design. John B. Caine. *Foundry*, v. 87, Jan. 1959, p. 74-79.

Effects of design on the mechanical properties of castings. Proper design also bears an important relationship to castability of the part. (E-general, 17-51)

93-E. What Car Builders Want in Automotive Castings. D. S. Harder. *Foundry*, v. 87, Jan. 1959, p. 114-116, 118.

Use of permanent mold casting and die casting processes permits closer tolerances and lower costs. (E13, E12, T21, 17-55)

94-E. Notes on the History of Patternmaking. L. Faulkner. *Foundry Trade Journal*, v. 105, Dec. 25, 1958, p. 771-774.

Patternmaking from the Bronze Age to the present. (E17, A2)

95-E. Economic Design of Light-Alloy Castings. P. A. Broadbent. *Machinery Market*, Dec. 11, 1958, p. 23-24, 28.

(E-general; 5, 17-51, Al, Mg)

96-E. New Molds for Non-Ferrous Castings. John Starr. *Pacific Factory*, v. 90, Nov. 1958, p. 20-21, 52.

Green sand molds cast Al and Mg castings with 0.05 to 0.005-in. tolerances and high strength. (E19a; Al, Mg)

97-E.* (Hungarian.) Influence of Magnesium on Eutectoid Transformation Temperature of Cast Iron. Ferenc Varga and Janos Vereskoi. *Kohaszati Lapok-Ontode*, v. 9, Feb-Mar. 1958, p. 37-41.

How Mg influences shape of graphite grains in gray cast iron. Tests to determine the temperatures of austenitic transformation as affected by different Mg alloys. Effect of these alloys on tensile strength of castings. 6 ref. (E25a, N8s; CI-r, *Mg*, AD-p36)

98-E. (Book-German.) Foundry Dictionary. A. Schulenburg. 748 p. Fachverlag Schiele & Schoen GmbH, (1) Berlin SW 61, Margrafenstr. 11, Germany. DM 58.

5000 foundry terms; 1000 literature references. (E-general, 11-67)

99-E. (Book-German.) Foundry Handbook 1959. Fachverlag Schiele & Schoen GmbH, (1) Berlin SW 61, Markgrafenstr. 11, Germany. DM 5.

Methods of gating, alloying, inserting parts in castings; instructions on use of chills; light metal casting with permanent molds; use of calcium carbide in the cupola. (E-general)

100-E. (Translation.) Grain Refining Light Alloys. H. Kessler. *Metal Industry*, v. 93, Dec. 12, 1958, p. 489-490. (From *Metall.*)

Effects of particle size of grain-refining additions on microstructure; suggests finer grinding. (E25q, M27c; Al-b, AD-p35)

101-E.* (German.) Aluminum Sand Castings of Improved Precision. Rolf Held. *Giessereitechnik*, v. 4, Nov. 1958, p. 294-297.
Complete mold for a crankcase assemblied from blocks of a mixture of waterglass and dry quartz sand, such as used for the cores, and CO_2 treated. (E19, E21, T21c; Al-b, NM-f45)

102-E.* (Italian.) Impregnation of Castings. Giuseppe Barchesi. *Fonderia*, v. 7, Sept. 1958, p. 411-416.
Elimination of porosity; procedures; impregnating agents for ferrous and some nonferrous materials. (E26)

103-E.* (Japanese.) Sampling of Molding Sand. Pt. 2. K. Oshima, A. Yoshida and K. Sasaki. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 779-785.
New method for dry sand. Properties of mulled sands in relation to mulling time. Fluctuation in mullers and error variance of sampling, reduction and analysis. (E18r)

104-E.* (Japanese.) Relation Between Gas Pressure in Mold Cavity and Permeability. Mototaka Mutaguchi. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 786-792.
Maximum gas pressure is proportional to the thickness of sand mold and inversely proportional to the permeability and total surface area of the cavity in lower pressure, and beyond a critical pressure the square of the maximum pressure is proportional to the same elements. (E19, W19g, P10m)

105-E. Automatic Molding Line. Robert H. Herrmann. *Foundry*, v. 87, Feb. 1959, p. 72-75.
At American-Standard Corp., Baltimore, Md., an automatic line turns out a 6600-lb. poured mold (including flasks, sand and casting) every 45 sec. The line produces sinks and wash basins. (E19; CI)

106-E. Now They're Casting Photos. Robert H. Herrmann. *Foundry*, v. 87, Feb. 1959, p. 78-80.
Process involves the use of conventional photographic methods to produce a master pattern mold from which an unlimited number of production wax patterns can be produced. These patterns, in turn, are used to make investment molds into which almost any castable metal can be poured to produce cast duplicates of the original pattern. (E15)

107-E. Nonferrous Foundry Uses Sand and Metal Molds. Robert H. Herrmann. *Foundry*, v. 87, Feb. 1959, p. 94-97.
Foundry operations at B.F. & S. Bronze Foundry Co., Brooklyn, N. Y., in the fabrication of die-cast Zn parts and permanent mold Al castings. (E12, E13, W19g; Zn, Al)

108-E. Control of Die Casting Quality Standards. H. K. Barton. *Machinery (London)*, v. 93, Dec. 31, 1958, p. 1531-1540.
Control of quality of die castings through operator's close supervision of the casting machine; careful design and lubrication of ejector pins. (E13, 1-52)

109-E. Properties of Some Foundry Sands Found in the Auckland Area. E. D. Burt and A. P. Neyland. *New Zealand Dept. of Scientific and Industrial Research, Information Series no. 20*, 1958, p. 5-19.
11 ref. (E18r)

110-E. (Dutch.) Cupola Furnace Practice. *Gieterij-Centrum Berichten*, v. 6, Nov. 1958, p. 64-66.
(E10a)

111-E. (French.) Standard Melting Charts for Nonferrous Alloys. *Journal d'Informations Techniques des Industries de la Fonderie*, Aug. 1958, p. 1-3.
Posted near furnaces, charts provide information in chronological order on make-up of charges, special treatments, pouring. (E10)

112-E. (German.) Plastics Used in Foundry Practice. Ludwig Kolb. *Giessereitechnik*, v. 4, Nov. 1958, p. 283-285.
(E-general; NM-d)

113-E. (German.) Cast Iron Permanent Molds for Gray Iron and Malleable Casting. Horst Hoffmeister. *Giessereitechnik*, v. 4, Nov. 1958, p. 290-291.
(E12, W19g; CI-n, CI-s)

114-E. (Japanese.) Various Treatments of Cast Iron Melt Containing Molybdenum and Copper. T. Otstani, M. Maruyama and Y. Tokunaga. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 792-798.
Influence of inoculation with Fe-Si and Ca-Si, vacuum melting, $Fe_3\Phi_4$ additive and Mg treatment on Mo-Cu iron. (E25q, N8q, 1-73; CI, *Cu, Mo, Mg, Si*, AD-p)

115-E. (Japanese.) Air Setting. K. Tanaka. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 811-816.
Bimders for foundry sands. (E18n)

116-E. (Swedish.) Better and Cheaper Melting. *Gjuteriet*, v. 48, Nov. 1958, p. 171-174.

Proposals concerning cupola practice. (E10a, W18d)

117-E. (Swedish.) Casting Defects and Their Causes. J. Drachmann. *Gjuteriet*, v. 48, Nov. 1958, p. 175-180.

Reasons for sand inclusions, slag and salt inclusions. Defects caused by mold paint particles, metal drops or premature solidification. (E11,9)

118-E.* Mechanized Molding Line Is Fast and Flexible. *Foundry*, v. 86, Sept. 1958, p. 62-65.

Automatic molding machines with efficient system of core delivery, mold handling, pouring and shakeout permit high rate of casting production. (E19a, W19f; CI, 18-74)

119-E.* Gray Iron Chilling Practice. Verne Pulsifer. *Foundry*, v. 86, Sept. 1958, p. 66-72.

Main factors in obtaining desired chill depth are C and Si content of cast metal, and grade and thickness of chilling material. (E22r, N8f; Fe, 2-60)

120-E.* Shrinkage Prevention in Bronze Castings. Clyde L. Frear. *Foundry*, v. 86, Sept. 1958, p. 73-77.

Correct heating and riser systems in feeding simple-shaped sections. (To be continued.) 3 ref. (E22, E25n; Cu-s, 9-74)

121-E.* Thickness of Precoat for Investment Castings. Donald J. Kenny and Paul A. Rutt. *Foundry*, v. 87, Feb. 1959, p. 82-85.

Thickness of precoating slurries used in investment casting is a function only of viscosity, not of composition, aging, drying time or the drying temperatures. (E15)

122-E.* Properties of Copper-Base Alloy Castings. F. Hudson, D. R. Wood and J. F. Gregg. *Foundry*, v. 87, Feb. 1959, p. 86-93.

Effects of casting section on properties of 88-10-2, 86-7-5-2 and 85-5-5-5 gunmetal, with and without Ni additions. (E-general, Q-general, 17-51, 2-60; Cu-b, *Ni*)

123-E.* Automatic Diecasting of Small Zinc Parts. Irwin Lubalin. *Foundry*, v. 87, Feb. 1959, p. 148, 150, 152-153.

New concept in die casting is the ability to run single-cavity dies at high rates of speed. Elimination of multiple-cavity dies means lower initial die cost, lower inspection costs and better tolerances from one part to the next. Improved thermal balance of the die results in fewer defects such as blisters, blows, soldering. (E13; Zn)

124-E.* Improving Aluminum-Magnesium Casting Alloys. H. Kessler. *Metal Industry*, v. 94, Jan. 2, 1959, p. 3-5.

Grain refining of Al-Mg alloys containing Ti and B by means of carbon tetrachloride introduced into metal melt with Cl or N as carrier gases. Effect of grain refinement on mechanical properties of castings. 7 ref. (E25q, Q-general; Al-b, Mg, *Ti*, *B*, AD-p35)

125-E.* Design of Die-Castings. Pt. 9. Converting Sand-Cast Parts to Die-Casting. H. K. Barton. *Metal Industry*, v. 94, Jan. 2, 1959, p. 7-9.

Suggested changes in wall thickness and other dimensions of castings to facilitate conversions from sand-cast to die-cast parts. (To be concluded.) (E13, 17-51)

126-E.* (Hungarian.) Introduction of Sodium Silicate Bonded Molding Materials in Foundry Practice. Lajos Hajdu. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 110-117.

CO_2 process for making molds, use of alcohol as a catalyst, air drying, advantages of method. (E18n, NM-f45)

127-E.* (Hungarian.) Pouring Large Crankcase Castings for Diesel Automotive Vehicles of Light Metal Alloys. Bela Rosner and Albin Buzansky. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 122-123.

Al-Si-Mg alloy cast in sand, pressurized feeders; 0.03-0.06% Na added to ladle before pouring. Casting heat treated in electric furnace, quenched and aged for 12 hr. (E11, T21b; Al-b)

128-E.* Casting and Coining Produce Small, Precision Parts. J. H. Cadieux. *Foundry*, v. 87, Feb. 1959, p. 102.

New precision forming process, known as Minicast, combines basic advantages of investment casting with advantages of coining or cold forming. Parts up to 1 cu.in. in size can be produced in difficult-to-machine metals such as high-alloy

steels, toolsteels, superalloys and stainless steels, as well as low-alloy steels. All commercial nonferrous metals except Mg alloys and high Zn-Cu alloys can be formed by the process. (E15, G3n; AY, SS, TS)

129-E.* (German.) High-Conductivity Castings of Copper and Copper Alloys. Ernst Brunhuber. *Giesserei*, v. 46, Jan. 1959, p. 2-8.

Influence of composition on electric conductivity. Castings are prepared in two melting processes providing double dehydration and refinement by oxidation. Deoxidation accomplished by addition of Cd, Zn, Ca, Mg or Li, with or without Be. (E10, P15g, 2-60; Cu, 5)

130-E.* Special Tool Steel Increases Die-Casting Die Life. *Modern Machine Shop*, v. 31, Feb. 1959, p. 150, 152.

Use of Potomac M with L-XX (T-1) high-speed steel inserts which accurately shape the rotor ends. (E13, W19n, W11q; TS, *Cr*, *V*)

131-E.* Refractory Shells Aid Investment Casters. E. M. Broad. *Steel*, v. 144, Jan. 26, 1959, p. 72-75.

Refractory shell molds formed on wax patterns by dipping liquid binder and applying coarse dry refractory, and repeating until enough layers have been applied to develop coat 1/4 to 1/2 in. thick. Advantages of process. (E15, E19)

132-E.* (French.) Additions of Ferro-Silico-Zirconium to Liquid Gray Iron. Pierre Detrez. *Fonderie*, Aug. 1958, p. 374-384.

Metallurgical study, mechanical properties, recommended practice. Treatment in ladle with granulated additions of Fe-Si-Zr of 0.1 to 0.6% results in good Si content in castings; causes shrinkage cavities when addition exceeds 0.3-0.4%. Combined action of Si and Zr produces calmed bath, Zr acting chiefly on O, N and S, in order listed. Tensile strength is increased, modulus of elasticity decreases, hardness is not appreciably affected, some porosity is noted. 12 ref. (E25, Q-general; CI-n, AD-n, Fe, Si, Zr)

133-E.* (Hungarian.) Air Heater Tubes Manufactured of Alloyed Cast Iron. A. Mocsy. *Kohaszati Lapok-Ontode*, v. 9, no. 8, 1958, p. 177-183.

Composition 4-6% Si, 2.5-3.5% Cr and 0.1-0.4% Ti provides heat resistance at 900 to 950° C. Cold wind used in cupola containing ferro-alloys. 5 ref. (E10a; CI-q, *Si*, Cr, Ti, 4-60)

134-E.* (Hungarian.) Continuous Production of Large Diesel Engine Crank Cases of Light Metal by Core Molding. M. Solti. *Kohaszati Lapok-Ontode*, v. 9, n. 8, 1958, p. 183-193.

Molding technique applied in producing Al alloy castings of engines, including chilled housings for main journal bearings. 4 ref. (E19, T21b; Al-b, *Si*, *Fe*, *Mg*, *Mn*, 5-60)

135-E.* Gating for Production of High-Duty Iron Castings. L. Clarke. *British Foundryman*, v. 41, Dec. 1958, p. 607-615.

Spacing of patterns is considered relative to box type, comfortable pouring and adequate weighing; problems of warping and escape of gas; metal flow on mold and core sections; turbulence and metal temperature. (E22p; CI)

136-E.* Slope Casting Test Results on Some Established and Experimental Magnesium Casting Alloys. D. J. Whitehead. *Light Metals*, v. 21, Dec. 1958, p. 391-395.

Tensile properties obtained in slope castings in Z5Z, RZ5, TZ6, TZ3, TZ4, TZ5, Z3Z, A8 and AZ61 alloys. Properties of Mg-Zn-Zr alloys fall as Zn content is reduced from 6% and a similar decrease occurs with solution treated Mg-Al-Zn-Mn alloys as the combined Al and Zn content is lowered from about 10%. (E-general; Q-general, Mg-b, *Al*, *Zn*, *Mn*, *Zr*, 2-60)

137-E. New Pressure Die-Casting Machine. *Light Metals* v. 22, Jan. 1959, p. 12.

Unit is hydraulic and semi-automatic in operation, being constructed to produce large, high-quality Mg and Al castings at a fast rate. (E13, 1-52; Al-b, Mg-b)

138-E. Hollow Pressure-Die Castings. *Light Metals*, v. 22, Jan. 1959, p. 29.

Die casting of Al alloys. (E13; Al-b)

139-E. Production and Fabrication of Nickel Alloys. *Metallurgia*, v. 58, Dec. 1958, p. 291-294.

Melting, rolling and extrusion operations at Henry Wiggin and Co. Ltd., Hereford, England. (E-general, F-general; Ni)

140-E. Diecastings and Stampings Are Compared. H. K. Barton. *Metalworking Production*, v. 102, Dec. 26, 1958, p. 2260-2262.

(E15, G3)

141-E. From Ore to Castings—Reynolds-Ford at Muscle Shoals. *Precision Metal Molding*, v. 16, Dec. 1958, p. 35-37, 48.

Transfer of molten Al from the Reynolds Metal Co.'s reduction plant to the Ford Motor Co. foundry renders ingot casting and remelting unnecessary. (E-general, A5a, W18n; Al, 14-60)

142-E. (Hungarian.) Shell Molding Process in the Iron and Steel Foundry in Kobanya. Gyula Banky. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 118-122.

(E19c)

143-E. (Hungarian.) Types of Feeding Heads Used in Steel Founding. Pal Nemeth, Ivan Lipovetz and Ferenc Varga. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 124-128.

Ferrostatic pressure head, air pressure head, and gas pressure head containing an agent within the head which forms gas due to heat of molten metal and additional pressure of nitrogen gas fed in. Methods of slowing solidification rate. (E22n; ST)

144-E.* Effects of Mould Rigidity, Moulding Sand Properties and Pouring Temperature on the Soundness of Unfed Grey Iron Castings. K. E. L. Nicholas. *British Cast Iron Research Assoc., Journal* v. 7, Dec. 1958, p. 446-475.

Changes in volume of mold cavity and casting size resulting from variations in pouring temperature, mold rigidity and moisture and cold dust content of green molding sands. Relation of top surface shrinkage with casting expansion. Comparison of soundness of flake and nodular graphite castings produced in green sand, dry sand, CO_2 process and cement sand molds. (E11, E25n, P10c, 2-62; CI-n, CI-r)

145-E.* Solidification and Risering of Grey-Iron Castings. Clyde M. Adams, Merton C. Flemings and Howard F. Taylor. *British Foundryman*, v. 41, Dec. 1958, p. 625-636.

Fundamental variables for determining shrinkage in gray iron. Size and location of voids resulting are dependent on size and shape of the casting, action of atmospheric or ferrostatic pressure, characteristics of the molding material and size, shape, location and thermal treatment of gates and risers. 11 ref. (E25n, E22; CI-n)

146-E.* (Hungarian.) Production of Malleable Cast Iron. Elek Chapo. *Kohaszati Lapok-Ontode*, v. 9, July 1958, p. 152-163.

Composition of melt, tensile strength of castings, melting facilities, heat treatment methods and equipment, economic aspects in Hungarian industry. 20 ref. (E11, J-general, 1-52; CI-s)

147-E.* (Russian.) The Eutectic State of Magnesium Iron and Its Importance in Technology and Quality. I. F. Kurtov, N. P. Chichagova and V. A. Zakharov. *Liteinoe Proizvodstvo*, Nov. 1958, p. 3-4.

Castings of eutectoid iron result in concentration of blowholes and porosity during solidification. These defects have been combatted with use of deadheads. Proper selection of carbon-silicon ratio in the charge with further addition of Si as modifier helps reduce porosity. Correct modification of magnesium eutectoid iron is best accomplished by continuous automatic regulation of the process. (E25q, 2-60, 18-74; CI-r, *Mg*, Si, 9-68)

148-E.* (Russian.) Desulphurization of Cast Iron With Magnesium. E. S. Mil'man, L. V. Il'icheva and M. A. Studnits. *Liteinoe Proizvodstov*, Nov. 1958, p. 15-17.

Investigation with radioactive isotopes shows that Mg forms stable compounds with the S which can only be decomposed at very high temperatures after which S reappears in the pig iron at 70% of original volume. To insure full desulphurization it is essential that the slag be completely removed from the liquid iron. Failure to do so will result in reappearance of S when iron is reheated to 1500° because of the thermodynamic instability of magnesium sulphite at high temperatures. 6 ref. (E10, D11n, 1-59; CI, *Mg*, *S*)

149-E. The Effect of Heat on the Properties of Compacted Moulding Materials. J. L. Evans and J. White. *British Foundryman*, v. 41, Dec. 1958, p. 615-625.

High hot strength in a sand is developed as a result of a sintering process involving the clay bond. The peak of the hot strength curve represents the temperature at which the increased sintering, which

takes place as the temperature rises, is offset by liquid formation and softening of the bond. (E19, E18n)

150-E. Ingot Mould Production. *Iron and Steel*, v. 32, Jan. 1959, p. 25-26.
New plant of the Brightside Foundry and Engineering Co. Ltd. at Ecclesfield, England, produces ingot molds weighing up to 15 tons. (E-general, W19c, 18-67; ST)

151-E. (French.) Permanent Mold Castings for Tension Tests of Light Metal Alloys. Andre Tatur. *Fonderie*, no. 155, Dec. 1958, p. 566-576.
Risk of cracking has been eliminated by carefully designed pouring basins and sprues which make it possible to preserve the cast skin of the samples. No subsequent machining is required. 9 ref. (E12, S12h; EG-a39, 5-63)

152-E. (French.) Manufacture and Properties of Ferrous Alloy Foundry Products. J. Goffart. *Industrie-Anzeiger*, Sept. 12, 1958, p. 26-27.
(E25; CI)

153-E. (German.) Molding Operations for Gray Iron and Steel Cast Seamless Welding Rods. J. Tanner. *Giesserei-Praxis*, Nov. 10, 1958, p. 429-430.
(E19, W29h; CI-n, ST, 5-60)

154-E. (German.) Economical Casting Resulting From Proper Molding Practices. Max Wernicke. *Giesserei-Praxis*, Nov. 25, 1958, p. 445-446.
Practical hints for numbering of molds and cores and handling of molds, cores and patterns. (E19)

155-E. (German.) High-Strength Castings. Hans Reininger. *Giesserei-Praxis*, Dec. 24, 1958, p. 469-473.
Influence of pouring temperature on strength of Mg alloys. Gating practice that avoids defects. (E22, E23, 2-61; Mg-b, SGB-a)

156-E. (German.) Cupola Process Controlled From a Central Cab. Alfred Rexroth. *Giesserei*, v. 46, Jan. 1959, p. 8-11.
(E10a)

157-E. (Russian.) Cast Iron With Nitrogen, Hydrogen and Oxygen. L. I. Levi. *Liteinoe Proizvodstvo*, Nov. 1958, p. 20-23.
H, N and O interact in solid as well as molten iron. Lowering temperature during pouring increases oxygen content of iron. Melting in vacuum with graphite lining results in remarkable change of chemical composition. Iron becomes strongly saturated with C and Si content is decreased. Cast iron absorbs oxygen in quantities depending on length of exposure to air and on its graphite structure. 10 ref. (E25s, E23, E10, 1-73, 2-61; CI, *Si, H, N, O*)

158-E. (Russian.) Equipment for Die Casting Steel Under Vacuum. V. M. Belov and S. A. Kazennov. *Liteinoe Proizvodstvo*, Nov. 1958, p. 7-8.
Vacuum die-casting machine with horizontal compression chamber. The press form is installed in vacuum compartment and is joined with a reservoir which is kept under continuous vacuum. Air from form mold cavities is withdrawn through ventilation canals. (E13, 1-52, 1-73; ST)

159-E. How to Make Shell Molding Pay. *Iron Age*, v. 183, Feb. 5, 1959, p. 96.
(E19c)

160-E. Design of Die-Casting. Pt. 9. Converting Sand-Cast Parts to Die-Casting. H. K. Barton. *Metal Industry*, v. 94, Jan. 9, p. 29-30.
(E13, 17-51)

161-E. Castings Do It Better for Aircraft Industry. *Modern Metals*, v. 35, Feb. 1959, p. 29-32.
High quality Al casting at American Brake Shoe. (E-general; Al-b)

162-E. Interrelation Between Stress Concentration and Castability. J. B. Caine. *Modern Metals*, v. 35, Feb. 1959, p. 101-104.
Relationship between shapes designed to minimim stress concentration, maximum load-carrying ability and castability of such shapes. 6 ref. (E-general, 17-51)

163-E.* Dimensioning of Sand Casting Risers. Harish D. Merchant. *Modern Castings*, v. 35, Feb. 1959, p. 73-86.
General equation for risers expressed in graphic form which is convenient to use, provided the values of the parameters of the equation are known. These are the solidification shrinkage at pouring temperature, the ratio of height to diameter of riser and number of risers required. 24 ref. (E22q; CI, ST)

164-E.* Mold Material Effect on Cooling Rate and Physical Properties of Cast Metals. *Modern Castings*, v. 35, Feb. 1959, p. 86-100.

Effect on the physical properties of various cast irons when cast into molds made in typical molding sands at various ramming densities; effect when using other types of molding materials of varying thermal properties. Increased coarseness of grain size and increased mold density increases tensile strength in all cases, when other variables are equal. 10 ref. (E19, E25n, Q27a; CI)

165-E.* (Dutch.) Pouring Times for Sand Casting. J. S. Abcouwer. *Metalen*, v. 14, Jan. 15, 1959, p. 2-6.

Formulas and graphs for different weights, wall thicknesses and thermal conditions. 6 ref. (E11, E23)

166-E.* From Gravity Die-Casting to Shell Moulding. D. Miller. *British Foundryman*, v. 52, Jan. 1959, p. 2-3.

Pattern equipment and procedures used in shell molding, shell core blowing and closing shell molds in the production of small brass castings. Economics. (E19c; Cu-n)

167-E.* Investment Casting—Recent Experiences and Improved Techniques. D.F.B. Tedds. *British Foundryman*, v. 52, Jan. 1959, p. 10-17.

Distortion in wax patterns and control with plaster fixtures. Improvements in method of applying primary coating; production of cored passages using water soluble cores; control of mold temperature and metal pouring time; vacuum casting and refractory shell techniques. (E15, 1-73)

168-E.* Non-Ferrous Alloys. Arthur Logan. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 84-124.

Equilibrium diagram for Cu-Sn systems. Melting practices for bronze. Effects of casting temperature, repeated melting, degassing, fluxing, grain refinement, Pb, Fe, Zn, S, P, Ni, Al, Si or Bi on soundness and mechanical properties of bronze castings. Foundry characteristics of Al bronze, Ni bronze and high-tensile brass. (E-general, M24b, Q-general, 3-69; Cu-s, Cu-n)

169-E.* Aluminum Alloys. Arthur Logan. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 125-141.

Composition and properties of Al casting alloys; melting practice, degassing, grain refining, modification; effect of Cu, Mg, Fe and Si on properties of alloys. (E25, E10, Q-general, 3-69; Al-b)

170-E.* Pattern Equipment. F.G. Butters, A. Marshall, R.C. Perkins and D.B. Orr. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, p. 180-216.

Materials used, layout of pattern equipment, types of patterns for production of light, medium and heavy castings. (E17)

171-E.* Moulds and Mould-Making. James Timbrell. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 268-318.

Ramming and pattern stripping procedures; denting; running systems; mold closing; feeders; chills; ladles; pouring basins; cover cores; stripping plates; precautions in pouring and other considerations in molding and casting with sand. Pit molds and loam molding. (E19a, E19b)

172-E.* Cores and Core Making. F.H. Hoult. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc. New York, 1959, p. 319-361.

Core sand practice; making green sand, dry sand, CO_2 process, loam, shell and resin bonded cores. Core blowing machines, types of core stoves, core handling. (E21g, E21h)

173-E.* Moulding Machines. E.D. Howard. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 362-393.

Straight draw machines, equipment for snap flask and pop-off flask and stack molding; squeeze rollover, jolt squeeze and sand sling machines. (E19a, 1-52)

174-E.* Modern Moulding Developments. J.L. Rice. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 394-415.

Patterns, molding equipment and sand mixes for CO_2 process and shell molding. Dimensional tolerances and advantages. (E19b, E19c)

175-E.* Fettling Practice. W.G. Morgan and J.E.O. Little. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, p. 416-438.

Fettling operations including brushing, hydraulic cleaning, blasting, tumbling, chipping, grinding, sawing, flame-cutting and pickling. (E24, L10, G22g, G17h)

176-E. Foundry Clays. J.J. Marais. *British Foundryman*, v. 52, Jan. 1959, p. 4-9.

General properties of kaolinites, illites and montmorillomites, in relation to foundry work and their applications. Methods of identifying clays. (E18n, E18r; NM-f45)

177-E. Hydraulics Boost Die Casting Process. L.W. Haisen. *Die Casting Engineer*, v. 2, Dec. 1958, p. 8-10.

Problem of increasing casting speed in relation to closing the die, inserting the core, making the shot, die opening and ejection. (E13, 1-70)

178-E. Carbon-Dioxide Process for Moulds and Cores. *Foundry Trade Journal*, v. 106, Jan. 29, 1959, p. 125-126.

Advantages and disadvantages summarized. (E18)

179-E. Production of Electrical Components. *Machinery (London)*, v. 94, Jan. 28, 1959, p. 207-215.

Pressure and gravity die casting of Al and gravity die casting of Al bronze and brass alloys at Metropolitan-Vickers Electrical Co., Ltd., Manchester, England. (E13, T1; Al-b, Cu-n, Cu-s)

180-E. Moulding Sands and Dressings. A. Tipper. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 217-267. (E18)

181-E. Foundry Mechanization. John Gardom and C.C. Patterson. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, p. 439-454.

Mechanical handling equipment. (E-general, W12)

182-E. Design Change + Shell Mold Casting = Savings. *Precision Metal Molding*, v. 17, Jan. 1959, p. 46-47.

Advantages of shell mold casting include greater accuracy; cores and mold components are rigid; smaller holes can be cored than in sand; thin-wall sections. (E16e, 17-51)

183-E. Low Cost Miniature Castings. *Precision Metal Molding*, v. 17, Jan. 1959, p. 59.

With the "Minicast" process the part is first cast as a rather conventional investment casting and is then coined to secure the required dimensional accuracy and flatness. (E15, G3n)

184-E. (Japanese.) Some Investigation on Cerium Treated Cast Iron. Masao Homma, Akira Minato, Hiroshi Meguro and Yosuhiko Abe. *Japan Foundrymen's Society, Journal*, v. 30, Dec. 1958, p. 947-953.

Effects of Ce on macro and microstructure of hypoeutectic and eutectic cast iron, inoculation and chill effects and production of malleable high-Si cast iron. Ce has effect of producing white cast iron by deoxidation. Graphitization is accelerated and high-Si malleable cast iron is much improved in its mechanical properties. (E25q, N8s; CI-p, CI-s)

185-E.* (German.) New Process for the Magnesium Treatment of Cast Iron. Werner Jahnig. *Freiberger Forschungshefte*, no. B31, 1958, p. 173-187.

Mg addition to melts of low-P and low-S cast iron by feeding a rod of Mg alloy under the bath surface, across a sealed opening near the bottom of the ladle. 5 ref. (E25q; CI-r, AD-p36, *Mg*)

186-E.* (German.) Centrifugal Casting of Cu Alloys. Joachim Muller and Eva-Maria Pettinger. *Freiberger Forschungshefte*, no. B31, 1958, p. 315-342.

Experimental casting of bushings in a Cu mold in a casting machine with air cooling. Effects of rotation speed, pouring conditions and different types of wash on quality of castings. (E14, T7d, 2-60, 3-67; Cu-b, 17-57)

187-E.* (Japanese.) Effects of Calcium on Cast Iron Melted Under Vacuum. Masuteru Maruyama and Hiroyuki Chida. *Japan Foundrymen's Society, Journal*, v. 30, Nov. 1958, p. 880-886.

Graphitization effect due to Ca is powerful and spherodization in low-carbon iron is better, with less Si, whereas graphitization in high-carbon iron is better with more Si. (E25q, N8s; CI, *Ca*, Si)

188-E.* (German.) Methods of Avoiding Defects in Castings. H. Kron. *Giesserei-Praxis*, Jan. 10, 1959, p. 15-19.

Causes of blowholes, cold shuts, cavitation, rough surfaces, cracks and segregation related to possible remedies. (E-general; 5, 9)

189-E.* (German.) Casting of Zinc Alloys. Karl Kramer. *Giesserei-Praxis*, Jan. 10, 1959, p. 10-15.

Die casting, permanent mold casting and composite castings of Z-430 alloy. (E13, E12; Zn-b)

190-E.* (German.) Gas Absorption, Gas Determination and Methods for Degassing Aluminum Alloys. A. Hohmann. *Giesserei-Praxis*, Jan. 10, 1959, p. 8-9.

Chemical and physical means for avoiding gas absorption during melting. (E25s, E10; Al-b)

191-E.* (German.) Production of High-Strength Castings. Hans Reininger. *Giesserei-Praxis*, Jan. 10, 1959, p. 3-8.

Tensile strength, elongation and hardness of AZG alloy in relation to pouring, degassing, refining, desulphurization and addition agents. (E-general, Q-general; Mg-b, 5-60, AD-q40)

192-E.* (German.) Compound Castings of Wear Resisting Materials. Hans Reininger. *Giesserei-Praxis*, Jan. 25, 1959, p. 30-31.

Compound casting method by which wear resistant surfaces and portions of harder material are added to castings of a softer base material. (E11; AD-q40, SGA-m)

193-E.* (Japanese.) Study on Bimetal Castings. Tsunemitsu Muraki. *Japan Foundrymen's Society, Journal*, v. 30, Dec. 1958, p. 959-967.

Adhesion mechanism between molten cast iron and steel, covered with oxide film. Cast iron and steel are stuck together and heated at 950 to about 1150°C. in argon gas atmosphere. Reduction and dissolution of oxide film and pressure welding takes place, CO gas being released. Intermetallic diffusion, Fe-ion from steel to cast iron and carbon from cast iron to steel, occurs, which makes the adhesion complete. 15 ref. (E-general; ST, *CI*)

194-E. Do You Ask, "Which Core Process"? W.B. Bishop. *Canadian Metalworking*, v. 22, Feb. 1959, p. 22, 24, 26.

Advantages and disadvantages of various processes. (E21)

195-E. Die Casting Under Reduced Atmospheric Pressure. *Precision Metal Molding*, v. 17, Feb. 1959, p. 30-31.

Vacuum system evacuates the shot sleeve and the die cavity through the pouring hole after the metal has been ladled. Continued withdrawal of vapors from the chamber is made during actual injection of the metal. (E13, 1-73)

196-E. Electron Beam Melting. *Precision Metal Molding*, v. 17, Feb. 1959, p. 32.

Heating mechanism is a high-voltage electron bombardment, in which an electron gun serves as the cathode and the melt stock as the anode. Material to be melted can be in any form and not necessarily compacted as with arc melting. (E10b)

197-E. (German.) Molding and Casting of Crankshafts. Walter Feicke and Georg Arand. *Freiberger Forschungshefte*, no. B31, 1958, p. 109-128.

Survey on materials and foundry practice. 31 ref. (E23, T7j; CI-n, CI-s, ST, 5-60)

198-E. (German.) Importance of Sprue and Flow Off Shapes in Iron Casting. Gerhard Gertz. *Freiberger Forschungshefte*, no. B31, 1958, p. 161-172.

16 ref. (E22; CI)

199-E. (German.) Die Casting and Permanent Mold Casting Machines. Werner Bahr. *Freiberger Forschungshefte*, no. B31, 1958, p. 289-313.

(E12, E13, 1-52)

200-E.* (Swedish.) Pressure Rightness of Copper Alloy Castings With Phosphorus as Affected by Shape Effects in Microporosity. Tore Malmberg. *Gjuteriet*, V. 48, Dec. 1958, p. 191-194.

Wedge and dumb-bell shaped test pieces were cast using various molding sands to study the influence of molding material on pressure tightness. Tight castings were obtained with green quartz sand and aluminum oxide added to dry sand. Pressure tightness is decreased by branch-shaped pores. (E25q, M27; Cu-b, *P*)

201-E.* Trends in Production of Castings in Aluminum Alloys. A. P. Fenn. *Metallurgia*, v. 59, Feb. 1959, p. 63-66.

Trend from sand casting to gravity die casting, and from gravity die casting to pressure die casting. Technical and economic considerations. (E11, E13; Al-b)

202-E.* (German.) Measurement of Thermal Cracking Susceptibility of Light Metals With Special Reference to Magnesium Alloys. K.E.

Mann. *Giesserei*, v. 45, Dec. 18, 1958, p. 761-765.

Mg-Al alloys increase in susceptibility up to 1% Al content, then decrease. Si additions give similar results. Fine-grained structure improved resistance. Hexachloroethane additions reduce grain size if content of Mn, Cu and Si is low. (E25n; Mg-b, Al, AD-p35, *Si, Mn, Cu*)

203-E.* (German.) Shrinkage and Dimensional Accuracy in Die Castings. Tomonobu Kanno and Torazo Uehara. *Giesserei*, v. 45, Dec. 18, 1958, p. 765-775.

Theoretical formulas for shrinkage derived from linear coefficients of thermal expansion for ASTM S12, SC54 and SC84 Al alloys. Shrinkage is reduced by increasing mold temperature. (E13, P10c; 17-55, 5-61, Al-b)

204-E.* (Japanese.) Flow of Aluminum and Its Alloys in Sand Molds. Goro Ohira and Mahito Koizumi. *Japan Foundrymen's Society, Journal*, v. 30, Nov. 1958, p. 897-904.

Behavior of pure metal, eutectic alloys (Al-Si, Al-Cu) and alloys of wide solidification range. (E25p, E11; Al-b, Cu, Si)

205-E.* (Russian.) Utilization of Low-Silicon Cast Iron. N.A. Barinov. *Liteinoe Proizvodstvo*, Dec. 1958, p. 3-6.

Various types of cast iron in regard to fluidity, mechanical properties, heat stability, sulphur content and gas inclusions. (E-general, Q-general, 3-60, 3-69; CI, *C, Mn, Si*)

206-E.* (Russian.) Steel Melting Technology for Profile Steel Casting. N.N. Dobrokhotov. *Liteinoe Proizvodstvo*, Dec. 1958, p. 8-9.

After melting add slags, lime, and heat steel above liquid temperature; discharge out of openhearth furnace in a boiling state; deoxidize and alloy with cold ferro-alloys added to the ladle. 4 ref. (E10, D2c; ST, RM-q, 5)

207-E.* Vacuum Die Casting of Aluminum and Zinc Alloys. J. P. Moehling, Jr. *Industrial Gas*, v. 37, Feb. 1959, p. 13-16.

Process eliminates porosity, provides better density, hardness and finish; is adaptable to automation. (E13, 1-73; Al-b, Mg-b, Zn-b)

208-E. Role of the Metallurgist in the Production and Usage of Austenitic Manganese Steel Castings. B. Needleman. *South African Institute of Mining and Metallurgy*, v. 59, Dec. 1958, p. 229-257.

Necessity for good control over casting temperature. Emphasis is placed on actual hardness figure of cold warked surface rather than lower hardness figure as given by the conventional Brinell machine using 3,000 Kg and a 10-mm.ball. (E-general, Q29, 2-61; ST, *Mn*, 5-60)

209-E. (Dutch.) Pouring Times for Sand Castings. J. S. Abcouwer. *Metalen*, v. 14, Jan. 31, 1959, p. 18-21.

Computations for cast iron and some nonferrous metal castings of various wall thicknesses. 6 ref. (E23; 5-60)

210-E. (Dutch.) Cupola Control. Pt. 4. *Gieterij-Centrum Berichten*, v. 7, Jan. 1959, p. 7-8.

Charge level is controlled by means of iron rod protruding from furnace sidewall which sinks as the level subsides. Charge can also be controlled by photo-electric cells. (E10a)

211-E. (French.) Flame Cutting Equipment for Cleaning Castings. *Journal d'Informations Techniques des Industries de la Fonderie*, no. 101, Nov-Dec. 1958, p. 12-13. (E24h, G22g, 1-52)

212-E. (German.) British Improvement in the Croning Process and Future Applications. A. N. Wormleighton, *Giesserei*, v. 45, Dec. 18, 1958, p. 775-777.

Croning process installation and typical products of the Phosphor-Bronze Co., Birmingham, England. (E16c)

213-E.* (French.) Dimensional Stability of Light Metal Castings. Henry Garnier and Jean-Jacques Desherault. *Fonderie*, no. 156, Jan. 1959, p. 13-20.

Dimensional changes due to residual stress. Effect of aging, heat treatment and various quenching media on dimensional stability. (E25, Q25, P10d, 2-64; Al-b, EG-a39, 5)

214-E. (French.) Statistical Control in the Production of Steel Castings. Pierre Destable. *Metallurgie et la Construction Mecanique*, v. 91, Jan. 1959, p. 19-26.

Statistical methods for control of C, Si, Mn and Cr contents. (E25, S12, 2-60; ST, *C, Si, Mn, Cr*, 5-60)

215-E.* (German.) Progress in the Foundry Industry During the First Six Months of 1958. Paul A. Heller. *Stahl und Eisen*, v. 79, Feb. 5, 1959, p. 156-162.

Melting techniques; new casting alloys; molding and cleaning practices. 93 ref. (E-general)

216-E.* (Japanese.) Metal Flow and Solidification of Aluminum in Casting Grates. Goro Ohira and Mahito Koizumi. *Japan Foundrymen's Society, Journal,* v. 30, Dec. 1958, p. 967-973.

Pouring, current flow and solidification process observed by the electromagnetic oscillograph. (E23, E25n; Al-b)

217-E.* (Russian.) Inoculation of Cast Iron With Liquid Iron-Magnesium Alloy. A. A. Ryzhikov and S. I. Ryabuchin. *Liteinoe Proizvodstvo,* Jan. 1959, p. 9-10.

Recommended procedure is to partially fill the ladle with liquid cast iron, charge 0.4% Mg and 0.4% FeSi, fill the balance with liquid cast iron, rotate the ladle 180° and discharge the metal into the cupola. After holding the metal for 20 min. to 1320°C. the metal is cast into forms. 4 ref. (E25q, E25s; CI-r, AD-p36, 14-60, *Fe, Si, Mg*)

218-E.* (Russian.) High Melting-Point Alloy for Nodular Cast Iron Inoculation. P. I. Stepin. *Liteinoe Proizvodstvo,* Jan. 1959, p. 10-11.

A ternary diagram of Mg-Si-Fe shows that the best alloying combination for use as an inoculant, and possessing both high Mg content and high melting point, is composed of 11% Mg, 35% Si, 11% Cu or Ni and 43% Fe. (E25q; AD-p36, CI-r, *Mg, Si, Cu, Ni, Fe*)

219-E.* (Russian.) Properties of Cast Iron Inoculated With Magnesium. G. A. Pisarenko, S. G. Guterman and P. V. Gubchevskii. *Liteinoe Proizvodstvo,* Jan. 1959, p. 12-13.

Cast iron with spheroidal graphite, obtained as a result of treatment with Mg has higher mechanical properties, even if unannealed. Still better properties result from Mg-FeSi treatment. (E25q, Q-general; CI-r, AD-p36, *Mg,* Si)

220-E.* (Russian.) Effect of Sulphur on Mechanical Properties of Inoculated Malleable Iron. A. S. Suprun. *Liteinoe Proizvodstvo,* Jan. 1959, p. 13-14.

Addition of Al to malleable Fe with high S content increases tensile strength, ductility and elongation, and changes considerably sulphur's effect upon mechanical properties. In addition, the annealing cycle is shortened. (E25q, Q27a; CI-s, AD-p36, *Al, S*)

221-E.* (Russian.) New Methods for Studying Flowability of Metals and Formation of Shrinkage Cavities. I. Chikel'. *Liteinoe Proizvodstvo,* Jan. 1959, p. 27-32.

Two kinds of test pieces for observing flowability of liquid metal and for studying shrinkage behavior. Influence of casting shape and wall thickness on structure; effects on pouring time, feeding time and casting temperature on concentration and deconcentration of shrinkage cavities. 16 ref. (E25p, P10c; CI, 14-60, 9-67)

222-E.* (German.) Casting and Properties of Components for Semi-Assembled Crankshafts. Gerhart Tschorn. *Giessereitechnik,* v. 5, Jan. 1959, p. 4-9.

Melting, molding and pouring processes, heat treatment of steel castings. (E-general, Q-general, T7j, 2-64; SS, 5-60)

223-E. (German.) Principles of Casting Design. Heinz Lucas. *Giessereitechnik,* v. 5, Jan. 1959, p. 19-25.

Basic design requirements related to gating and risering. (E17, E22, 17-51)

224-E.* (German.) Magnesite Risers. Horst Riess. *Giessereitechnik,* v. 5, Jan. 1959, p. 25-26.

Mixture of magnesite, lye and sawdust or wood shavings is used, packed solidly into sheet metal forms. (E22q)

225-E.* (Russian.) Use of Exothermic Feeding Compounds in the Production of Nodular Cast Iron. N. I. Klochev and A. M. Sucharev. *Liteinoe Proizvodstvo,* Jan. 1959, p. 11-12.

Exothermic mixes (Feedex) must have good heat conductivity, high ignition temperature and combustion rate; excellent molding properties; good stability as it reaches ignition temperature; combustion products should have low heat conductivity and not enter into reaction with the metal. Typical analysis of an exothermic mix for Mg inoculated cast iron. (E25q, E25n; CI-r, AD-p36)

226-E.* Centrifugal Casting Applied to Grey Iron. L. McIntosh. *Castings,* v. 5, Jan. 1959, p. 7-17.

Quality control of castings, mold speeds, centrifugal casting machines. (E14; CI-n)

227-E. (Italian.) Use of Ferro-Alloys Makes It Possible for Small Iron Foundries to Meet Customer Specifications. *Fonderia,* v. 7, Dec. 1958, p. 533-536.

Effects of alloying on composition and properties of castings; form and composition of ferro-alloys; additions in furnace and in ladle. (E-general, 2-60; AD-n31, Fe, 5-60)

228-E. (Italian.) Elektron Foundry Practice. Giuseppe Barchiesi. *Fonderia*, v. 7, Dec. 1958, p. 537-542.
Care and use of crucibles; melting; alloying additions; preparation of cores and molds; molding and chill casting; repair of defective castings; Cr plating in alkaline solution. (E-general; Mg-b)

229-E.* Investment Casting in US and UK: Pt. 1. H. P. Gray. and A. Dunlop. *Foundry Trade Journal*, v. 106, Feb. 19, 1959, p. 203-209.
Detailed developments of the original process, and Investment X, Mercast, Glascast and Shaw processes. 19 ref. (E15)

230-E.* (German.) Melting Plain Carbon and Alloy Steels in Low-Frequency Induction Crucible Furnaces. Dieter Hartman. *Giesserei*, v. 46, Jan. 15, 1959, p. 25-29.
Remelting and refining processes; furnace systems; advantages for the steel foundry. 6 ref. (E10p, 1-69; AY, CN)

231-E.* (German.) Economics of Exothermic Feeding Compounds. Leo Remmeke. *Giesserei*, v. 46, Jan. 15, 1959, p. 34-37.
Savings realized by use of exothermic compounds in preventing formation of shrinkage cavities as the metal contracts on cooling. (E23, E25n, 9-67)

232-E.* (German.) Pinholes in Steel Castings. Fritz Brunn. *Giessereitechnik*, v. 4, Dec. 1958, p. 307-310.
Pinholes in the form of blowholes a few tenths of an inch under the skin of the casting are analyzed in relation to incidence, causes and possible remedies. 5 ref. (E-general; 5-60, ST, 9-68)

233-E.* (German.) Magnesium Inoculated, Spheroidal Graphite Cast Iron and Its Application in Pipelines. Georg Haensel. *Gas, Wasser, Warme*, v. 13, Jan. 1959, p. 8-20.
Preparation by inoculation of powdered Mg into the melt by lance in a stream of nitrogen. Mechanical properties are improved by heat treatment. (E25q, T26r, 2-64; CI-r, *Mg*, AD-p36)

234-E. How to Mechanize the Smaller Foundry. Henry W. Zimnawoda. *Foundry*, v. 87, Mar. 1959, p. 82-89.
Mechanization applied to molding practice. (E19, 18-74)

235-E. Modern Diecasting Plant Designed for Future Expansion. *Foundry*, v. 87, Mar. 1959, p. 93-95.
Melting and die casting practice at Rockwell Mfg. Co., Pittsburgh. (E13)

236-E. (French.) Safety Measures in Foundry Operations. J. Leonard. *Fonderie Belge*, v. 28, Dec. 1958, p. 376-378.
(E-general, A7p)

237-E. (German.) New Trends in Pattern and Mold Making. Franz Rossberger. *Giesserei*, v. 46, Jan. 15, 1959, p. 30-34.
(E19, E17)

238-E. (German.) Invertible Molding Plates Increase Productivity. Fritz Naumann. *Giessereitechnik*, v. 5, Jan. 1959, p. 10-12.
Invertible molding plates are used to produce both upper and lower halves of the mold of symmetrical castings in the small and medium-size ranges. Molding plates may be made of metals or plastics, but calcined gypsum is usually preferred. (E17)

239-E. (Russian.) New Non-Searching Facing Material for Foundry Molds. P. V. Chernogorov, Yu. P. V. Bobrov. *Liteinoe Proizvodstvo*, Jan. 1959, p. 4-5.
Limestone slag, in place of talcum powder, sprinkled on mold surfaces, produces cleaner castings. (E11, E25)

240-E.* (German.) Production of High-Quality Sand Castings From Remelted Aluminum Alloys. Hans Reininger. *Giesserei-Praxis*, no. 4, Feb. 25, 1959, p. 61-68.
Attention must be paid to casting temperature, cooling rate and systematic gating. (E11, E25; Al-b)

241-E. (Book.) Modern Foundry Practice. 3rd Ed. E. D. Howard, Editor. 464 p. 1959. Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $15.
Sections on ferrous metals, nonferrous alloys, heat treatment, melting furnace, pattern equipment, molding sands, molding, molding equipment, coremaking, fettling practice. Papers separately abstracted. (E-general)

242-E.* Shell Moulding for Steel. *Iron and Steel*, v. 32, Feb. 1959, p. 45-48.
Shell molding technique provides carbon, low-alloy and stainless steel castings of good finish and accuracy in dimensional tolerance (E16c; SS, CN, AY)

243-E.* Miniature Investment Castings. *Precision Metal Molding*, v. 17, Mar. 1959, p. 33-35.

Castings are produced in Al, stainless steel, BeCu, silicon brass, toolsteel, alloy steel and carbon steel. (E15; ST, Al, Cu-b, *Be*, Cu-n, Si)

244-E.* (Hungarian.) Increasing the Life of Ingot Molds. Arisztid Kralik. *Kohaszati Lapok-Ontode*, v. 91, Sept. 1958, p. 205-215.

Factors influencing life time include composition of metal, shape of molds, direction of pouring, cooling rate and temperature preceding pouring. 11 ref. (E23, W19c)

245-E.* Development of a Marine-Propeller Alloy. A. J. Smith. *Foundry Trade Journal*, v. 106, Mar. 5, 1959, p. 265-267.

Casting practice for Ni-Al bronze; properties and performance of the castings. (E11, A-general, T22h; Cu-s, *Al*, *Ni*)

246-E.* Production of Investment Castings for Commercial Applications. *Machinery (London)*, v. 94, Mar. 4, 1959, p. 484-492.

Techniques employed by P. I. Castings, Ltd., in manufacturing a wide range of castings. (E15)

247-E.* (Rumanian.) Effect of Aluminum on the Microstructure of Cast Iron With Laminar or Nodular Graphite. Traian Dumitrescu, Maria Solacolu-Nicolaid and Alfred Kathrein. *Studii si Cercetari de Metalurgie*, v. 3, no. 4, 1958, p. 417-438.

Graphitization; ferrite formation; development of epsilon-phase; hardness as influenced by Al content. 11 ref. (E25q, M27, 2-60; CI, *Al*)

248-E.* Resin and Sand Economy, and Surface Finish in Shell Molds. R. S. Jackson and W. W. Glick. *British Foundryman*, v. 52, Feb. 1959, p. 53-60.

Effect of sand composition and resin content on cold strength of shell molds and surface finish of phosphor bronze test castings. Comparison of silica, zircon and olivine sand mixes. Use of precoated sand, reclaimed sand and pickup agents. Economics. (E19c, E16c; Cu-s)

249-E.* Effect of Mold Material on the Cooling Rate and Physical Properties of Cast Metals. *British Foundryman*, v. 52, Feb. 1959, p. 66-79.

Effect of molding materials and ramming densities on cooling rate of cast iron and the resulting microstructure and tensile properties. Mold materials, including normal sand, resin bonded sand, silicon carbide, oil sand, graphite, sodium silicate-bonded sand. Zircon, olivine and cement bonded sand. Variations with inoculation; changes in ratio of volume to surface area, superheating and carbon equivalent. 10 ref. (E19, E11, E25q, Q27a; CI)

250-E.* Running and Gating of Copper-Alloy Castings. W. W. Glick, R. S. Jackson and R. W. Ruddle. *British Foundryman*, v. 52, Feb. 1959, p. 90-107.

Assessement of single-gate systems, horizontal multiple-gate systems and vertical-gate systems for castings of phosphor bronze, leaded gunmetal, aluminum bronze and high-tensile brass. Comparison between flow of Cu alloys through channels in shell molds and in green sand molds. Practical recommendations for running and gating of Cu alloys differing in susceptibility to formation of dross. 17 ref. (E11, E22p; Cu-b, Cu-s, *Al*, *P*, Cu-n)

251-E.* Why and How to Use Magnesium Castings. Jerry Singleton. *Modern Castings*, v. 35, Mar. 1959, p. 39-41.

Sand casting and die casting; mechanical properties of castings. (E11, E13, Q-general; Mg-b, 5)

252-E.* Why and How to Use Investment Castings. R. R. Miller. *Modern Castings*, v. 35, Mar. 1959, p. 42-44.

Principles of investment casting; mechanical properties of castings. (E15, Q-general; 5-62)

253-E.* Factors Influencing Soundness of Gray Iron Castings. A Review of Some Recent British Work. I. C. H. Hughes, K. E. L. Nicholas, A. G. Fuller and T. J. Szajda. *Modern Castings*, v. 35, Mar. 1959, p. 73-89.

General expansion of the casting during solidification is associated with the formation of shrinkage defects. Casting expansion is promoted by mold cavity volume changes, which are more pronounced in softer molds and are dependent upon pouring temperature and molding sand type and properties. 28 ref. (E25n, P10c; CI-n, CI-r)

254-E.* (French.) Chill Cast Aluminum-Bronze. Melting Loss Due to Oxidation. *Journal d'Informations Techniques des Industries de la Fonderie*, Oct. 1958, p. 7-9.

Oxidation being a surface phenomenon, loss can be reduced by reducing volume to surface ratio of metal charge, by using melting furnaces of proper design and holding furnaces of size conducive to reduction of holding time and of exposed surface of molten metal, and by avoiding, insofar as possible, breaking of oxide film when removing molten metal from holding furnace with ladle. (E10, R1h; Cu-s, *Al*)

255-E.* (Italian.) Effects of Heat Treatment on the Properties of a Defective 13% Cr Steel Casting. Piero Virdis. *Fonderia Italiana*, v. 7, Dec. 1958, p. 497-500.

Specimens of material used in two-ton casting with structural abnormalities (segregation of ferrite and carbides) and undesirable mechanical properties subjected to various treatments. Corrective hardening and tempering conditions permit reclamation of casting. (E26, 2-64; SS, *Cr*, 9-69)

256-E.* General Motors Describes Centrasteel. W. B. Larson, C. F. Joseph, F. J. Webberle and R. F. Thomson. *Modern Metals*, v. 35, Mar. 1959, p. 47-52, 134.

New steel-like material having a compacted type of graphite in the as-cast condition is produced by inoculation with boron and tellurium of a low-carbon, high-silicon base composition. (E25q, Q-general; AD-p36, *B, Te*, CI, ST)

257-E.* (Rumanian.) Effect of Modification on Contraction of Cast Iron. L. Sofroni and C. Cosneanu. *Studii si Cercetari de Metalurgie*, v. 3, no. 4, 1958, p. 439-450.

Cast iron melt modified with ferrosilicon and alternately with Mg, was cast to study contraction behavior. Contraction is influenced by the quantity of modifying agent and its carbon equivalent. (E25n, 2-60; AD-p, CI, *Si, Mg*)

258-E.* Castings: 354 to the Ounce. Robert H. Herrman. *Foundry*, v. 87, Apr. 1959, p. 183-184, 186.

Investment casting of small stainless steel bomb vanes. (E15, T2k; SS)

259-E.* Ceramic Shell Casting Method Employs Conventional Investment Tooling. *Western Metalworking*, v. 17, Mar. 1959, p. 60-61.

New precision casting process which combines the benefits of lost wax investment casting with ceramic shell molding. (E15, E16c; SGA-h)

260-E.* (German.) Significance of Induction Furnaces for Foundries. Karl-Heinz Brokmeier. *Giesserei*, v. 46, Mar. 12, 1959, p. 129-136.

Remelting techniques; bath motion; automatic cleaning; vacuum melting. (E10r, W18a)

261-E.* (German.) Melting Losses With a Charge of Brass Scrap Containing 50% Chips. Manfred Stammler. *Giesserei*, v. 46, Mar. 12, 1959, p. 138-139.

Tests with alloy MS 58 indicate that a slow stirring in of brass chips enables a reduction of melting loss by about 6%. (E10, B23; Cu-n)

262-E.* (Hungarian.) Formation and Presence of Silica Inclusions in Cast Iron. Gyula Nandori. *Kohaszati Lapok-Ontode*, v. 91, Oct-Nov. 1958, p. 225-235.

Influence of Mn content on proportion of submicroscopic silica inclusions. 23 ref. (E25q, 2-60; CI, *Mn*, 9-69)

263-E.* (Hungarian.) Modern Nonferrous Melting Processes and Equipment. Janos Payer and Janos Imre. *Kohaszati Lapok-Ontode*, v. 91, Oct-Nov. 1958, p. 252-258.

British methods and equipment for melting relatively small quantities of nonferrous alloys and scrap metals. (E10, W18; EG-a38)

264-E. (Russian.) Technological Improvements in the Production of Castings for Metalworking Equipment. I. A. Onufriev. *Liteinoe Proizvodstvo*, Feb. 1959, p. 16-23.

Casting practices, patternmaking, casting molds and core design. (E-general, W19)

265-E.* Some Factors Influencing the Production and Control of Quality of Aluminum-Alloy Die Castings. R. R. Woodward and H. J. Proffitt. *British Foundryman*, v. 52, Mar. 1959, p. 119-126.

Techniques to reduce riser proportions by the application of progressive-feeding methods employing the principles of directional solidification, and the automation of die operation. (E13, E25; Al-b, 5-61)

266-E.* (German.) Susceptibility to Hot Tearing and Mechanical Properties of Al-An-Mg Casting Alloys. W. Patterson and S. Engler. *Aluminum*, v. 35, Mar. 1959, p. 124-130.

Hot tearing of Al alloys with 0-10% Zn and 0-10% Mg and effects of Ti, Fe and Cu additions. High strength and good elongation are combined with low susceptibility to hot tearing at 6-7% Zn and 0.3-0.5% Mg. 16 ref. (E25q, Q-general, 2-60; Al-b, Zn, Mg, 9-71)

267-E.* (German.) Shrinkage Cavities in Gray Cast Iron. Joseph Czikel and Harald Koechling. *Freiberger Forschungshefte*, v. B30-2, 1958, p. 12-21.

Shrinkage holes seldom appear in most eutectic alloys. Undereutectic and overeutectic alloys are more susceptible to cavity formation. 17 ref. (E25n, CI-n, 9-67)

268-E.* (German.) Defects in Castings. Gustav Nickell. *Freiberger Forschungshefte*, v. B30-2, 1958, p. 58-83.

Segregation and shrinkage holes can be avoided by fast and uniform solidification. Formation of pinholes may be prevented by keeping the casting uncovered during solidification. 43 ref. (E25q; 9-68, 9-69)

269-E.* (German.) Oxidizing Agents in the Melting of Copper Alloys. Ernst Brunhuber. *Giesserei*, v. 46, Feb. 14, 1959, p. 86-92.

Hydrogen unsoundness of Cu castings eliminated by oxygen enrichment supplied by air or oxygen injection; treatment by an oxidizing flame in fuel-fired furnaces; or addition of oxygen compounds. 7 ref. (E25s, E10; AD-s, Cu-b, 5-60, 9-68)

270-E.* (German.) Inoculation by Magnesium Alloys (Zinc and Aluminum) Compared With Magnesium Metal to Produce Nodular Cast Iron. Hans Grossmann. *Giessereitecnik*, v. 5, Feb. 1959, p. 48-52.

Trace additions of Mg to cast iron cause spheroidal nodulization of the graphite and thus improve ductility. Use of Mg containing 5-6% Al and 2-3% Zn produces no difference in effect than pure Mg. Effects of ferrosilicon inoculation, cooling rate and annealing on hardness, tensile properties, grain structure and nodulization. 18 ref. (E25q, 2-60; CI-n, Mg-b, *Al*, *Zn*, AD-p36)

271-E.* Practical Application of Reinforced Epoxy Resins for Foundry Use. H. A. Burton. *British Foundryman*, v. 52, Mar. 1959, p. 127-136.

Application of epoxy resins to manufacture strong void-free pattern equipment; vacuum-bag molding and vacuum-drawing process. (E17; NM-d, 17-57)

272-E.* Lost Wax Investment Casting. *Australasian Manufacturer* v. 43, Feb. 21, 1959, p. 60-69.

New injection machine, furnace and refractory. (E15, 1-52)

273-E.* Using the Sealed Ladle. W. E. Braidwood. *Engineer and Foundryman*, v. 24, Feb. 1959, p. 38-42.

cupola practice in the preparation of nodular cast iron. (E10a, CI-r)

274-E.* Causes and Effects of Die Casting Porosity. H. K. Barton. *Machinery (London)*, v. 94, Mar. 25, 1959, p. 673-684.

Behavior and flow of metal when it is injected into dies, and the manner in which air bubbles can form and cause porosity to varying degrees. 18 ref. (E13; Al-b, Zn-b, 5-61, 9-68)

275-E.* How Melting Practice Affects Casting Quality. H. K. Barton. *Metalworking Production*, v. 103, Mar. 27, 1959, p. 542-545.

Reduction of cost of zinc die casting by conservation of metal. (To be continued.) (H13; Zn-b, 17-53)

276-E.* (Dutch.) Melting of G-Al-Si 13 Alloy. H. Boswinkel. *Metalen*, v. 14, Feb. 1959, p. 50-56.

Effects of modifiers composed of 33% NaCl and 67% NaF, casting processes, casting temperatures and wall thicknesses on the tensile strength and elongation of the cast metal. (E10, Q27a; Al-b, *Si*, 5)

277-E. (German.) Experiments Using Permanent Molds for Casting Gray Iron. Gerhard Schwarz and Dieter Junghans. *Giessereitechnik*, v. 5, Feb. 1959, p. 35-46.

Design of permanent molds for castings with thin walls; applications of permanent mold technique. (E12, 17-51; CI-n)

278-E. (German.) Sweating Due to Flaws in the Mold. Josef Czikel. *Giessereitechnik*, v. 5, Feb. 1959, p. 47.

Sweating in a cast iron ship propeller due to lifting of the cement mold by the liquid metal. (E25; CI)

279-E.* Gray Iron Permanent Molding. H. U. McClelland. *Modern Castings*, v. 35, Apr. 1959, p. 88-90.

Development of technique, design and fabrication of mold, metallurgy and dimensional tolerances of gray iron castings produced in permanent molds. (E12; CI-n)

280-E.* Hot Cracking Test for Light Metal Casting Alloys. E. J. Gamber. *Modern Castings*, v. 35, Apr. 1959, p. 99-103.

Test castings in shape of thin elongated channel sections with short upright ends

which vary in fillet radii and length to provide for wide range of hot cracking susceptibility. Relative hot cracking rating for various commercial Al and Mg casting alloys. 4 ref. (E25n, 1-54, 9-72; Al-b, Mg-b)

281-E.* (German.) Absorption of Gas From Combustion Gases During the Melting of Light Metal Alloys. Claude Mascre and Andre Lefebvre. *Giesserei*, v. 46, Mar. 26, 1959, p. 153-159.

Below a critical surface temperature of 930-950°C. the melt (Al with 8% Cu, 4% Si) releases gas, but above this temperature the absorption on the surface and through the crucible becomes very great due to the reaction $2Al + 3H_2O$ $Al_2O_3 + 6H$. Suggested remedies. 7 ref. (E25s, E10r; Al-b)

282-E.* Exercise in Pattern Duplication. *Foundry Trade Journal*, v. 106, Apr. 2, 1959, p. 377-384.

Replacement of wooden patterns by epoxy patterns in development of castings for aircraft (E17; NM-d)

283-E.* (Dutch.) Practical Control in Melting G-Al-Si-13 Alloy. H. Boswinkel. *Metalen*, v. 14, Mar. 14, 1959, p. 64-69.

Factors influencing degree of modification, such as composition of modifier and setting time. Fracture surface of samples is determined by degree of modification and gas content. (E25; Al-b, *Si*)

284-E.* (German.) Conditions for the Formation of Spheroidal Graphite in Cast Iron. B. S. Milman. *Bergakademie*, v. 11, Jan. 1959, p. 26-27.

The main conditions are increase of surface tension and undercooling, effected by Mg. Al and Ca disturb nodulizing because there is no undercooling. (E25q; CI, AD-p36, *Mg*)

285-E. Mechanized Shellmolding in an American Foundry. *Foundry Trade Journal*, v. 106, Mar. 26, 1959, p. 352-355.

Evinrude Motor's foundry at Milwaukee (E19c, W19, 18-67, 18-74)

286-E. Fixing Patterns on Plates and Boards. *Foundry Trade Journal*, v. 106, Apr. 2, 1959, p. 385-386.

(E17)

287-E. (German.) Penetration of Metal in Sand Cores. K. Fursund. *Giesserei*, v. 46, Mar. 26, 1959, p. 159-164.

Influence of molding sand and additions and of steel pressure and temperature on penetration. 4 ref. (E11; ST)

288-E. (German.) Rationalization and Mechanization of Foundries. T. Klingenstein. *Metall*, v. 13, Apr. 1959, p. 309-313.

(E-general, 18-74)

289-E. (Italian.) Infrared Drying and Its Applications in Foundries. P. G. Lanino. *Fonderia*, v. 8, Feb. 1958, p. 41-46.

(E-general, W4k)

290-E. (Japanese.) Effects of Several Molding Materials on Sand Adherence to Steel Casts. Susumu Minowa. *Nagoya Government Industrial Research Institute, Reports*, v. 7, June 1958, p. 406-411.

Reaction of sand, bentonite, zircon, iron oxide, chromium oxide and lead oxide with molten steel. 4 ref. (E18r, E25n, ST, 14-60)

291-E.* Metal-Handling Practice for Diecasting. Pt. 2. Ladling Gives Way to Automatic Pouring. *Metalworking Production*, v. 103, Apr. 3, 1959, p. 595-599.

New techniques and equipment. (E13, E23, W19b, 1-52)

292-E.* Effect of Carbon, Silicon and Other Factors on the Shrinkage Behavior of Gray Cast Iron. T. J. Szajda. *British Cast Iron Research Assoc., Journal*, v. 7, Feb. 1959, p. 567-603.

High and low-phosphorus irons containing 2.2 to 4.5% C and 0.5 to 4.0% Si cast in green sand molds. Relation of eutectic graphite, carbon equivalent, carbon, Si and phosphorus with internal porosity, surface shrinkage and increase in volume of mold cavity. 9 ref. (E25n, P10c; CI-n, *C, Si*, P)

293-E.* Influence of Mold Rigidity, Pouring Temperature and Metal Composition Upon the Soundness of Fed Nodular and Flake Graphite Iron Castings. K. E. L. Nicholas. *British Cast Iron Research Assoc., Journal*, v. 7, Feb. 1959, p. 605-623.

Comparison of mold and casting dimensions for green sand, dry sand and cement-sand molds. Relationship between casting expansion and quantity of feed metal required as measured by volume of feed head pipe. 11 ref. (E11, E25n; CI-r, CI-n)

294-E.* (German.) Treatment of Melts in Foundry Practice. R. S. Meisenheim. *Giesserei-Praxis*, Mar. 25, 1959, p. 99-101.

Degassing of Al by chlorine and nitrogen and deoxidation of Cu alloys in relation to quality of castings. (E25s; Al, Cu)

295-E.* (German.) Water-Cooled Cupolas. *Giesserei-Praxis,* Mar. 25, 1959, p. 101-102.

Water cooling has a considerable effect upon the ratio of Mn while the degree of acidity in slag can be reduced by 30% with the CaO content being increased correspondingly. (E10a)

296-E.* (German.) Use of Calcium in Cupolas. *Giesserei-Praxis,* Mar. 25, 1959, p. 102.

"Foundry carbide" is a secondary fuel in cupola operations. Its effect results from melting at 1650-1680° C. and its burning in oxygen blast. (E10a)

297-E.* How Science Serves Canadian Foundries. Pt. 2. S. L. Gertsman. *Canadian Metalworking,* v. 22, Apr. 1959, p. 26-28.

Research in magnesium foundry practice; development of Mg alloy ZK61-T6; study of effects of prolonged heating on Ni bronze; investigations of hot tearing and pressure tightness of Cu alloys. 10 ref. (E-general, Q-general, 2-62; Cu-b, Cu-s, *Ni,* Mg-b, 9-71)

298-E.* (German.) Die Casting Practice. H. Kron. *Giesserei-Praxis,* Apr. 10, 1959, p. 115-117.

Hot chamber and cold chamber processes. (E13)

299-E.* (French.) Manufacture of Melting Pots for Lead. *Journal des Informations Techniques des Industries de la Fonderie,* no. 103, Feb. 1959, p. 20-21.

Cupola charge composition for cast iron containing Cr and Mn used for lead pots. Calsichrome or rechrom additions to the melt in the ladle; molding and treatment of castings. (E10a, W18h; CI, *Cr, Mn*)

300-E.* (German.) Change of Hydrogen Content in Refining the Approximately Eutectic Aluminum-Silicon Alloys. W. Manchen and W. Fischer. *Metall,* v. 13, Mar. 1959, p. 184-188.

In refining approximately eutectic Al-Si alloys at 650° C. hydrogen content decreases despite quantity of sodium being added provided the hydrogen content in unrefined material is higher. 11 ref. (E10; Al-b, *Si, Na, H*)

301-E.* (French.) Measurement of Oxidation Loss by Chemical Analysis. *Fonderie,* no. 158, Mar. 1959, p. 149-150.

A method is proposed to calculate losses in melting, transformation and fabrication. (E10)

302-E.* (German.) High-Conductivity Copper Castings. E. Brunhuber. *Radex-Rundschau,* no. 7, 1958, p. 361-369.

Maximum electrical conductivity is obtained with the double melting process for removal of hydrogen and refining by oxidation. 4 ref. (E10, P15g; Cu-b, 5-60)

303-E.* (Russian.) Inoculation of Cast Iron by the Addition of Liquid Steel. M. M. Turbovskii. *Liteinoe Proizvodstvo,* Mar. 1959, p. 4-7.

Process results in improved mechanical properties. 10 ref. (E25q; CI-n)

304-E.* (Russian.) Sources of Sulphur Saturation in Metallic-Mold Surfaces. Yu. L. Litvakovskaya and Yu. P. Bardachev. *Liteinoe Proizvodstvo,* Mar. 1959, p. 29-30.

Sulphur migrates into the surface of metallic molds from the cast metal during the use of the mold. An effective means to prevent saturation in chills is to lower their temperatures while in use, or by the application of dyes, pigments or paints. (E23, W19; S)

305-E.* (Russian.) Graphite Formation Mechanism in Magnesium Cast Iron. K. I. Vashchenko, R. P. Todorov and G. I. Koshovnik. *Liteinoe Proizvodstvo,* Mar. 1959, p. 34-39.

Spheroidal graphite forms in cast iron containing Mg equally well by direct precipitation in the eutectic crystallization as by the decomposition of cementite. 18 ref. (N8s, N12q)

306-E. Investment Castings in the US and UK. Pt. 2. *Foundry Trade Journal,* v. 106, Apr. 9, 1959, p. 409-417.

Review of papers from the European Investment Casters' Congress, 1958, dealing with U. S. specifications, low alloy and stainless steel castings. (E15, S22; AY-n, SS, 5-62)

307-E. (Dutch.) Foundry Practice. *Gieterij-Centrum Berichten,* v. 7, Mar. 1959, p. 16-17.

Control of cupola melting process by automatic detection of Fe temperature. (E10a, S16; Fe)

308-E. (French.) Principles of the Cupola Process. *Journal des Informations Techniques des Industries de la Fonderie*, no. 103, Feb. 1959, p. 1-7.

Melting temperature; coke combustion; temperature distribution; melting equilibrium; iron temperature; quantity of blast air. (E10a)

309-E. (French.) The Label "Alufran". *Journal des Informations Techniques des Industries de la Fonderie*, no. 103, Feb. 1959, p. 9-12.

Specifications; sand and permanent mold casting processes. (E11, E12; Al-b)

310-E.* (French.) Gassing of Molten Alloys by Air and Combustion Gases. Claude Mascre and Andre Lefebre. *Fonderie*, no. 158, Mar. 1959, p. 125-132.

Below the critical temperature degassing is faster than gassing by humid atmosphere or combustion gases diffusing through graphite crucible. Gassing by air and combustion gases is faster than natural degassing. 7 ref. (E25s; Al-b)

311-E.* Metal-Handling Practice for Diecasting. Pt. 3. How to Handle Magnesium Alloys. H. K. Barton. *Metalworking Production*, v. 103, Apr. 24, 1959, p. 727-730.

Pouring technique and equipment which minimize oxidation and provide automatic metering. (Concluded.) (E13, E23, W19b; Mg-b)

312-E.* New High-Magnesium Alloy for Plunging. *Union Carbide Metals Review*, v. 2, no. 2, Spring 1959, p. 6-7.

Technique consists of plunging the Mg alloy into a ladle of Fe. The method almost doubles Mg recovery by preventing burning of floating Mg. (E26q; CI-r, Mg-b, 17-57)

313-E.* (Hungarian.) Production of Gray Iron Castings Using Cast Iron Molds. Bela Bodnar. *Kohaszati Lapok-Ontode*, v. 91, Dec. 1958, p. 274-276.

Preheating of molds to 100 to 150° C. which are then arranged in tilted position to facilitate escape of gases. (E10, W19g; CI-n)

314-E.* What Is "High-Quality" Cast Iron? John Obrebski. *American Machinist*, v. 103, May 4, 1959, p. 104-107.

Melting, inoculation, alloying, heat treatment, composition, properties. (E-general, J-general; CI-n)

315-E.* Die Casting of Metals Under Vacuum. H. K. Barton. *Machinery (London)*, v. 94, Apr. 29, 1959, p. 967-979.

Application of vacuum in various types of permanent mold casting. (E12, E13, W19, 1-73)

316-E.* Brown-Coal Char as a Fuel for Foundry Cupolas. D. G. Evans, R. S. Higgins and G. L. Kennedy. *British Foundryman*, v. 52, Apr. 1959, p. 171-183.

Melting trials in experimental and commerical cupolas. Melting rate, stack-gas composition and temperatures; heat balances. Combustion behavior of char. 9 ref. (E10a, RM-j42, CI)

317-E.* Making Precision Castings for Commerical Applications. Examples of Components Produced by P. I. Castings (Altrincham), Ltd. *Machinery (London)*, v. 94, May 6, 1959, p. 1027-1034.

Picast process. (E15)

318-E. Cast Outboard Motor Crankshafts. Shell Moulding Technique Adopted. *Metallurgia*, v. 59, Apr. 1959, p. 174-175.

(E16c, E19c, 1-52; ST)

319-E. (German.) Cupola Control. Fritz Kretzschmer. *Giesserei*, v. 46, Apr. 23, 1959, p. 239-240.

(E10a)

320-E. (Pamphlet.) Bibliography on Shell Molding. 26 p. 1959. Engineering Societies Library, 29 West 39th St., New York 18. $2.

Selected list of 200 references to books, reports and articles published from 1952-1958. (E16c)

321-E. (Book-French.) Handbook for Cupola Practice. 2nd Edition. Francois Danis. 35 p. 1959. Editions Techniques des Industries de la Fonderie, 12 Ave. Raphael, Paris (16 eme). 900 F + 120 F postage.

Cupolas for the melting of gray cast iron, for steel casting, malleable casting and continuous melting. (E10a, W18d)

322-E.* (Book-Russian.) Compendium for the Foundry Industry. S. Ya. Golovin. 230 p. 1955. Gosudarstvennoe Nauchno-Tekhnicheskoe Izdatel'stvo Mashinostroitel'noi Literatury, Moscow. $1.

Basic technical information for the ferrous and nonferrous foundry industry; fireproof and insulating materials; furnace and cupola charging; foundry molds, flasks, core boxes, molding materials and patterns; manual and machine molding. 48 ref. (E-general)

323-E.* Timing of Expansion Scab Formation. J. E. Haller. *Modern Castings*, v. 35, May 1959, p. 65-68.

Tests showed that one type of scabs and/or buckles occurred because of sand expansion, and occurred either at the time the mold was filling or while the metal was still in a liquid state. (E25n; CI, 9-71)

324-E.* Deoxidation Defects in Steel Castings. R. A. Flinn and L. H. Van Vlack. *Modern Castings*, v. 35, May 1959, p. 93-97.

Essential feature of the defect, corundum, originates in the metal as a result of deoxidation with Al. 5 ref. (E25; ST, 9-69)

325-E.* Porosity, Inclusions and Pinholes in Malleable Castings. C. A. Sanders. *Modern Castings*, v. 35, May 1959, p. 103-111.

Hot sand and brittle sand are the most common sources of inclusions that may create pinhole porosity in production malleable foundries. 75 ref. (E11, E18; CI-s, 9-68, 9-69)

326-E.* Designing for Aluminum Die Casting. *Precision Metal Molding*, v. 17, May 1959, p. 39-40.

Advantages of die casting; rules for designing. (E13, 17-51)

327-E.* Designing for Zinc Die Castings. *Precision Metal Molding*, v. 17, May 1959, p. 41-43.

Checklist of general principles. (E13; Zn, 17-51)

328-E.* Designing for Investment Casting. *Precision Metal Molding*, v. 17, May 1959, p. 50-55.

Advantages of investment casting; list of design pointers. (E15, 17-51)

329-e.* Designing for Plaster Mold Casting. W. J. Prestel. *Precision Metal Molding*, v. 17, May 1959, p. 64, 66.

Advantages, techniques. (E16a, 17-51)

330-E. An American Looks at European Foundries. C. A. Sanders. *Foundry Trade Journal*, v. 106, May 7, 1959, p. 525-533.

(E-general)

331-E. (Russian.) Effect of One-Time and Semi-Permanent Molds on Quality of Cast Ingot Molds. N. I. Pavlovtseva. *Stal'*, Mar. 1959, p. 275-281.

Causes of decreased life and durability of ingot molds cast in semi-permanent molds. (E12, W19c; CI)

332-E.* (Hungarian.) New Methods for Producing Improved Quality Steel. Pt. 1. Alexander Mihajlovics Samarin. *Kohaszati Lapok*, v. 92, Feb-Mar. 1959, p. 49-54.

Remelting stainless steel and ball bearing steel in induction-type vacuum furnaces to reduce impurities, particularly oxygen, nitrogen and sulphur, and to improve structural and application properties. (E10, 1-69, 3-69; SS, *O, N, S*)

333-E.* (German.) Hardness and Structure Control in the Casting of Slides for Machine Tools. Kurt Wullenweber. *Giesserei*, v. 46, May 7, 1959, p. 265-274.

Effect of cooling conditions as given by various molding materials and wall thicknesses on hardness and structure. (E25q, Q29n, N8h; CI)

334-E.* (Hungarian.) Alloying Compounds for Producing Nodular Cast Iron. Nandor Hajto and Ferenc Varga. *Kohaszati Lapok-Ontode*, v. 92, Feb-Mar. 1959, p. 42-56.

Use of alloying compounds containing Al, Mn and Mg in correct proportions to obtain nodular cast iron with pearlitic structure. Heat treating methods and their influence on final macrostructure. (E-general, M28, J-general; CI-r, *Al, Mn, Mg, AD-p*)

335-E.* (Hungarian.) Shell Molding in an Iron and Steel Foundry. Otto Racz and Lajos Kalman. *Kohaszati Lapok-Ontode*, v. 92, Feb-Mar. 1959, p. 84-89.

Motor cycle engine cylinders are cast in a highly mechanized process using blowing machines for cores and shells. (E16c; Fe, ST)

336-E.* (Portuguese.) Production of Acicular Cast Iron Crankshafts. L. A. de Lacerda and C. Guimaraes. *Instituto de Pesquisas Tecnologicas*, Publication no. 592, 1959, p. 91-109.

Experimental casting of Javelin and Willys crankshafts; effects of Ni and Mo additions, patterns, molds; heat treatment and machining. 8 ref. (E-general, 2-60, T7j; CI-n, *Ni, Mo*)

337-E. (Hungarian.) Effect of Gating and Riser Systems on Quality of Nonferrous Casting. Karoly Marechal. *Kohaszati Lapok-Ontode*, v. 92, Feb-Mar. 1959, p. 96-100.

Evaluation of various gating and riser designs and resulting heat concentrations in brass and bronze castings. (E22; Cu-n, Cu-s)

338-E. (Swedish.) Control of the Level in Cupolas by Gamma-Rays. K. A. Fredriksson. *Gjuteniet*, v. 49, no. 4, 1959, p. 105.
(E10a, S14e)

339-E.* (German.) New Centrifugal Casting Processes. Hugo Dettela. *Industrie-Anzeiger*, v. 81, May 12, 1959, p. 581-583.
Solidification mechanism. Comparison of centrifugal castings and sand castings with reference to mechanical properties. Effect of wall thickness of permanent molds on formation of perfect cast surfaces. Factors influencing solidification direction in centrifugal casting in sand molds. 10 ref. (E14, Q-general, E25n; CI)

340-E.* (German.) New Centrifugal Casting Processes. Hugo Dettela. *Industrie-Anzeiger*, v. 81, May 15, 1959, p. 595-597.
Manufacture of large cylindrical parts from stainless and heat resistant steel. Flaw elimination by control of pouring temperature and pouring velocity, r.p.m. of mold, mold temperature and balancing the mold to avoid vibrations. (E14; SGA-h, SS)

341-E.* (Portuguese.) Manufacture of Free-Machining Carbon Steels With Galena Additions. Vincente Mazzarella. *Instituto de Pesquisas Techologicas*, Publication no. 591, 1959, p. 149-157.
Difficulties attendant on the use of finely powdered galena additions in melts weighing more the 20 kg. Experimental melts in a 20-kg. induction furnace and one-ton electric furnace produced steels with assimilation of between 22 and 56% of coarse galena powder additions. A 45% assimilation was obtained in one melt alloyed with metallic lead. (E-general, 2-60; Pb, RM-h, SGA-k, CN)

342-E.* Solidification of Various Metals in Ingot and Sand Molds. William S. Pellini. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 93-142.
Temperature distribution during solidification of gray and nodular irons, carbon steel, stainless steel, Al alloys, Pb, Cu, brass, bronze and Monel in chill and sand molds. Effect of superheat, composition, thermal properties of mold wall and feeding characteristics. 26 ref. (E25n; CN, CI, Al-b, Pb, SS, Cu-n, Cu-s, Ni)

343-E.* (German.) Effect of Ladle Additions on Cast Iron. Wilhelm Patterson. *Giesserei*, v. 46, May 21, 1959, p. 289-301.
Effect on "degree of normality", tensile strength, hardness and distribution of graphite types and ledeburite. 26 ref. (E25, Q-general, 2-60; CI)

344-E.* (German.) Choice of Melting Process for Malleable Castings in the Construction of Agricultural Equipment. M. M. Turbowski. *Giesserei-Praxis*, no. 9, May 10, 1959, p. 168-169.
A considerable decrease in carbon content and improvement in mechanical properties is observed in the melting of malleable pig iron in a cupola with oxygen refining in the forehearth. (E10a, T3; CI-s)

345-E.* (German.) Procedures and Equipment for the Degassing of Molten Metal. Klaus Herfurth. *Giessereitechnik*, v. 5, Mar. 1959, p. 73-77.
Degassing by means of hexachloroethane, salt-bath, argon and hydrogen, electrolysis and filtering. 22 ref. (E25s; 14-60)

346-E.* (German.) Precision Casting With Frozen Mercury Patterns. Han Allendorf. *Giessereitechnik*, v. 5, Mar. 1959, p. 78-81.
Mercast process achieves high accuracy in precision investment casting. The main difficulty results from low working temperatures. 5 ref. (E15; 14-60)

347-E.* (Polish.) Pressure Feeding of Steel Castings. Stanislaw Teodor Jazwinski. *Archiwum Hutnictwa*, v. 4, no. 1, 1959, p. 45-62.
Investigation of shape and position of shrinkage cavities in gravity and atmospheric feeder heads to evaluate the advantages of pressure exerted in the feeder head on the efficiency of feeding and on the quality of castings produced. 4 ref. (E23; ST)

348-E. (German.) Graphs for the Determination of Charge Compositions for Cupolas. Franz Hickel. *Giesserei*, v. 46, May 21, 1959, p. 301-304.
(E10a)

349-E. (German.) Steel Casting. A. Heuvers. *VDI-Zeitschrift*, v. 101, May 11, 1959, p. 561-567.
Survey of casting methods. Directions for elimination of flaws, cleaning, welding, heat treatment and testing. 5 ref. (E-general, J-general, K-general; ST, 5-60)

350-E.* (German.) Changes in the Hydrogen Content Produced by the Modification of Almost Eutectic Aluminum-Silicon Alloys. Wolfgang Fischer. *Bergakademie*, v. 11, Mar. 1959, p. 193.

The hydrogen content of Si is lowered by the addition of Na as a modifier. Decrease in hydrogen content reaches 0.4 ccm. $H_2/100_g$ of metal. The hydrogen content depends on the quantity of Na. When the modification effect is canceled by a long setting time, a second Na addition again causes the structural change without increasing the hydrogen content. (E25q; Al-b, *Si, H*)

351-E.* Some Experiences in the Manufacture of Steel Castings for High-Pressure Turbine Components. G. L. Hancock and J. Taylor. *British Foundryman*, v. 42, May 1959, p. 246-254.

Review of foundry practice with special reference to modifications in the method of running and feeding. Improvement in creep properties which can be attained by not adding Al to steel for deoxidation purposes. (E-general, Q3; CN)

352-E.* Ductile Iron Production in Basic Direct-Arc Furnace. C. R. Isleib. *Modern Castings*, v. 35, June 1959, p. 61-66.

Advantages and procedure for this method of melting. Properties of iron produced by this process. (E10r; CI-r)

353-E.* Hypereutectic Aluminum-Silicon Alloy. Rolf Kissling and Oldrich Tichy. *Modern Castings*, v. 35, June 1959, p. 67-72.

Recently developed effective method of refining this alloy with phosphorus improved machinability. Mechanical, physical and thermal properties. 22 ref. (E-general, Q-general; Al-b, *Si*)

354-E.* Proper Gating Through Use of Cobalt-60. A. J. Karam. *Modern Castings*, v. 35, June 1959, p. 73-78.

Various machine part castings improved by proper feeding and gating, determined by radiographic inspections. (E22p, 1-59)

355-E.* Mottling in Heavy Section White Iron Castings. C. R. Loper, Jr., and R. W. Heine. *Modern Castings*, v. 35, June 1959, p. 100-104.

Determined curves showing maximum and minimum carbon and Si content which yields white and gray fractures respectively. Effects of water vapor and addition of Bi at varied temperatures. 17 ref. (E25q, 2-60; CI-p, *C, Si, Bi*)

356-E.* (German.) Some Operations Involved in the Casting of Heavy Metals in Permanent Molds. H. Kron. *Giesserei-Praxis*, no. 10, May 25, 1959, p. 183-191.

Special reference to spot test allowing the determination of the component element of alloys of unknown composition. (E12, S11a; Cu-b, Pb)

357-E. Selection of Die Casting Lubricants. William C. Kennedy and Edward A. Day. *Die Casting Engineer*, v. 3, June 1959, p. 7-9.

(E13; NM-h)

358-E. Vacuum-Melted Metals. *Electrical Review*, v. 164, May 8, 1959, p. 877-878.

Technique for processing new alloys. (E10, 1-73)

359-E. Ford's Unique Casting Plant Uses Molten Aluminum From Reynolds. *Industrial Heating*, v. 26, May 1959, p. 932, 934, 936, 938, 942, 944, 1041.

Ford's Engine and Foundry Division Plant in Sheffield, Ala., utilizes molten metal that is delivered from an outside supplier direct to the plant's holding furnaces. (E-general; Al)

360-E. Vacuum Melting of Metals. *Metallurgia*, v. 59, May 1959, p. 241-244.

Processes and equipment at a new plant installed for Wm. Jessop and Sons Ltd., Sheffield, England. (E10, 1-73)

361-E. (German.) Preparation of Work in a Modern Foundry. E. A. Hohmann. *Giesserei-Praxis*, no. 10, May 25, 1959, p. 192-194.

(E-general, A5b)

362-E. (Japanese.) Length of the Inoculation Effect. Kaoru Sato and Harutoshi Yamamoto. *Japan Foundrymen's Society, Journal*, v. 31, Jan. 1959, p. 20-25.

Effective duration of inoculation of cast iron with 0.25 to 0.30% Ca-Si in a large ladle. The improvement in mechanical properties due to inoculation is almost lost after 15 min. and, thereafter, still continues to decline, even if the melt is held at constant temperature. (E25q; CI, AD-p36, *Ca, Si*)

363-E. (Japanese.) Segregation in Aluminum and Aluminum Alloy Castings. Kazuo Yasuda. *Japan Foundrymen's Society, Journal*, v. 31, Jan. 1959, p. 31-40.

Relation between size of castings and shape of segregation studied by determining the segregation at various widths of

the wedge-shaped section of samples. Influence of pouring temperature and mold material on the shape of segregations. (E25n; Al-b, 9-69)

364-E. Automatic Diecasting of Small Zinc Parts. *Australasian Manufacturer*, v. 44, May 16, 1959, p. 54, 56-58, 61. (E13; Zn)

365-E. How to Choose—Investment Casting or Sintered Powder. Lloyd E. Raymond. *Product Engineering (Design Issue)*, v. 30, June 8, 1959, p. 86-87.

Applications, cost, geometry and tolerances required for small mechanical parts are factors. (E15, H15, 17-57)

366-E.* (Japanese.) Study on Scab Formation in Natural Sand Molds. U. Harada, K. Nishiyama and T. Kubota. *Japan Foundrymen's Society, Journal*, v. 31, Mar. 1959, p. 186-193.

Pouring was stopped at various stages during casting. Scab is mainly caused by expansion of the foundry sand and external pressure on the mold surface with the defect being aggravated by thermal stresses on the mold surface. (E25, E23)

367-E.* (Japanese.) Effect of Moisture Content in Sand Molds on Gray Iron Castings. Kaoru Katoh and Shigeaki Kita. *Japan Foundrymen's Society, Journal*, v. 31, Mar. 1959, p. 194-202.

Castability is good when moisture content is 4%, except when smooth surfaces are required. Mechanical properties are good with moisture content in the range 2-4%. Shrinkage cavities and pipe appear with higher moisture content. (E25p, E25q, E19, 9-67; CI-n)

368-E. (Japanese.) Quality Improvements of Aluminum Die Castings. H. Asada, J. Wada and T. Kanno. *Light Metals*, v. 9, Jan. 1959, p. 28-40.

Effects of casting conditions on mechanical properties; relationship between microstructure and strength. Mechanical properties of the die-cast tensile specimens were markedly affected by casting temperature and injection pressure but not by the die temperature. (E13, Q-general; 5-61, Al)

369-E. (Book-German.) Casting of Aluminum in Sand Molds and Permanent Molds. 6th Ed. Roland Irmann. 302 p. 1959. Aluminium-Verlag GmbH, Dusseldorf, Germany.

Effects of melt preparation and solidification mechanism on quality of castings; melting techniques and treatment of melts; cleaning, repair and testing of castings; heat treatment; design. 390 ref. (E-general; Al)

370-E. (Book.) Exploring Patternmaking and Foundry. Harvey D. Miner and John G. Miller. 206 p. 1959. D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J.

Basic operations, use of various tools and processes. (E17)

371-E. (Russian.) Improved Methods in Casting Tractor Crankshafts. I. B. Gel'perin. *Liteinoe Proizvodstvo*, Apr. 1959, p. 16-19.

Cast iron melted in cupola and transformed into pearlitic and ferritic malleable iron suitable for casting in green sand molds. Cast iron can also be melted in electric furnaces or made by duplex method, inoculated and treated to become pearlitic and ferritic cast iron and adopted for precision casting. (E-general, T7j; CI-s)

372-E. (Russian.) Experience in Using Openhearth Pig Iron in the Cupola Process. Mishukov. *Liteinoe Proizvodstvo*, May 1959, p. 5-7.

The use of openhearth pig iron in a melting cupola reduces the charging time about 15%, increases the chemical activity of slag, mainly at the expense of somewhat increased amount of MnO and decreased amount of FeO. (E10a; CI-n)

373-E. (Russian.) Minimizing Nonmetallic Inclusions in Magnesium Cast Iron. V. I. Soldatenko and M. I. Rotenberg. *Liteinoe Proizvodstvo*, May 1959, p. 7-8.

Cleaning molten gray cast iron from slag (at 1450-1460° C.), addition of 0.35% Mg, followed by further cleaning and addition of 25-30% of gray cast iron with the simultaneous introduction of 0.3-0.6% Si into the ladle, considerably reduces nonmetallic inclusions in Mg cast iron. 5 ref. (E10; 9-69, CI-q, *Mg*)

374-E. (Russian.) Elimination of Inclusions in Magnesium Iron. X. M. Korolev. *Liteinoe Proizvodstvo*, May 1959, p. 17-18.

Use of cryolite in Mg iron (up to 1%) eliminated nonmetallic inclusions and black spots in castings and produced homogeneous castings. Following heat treatment castings possessed excellent tensile strength. (E10, Q-general; 9-69, CI-q)

375-E. (Russian.) Application of Boron Chloride During Casting of Magnesium Alloys. D. A. Kuznetsov and A. I. Malakhov. *Liteinoe Proizvodstvo*, May 1959, p. 32.

Substituting BCl_2 for BF_3 to prevent oxidation during pouring showed that the solid solution formed on the surface of the castings prevents the interaction of Mg with oxygen, nitrogen or water vapor. 10 ref. (E23, R1h; Mg-b)

376-E. (Russian.) Structure Refinement and Elimination of Cracks in Magnesium Alloy Castings. V. S. Astaulov, A. D. Klimov and A. S. Astaulova. *Liteinoe Proizvodstvo*, May 1959, p. 33-34.

Susceptibility of Mg alloy castings to cracking depends upon the alloy structure and its crystallization mechanism. Cracking can be controlled by structure refinement during crystallization, treating it with proper fluxes, inoculation and other mechanical methods. (E10, E25q, N12; Mg-b)

377-E. (Russian.) Decarburization Layer in Precision Investment Castings. O. V. Stupishina. *Liteinoe Proizvodstvo*, May 1959, p. 36-38.

Decarburization is mainly caused by Si in the casting mold. The casting's surface has a layer of more concentrated carbon which reacts with Si. Decarburization layer is reduced as the mold temperature and the casting temperature are decreased and as the cooling rate is increased. 5 ref. (E15; CI)

378-E.* (French.) Casting Squirrel Cage Rotors. Lucien Martin. *Fonderie*, no. 159, Apr. 1959, p. 159-175.

An A5 Al alloy proved most suitable for casting rotors. Melting practice, metallurgical control, pouring methods; influence of Fe, Si and Cu impurities on electrical conductivity. (E-general, P15g, 3-69, W11q; Al-b)

379-E.* (French.) Impregnation of Castings After Anodization Prior to Coloring. Henry Garnier. *Revue de l'Aluminium*, v. 36, Mar. 1959, p. 349-350.

Defects in coloring are derived from imperfections such as porosity. Remedies are suggested with special reference to neutralizing the castings after anodizing and closing the pores before buffing by an impregnation with bakelite effected under vacuum and then under pressure. (E26, L19)

380-E. (Russian.) Methods of Heating Cupola Blast. A. M. Katsnel'son. *Liteinoe Proizvodstvo*, Apr. 1959, p. 3-8.

Utilization of heat from cupola gases and blast furnace gases to attain a melting temperature of 1500° C. and an air temperature of 400-500° C. Temperature and metal yield depend on the coke consumption. (E10a)

381-E. (Russian.) Heating Cupola Blast. A. P. Komarov. *Liteinoe Proizvodstvo*, Apr. 1959, p. 8-9.

A fin-type recuperator installed in the cupola shaft utilizes the heat of cupola gases to preheat blast air. (E10a)

382-E. (Russian.) Features of Cupola Operations With Partial Withdrawal of Gases Through the Hearth and Forehearth. L. M. Marienbakh and Yu. S. Sukharchuk. *Liteinoe Proizvodstvo*, Apr. 1959, p. 9-10.

Withdrawal of 15-20% of combustion products through the hearth and forehearth produced an accelerated activity of the nonmetallic charge. This caused an expansion of the coke burning zone, creating a temperature to superheat the cast iron. This process reduces the heat losses during tapping. Metal's temperature is increased by 50-80° C. 7 ref. (E10a)

383-E. (Russian.) Vapor Cooling Systems for Cupolas. S. M. Andon'ev and O. V. Filip'ev. *Liteinoe Proizvodstvo*, Apr. 1959, p. 14-15.

Evaporative cooling of a cupola housing, where the heat absorbed by water is utilized to vaporize the water (steam making) is more economical than water cooling. (E10a, W18d)

384-E. (Russian.) Automatic Line for Shaking, Cooling and Cleaning Castings. G. Z. Lipovetskii and I. P. Burtsev. *Liteinoe Proizvodstvo*, Apr. 1959, p. 19-20.

(E24)

385-E. (Russian.) Formation of Spheroidal Graphite in Cast Iron. S. Ya. Kolodnyi. *Liteinoe Proizvodstvo*, May 1959, p. 34-36.

14 ref. (E25q; CI-r)

386-E. (Russian.) Continuous Breaking of Pouring Gates and Feeder Heads From Castings. N. V. Potekushin. *Liteinoe Proizvodstvo*, May 1959, p. 40.

A drum with continuous mechanical motion in place of manual labor designed to break away pouring gates and feeder heads from steel castings. (E24; ST)

387-E. (Russian.) Pressure Die Casting of Brass Fittings for Steam and Water Lines. N. I. Domcharev. *Liteinoe Proizvodstvo*, May 1959, p. 41.

Pressure die casting produced improved and cheaper brass steam and plumbing fittings than previously employed sand castings. (E13, T6a; Cu-n)

388-E. (Russian.) A Universal Flux for Aluminum-Silicon Alloys. M. Ya. Telis. *Liteinoe Proizvodstvo*, May 1959, p. 42.

Flux consists of cryolite as a refining reagent, NaF as a modifier and KCl or NaCl to reduce the melting temperature. (E10; Al-b, *Si*, RM-q)

389-E. Making Epoxy Coreboxes From Patterns. John MacClarence. *Foundry*, v. 87, June 1959, p. 98-99.

(E17, W19g)

390-E.* Cupola Botting Materials and Their Relation to Casting Defects. A. D. Morgan. *B.C.I.R.A. Journal*, v. 7, Apr. 1959, p. 638-643.

Composition and properties of botting mixtures used in 26 English foundries. Slag and dross in castings resulting from use of botting clays with low fusion temperature. Recommended mixtures. 10 ref. (E10a, W18e; CI, 9-69)

391-E.* Ceramic Mold Process Offers Improved Casting Properties. Ronald Greenwood. *Foundry*, v. 87, June 1959, p. 84-87.

Surface finish, tolerances and metallurgical properties of carbon and alloy steel castings produced in ceramic molds. Molding procedures and equipment. (E16, E19; CN, AY, NMf)

392-E.* Causes and Mechanics of the Scum Defect. G. J. Vingas and J. B. Caine. *Foundry*, v. 87, June 1959, p. 94-97.

Scum material on steel castings identified by petrographic and chemical analyses as eutectics of manganosite, silica and alumina. Mechanism of scum formation and its prevention. (E11; ST, 5-60, 9-69, 9-71)

393-E.* (Spanish.) Nodular Iron. Pt. 2. Manufacture. Francisco Radriguez-Yufera. *Instituto del Hierro y del Acero*, v. 12, Jan-Mar. 1959, p. 28-45.

Mechanism of graphitization and spheroidization; thermodynamic nature of spheroidization; atomic and crystal structure of graphite; production of nodular iron, inoculants, cooling phenomena, heat treatment; structures and mechanical properties of variously treated melts. 10 ref. (To be continued.) (E25q, M26, Q-general; CI-r)

394-E.* Pressure Tightness of 85-5-5-5 Bronze. Richard A. Flinn and Chester R. Mielke. *Modern Castings*, v. 36, July 1959, p. 35-42.

Measurement of the thermal gradients during solidification to provide a quantitative evaluation of different risering and chilling combinations. Pressure-tight castings were obtained in 2-in. square bar sections when the thermal gradient exceeded 60° F. per in. By the use of tapered chills it was possible to attain this gradient in bars up to 9 in. in length. (E25r, E22q, E22r; 9-68, Cu-s)

395-E.* Pinhole Occurrence in Malleable Castings. D. R. Jones and R. E. Grim. *Modern Castings*, v. 36, July 1959, p. 47-50.

Pinholes are often caused by the evolution of water vapor from certain clay bonds in green sand molds when heated above 212° F. by molten iron. (E25n, 9-68; CI-s)

396-E.* Tin Effect on Structure and Properties of Flake and Nodular Graphite Cast Irons. E. C. Ellwood. *Modern Castings*, v. 36, July 1959, p. 73-80.

Sn has a marked effect in eliminating ferrite from the matrix of both gray and nodular irons. At the same time, in larger amounts than required to promote a completely pearlitic matrix, Sn does not lead to the formation of massive cementite. In amounts sufficient to give a substantially pearlitic matrix in gray iron it does not have any detrimental effect on the mechanical properties. 5 ref. (E25q, 2-60; CI-n, CI-*r*, AD-p, *Sn*)

397-E.* Cyclic Permanent Mold Operation, Some Thermal Aspects. C. L. Goodwin and H. Y. Hunsicker. *Modern Castings*, v. 36, July 1959, p. 81-85.

Influence of mold section and casting section thickness and operating rate on mold temperatures and time required for solidification of Al castings in permanent molds. (E12, 3-73; Al)

398-E.* (Italian.) Aluminum Alloy Castings With Controlled Properties. *Alluminio Nuova Metallurgia*, v. 28, no. 4, 1959, p. 189-190.

Foundry practice, heat treatment and mechanical properties of Duralite, G-AC3FGN.UNI 3046 alloy. (E-general, J-general, Q-general; Al-b)

399-E.* (French.) Manufacture and Service Life of Parts for Marine Diesel Engines. Francois Danis. *Fonderie*, no.160, May 1959, p. 209-220.

Wear of alloyed and unalloyed cast iron sleeves, cylinder heads, pistons and piston

rings. Effect of phosphorus content on wear resistance, preparation of charge, alloy additions, pouring, gating and risering on the production of parts. 14 ref. (E-general, Q9n, T22h, 2-60, CI-q, *P*)

400-E.* (French.) Defects in A-U5 GT Castings. *Journal des Informations Techniques des Industries de la Fonderie*, no. 105 May 1959, p. 15-16.

Microporosity is caused by incorrect gating and riser design; dark spots result from absorption of heat treating salts and subsequent oxidation in porous areas. Heat treatment of castings is recommended. (E22p, E22q, J27; Al-b, 5, 9-68)

401-E.* (German.) Use of Permanent Molds in Steel Casting. Rudolf Graichen. *Giesserei Technik*, v. 5, May 1959, p. 131-134.

Economies achieved by use of permanent molds in preference to sand molds. (E11, E12; ST)

402-E.* (German.) Development and Application of New Casting Processes. Helmut Oppermann. *Giesserei Technik*, v. 5, May 1959, p. 141-145.

Advantages and disadvantages in the application of sand, pressure, centrifugal and chill casting processes. (E11, E12, E13, E14)

403-E.* (German.) Defects in Castings Caused by Chaplets Can Be Avoided. Walter Goeschel. *Giesserei Technik*, v. 5, May 1959, p. 150-152.

Many defects in medium and heavy castings result from an improper attachment of the core. Various methods of core fastening and types of chaplets. (E22; 9)

404-E. Method of Obtaining Castability and Maximum Field Service From Cast Products. J. W. Beckham. *Modern Castings*, v. 36, July 1959, p. 43-46.

Relation between foundry practice and casting design. (E-general, E25p, 17-51)

405-E. (French.) Measurement of Air Input to the Cupola. *Journal d'Informations Techniques des Industries de la Fonderie*, May 1959, p. 1-3.

(E10a, S18r)

406-E. (Swedish.) Consumption of Cupola Refractories. Jorgen Drachmann. *Gjuteriet*, v. 49, no. 5, p. 131-144.

(E10a; RM-h)

407-E.* (Dutch.) Melting of G Al-Si-13 Alloy. *Gieterij-Centrum Berichten*, v. 7, May-June 1959, p. 28-30.

Structure control achieved by modification determined by the fracture of test pieces. (E25q, 1-60; Al-b, *Si, Na*)

408-E. Tube Casting Takes a Spin for Quality. C. W. Farrar. *Canadian Metalworking*, v. 22, July 1959, p. 32-33.

Permanent mold centrifugal casting produces tubes for high-stress applications. (E14, E12; 4-60)

409-E. (French.) Equipment and Methods for the Die Casting of Electric Motor Armatures. *Machine Moderne*, v. 53, June 1959, p. 19-22.

(E13, 1-52, T7)

410-E. (German.) Casting of Roller Shells. *Giesserei-Praxis*, no. 12, June 25, 1959, p. 221-223.

Rigging directions for aluminum bronze. (E22; Cu-b, *Al*)

411-E. (Translation—Brutcher No. 4518.) Desulfurization of Liquid Cupola Iron by Magnesium. B. S. Mil'man. *Liteinoe Proizvodstvo*, v. 9, Nov. 1958, p. 15-17.

See item 148-E, 1959. (E10, D11n, 1-59; CI, *Mg, Si*)

412-E.* (Russian.) Casting Nodular Cast Iron Crankshafts. M. I. Rotenberg and V. I. Soldatenko. *Liteinoe Proizvodstvo*, June 1959, p. 1-4.

Since the top and bottom of the shafts vary in their ferritic content and graphite structure, it is essential to heat treat them to obtain satisfactory macrostructure and mechanical properties. Black spots on the shafts can be remedied by melting the cast iron in basic electric furnaces, reducing sulphur content to 0.002-0.008% and excluding the possibility of formation of MgS. (E25q, 2-64, E10r, T7j; CN-p, 9-71)

413-E.* (Russian.) Some Factors Affecting the Quality of Alloy Cast Iron Crankshafts. M. G. Kvasman, A. M. Zav'yalov and A. A. Tunik. *Liteinoe Proizvodstvo*, June 1959, p. 4-5.

Defects in the ridge of the hollow center of crankshafts are determined by casting properties of the iron (such as shrinkage and fluidity), by pouring temperature and chemical composition. Defects are prevented when the amount of carbon and silica and the sum total of C

and Si are kept in the lower limits. Avoiding overheating during the melting period and limiting the amount of inoculant (ferrosilicon) to 0.8-1% prevents the formation of graphite with a dendritic orientation. (E25p, T7j, 2-60, 2-61; AD-p36, Fe, Si, AD-n31, CI-q)

414-E.* (Russian.) Hydrodynamic State of Metal and Its Effect on the Macrostructure of Centrifugal Castings. *Liteinoe Proizvodstvo,* June 1959, p. 22-27.

During the crystallization of castings in rotating molds, there are various instances of hydrodynamic state of the liquid metal, and this bears a relationship to the macrostructure of the centrifugal casting. 6 ref. (E14, N12, M28h, CI)

415-E.* (Russian.) Basic Features of Centrifugal Castings. B. I. Loshkarev. *Liteinoe Proizvodstvo,* June 1959, p. 27-32.

To obtain homogeneity of structure, chemical composition and mechanical properties, the rotation of the mold must be coordinated with the conditions affecting cooling. Rotation rate and cooling conditions are dependent on physical properties of the molten metal, such as heat conductivity, oxidation, and the susceptibility to segregation. 16 ref. (E14, E25q)

416-E.* (Russian.) Defects in Hollow Centrifugal Castings Caused by Gas Evolution. L. S. Konstantinov. *Liteinoe Proizvodstvo,* June 1959, p. 32-35.

Gaseous inclusions such as screen-like blisters in thin-walled tubes, honeycomb defects in thick-walled pipes and surface hollows of various depths. (E14; 5-65, 4-60, 9-69, 9-71)

417-E.* (Russian.) Unequal Wall Thickness of Centrifugally Cast Pipes. B. D. Khakhalin, A. N. Smolyakov and B. A. Iskra. *Liteinoe Proizvodstvo,* June 1959, p. 35-37.

Pipes cast in sand molds, depending on their inclined position, have comparatively small differences in wall thickness. Casting in a metal mold produces a more uneven wall due to inadequate feeding of the molten metal. (E14, E11, E12, 9-71)

418-E.* Effects of Vacuum Melting on Gas Content and Metal Structure of Cast Nickel-Base Alloys. C. M. Hammond and R. A. Flinn. Paper from "High Temperature Materials". John Wiley & Sons, New York 16, 1959, p. 345-363.

Stress-rupture properties, microstructure and cracking behavior of Guy, Inco 700 and GMR 235 alloys in terms of residual nitrogen and trace elements. Thermochemical reactions affecting gas content and removal of nongaseous minor elements. 7 ref. (E10, 1-73, M27, Q3q, Q26, 3-69; Ni-b, *N,* SGA-h)

419-E.* (German.) Induction Melting. *Giesserei,* v. 46, June 1959, p. 148.

Quality of cast iron in relation to melting and inoculation temperature and concentration; changes in mechanical properties following CaSi inoculation. (E10r, 1-69, E25q, Q-general; CI, AD-p36, Ca, Si)

420-E.* Aluminum-Rich Zinc-Base Alloys for Permanent Mold Castings. E. Belkin. *Foundry,* v. 87, Aug. 1959, p. 70-74.

Composition is 50-65% Zn, 50-35% Al and 1-5% Cu. Alloy showed a high fludity and accurately reproduced the mold details. Corrosion resistance is good. 11 ref. (E12, R-general; Zn-b, *Al, Cu*)

421-E.* (Italian.) New Process for the Production of Quality Cast Iron. Albert de Sy. *Fonderia,* v. 8, June 1959, p. 243-246.

Two-chamber-type induction furnace produces cast iron or alloy steel. (E10r, D6, W18a; CI, AY)

422-E. An Automatic Molding and Pouring Plant. Charles Zehnder. *British Foundryman,* v. 52, June 1959, p. 278-289.

Compacting the mold; molding box; pattern plate; transferring the mold to the main conveyer and closing; pouring operation; automatic loading of the mold with weights; cooling of the mold before shake-out; main conveyer; sand-handling plant; output of the molding machines. (E19, W19, 18-74)

423-E. Rotor Bodies for Motors Cast Centrifugally. W. S. Atkinson. *Foundry,* v. 87, Aug. 1959, p. 54-56.

The most critical factor in casting is temperature of the rotor bodies, top and bottom molds, and the Al used to cast the windings. (E14, T7)

424-E. Melting Iron in the Induction Furnace. M. B. Hartman. *Foundry,* v. 87, Aug. 1959, p. 98-103.

Metal for ductile, gray and alloy iron centrifugal castings and for ductile iron sand castings is successfully produced in a 60-cycle furnace at Dayton Foundry, Holydale, Calif. (E10r, W18a; CI)

425-E. (Russian.) Molding of Large Steel Castings in Jackets. I. M. Barabash, A. S. Shuper and S. I. Knyazev. *Liteinoe Proizvodstvo,* June 1959, p. 6-7.

Warping of steel castings at the corner and sides is eliminated by correct pattern design which allows for distortion during solidification. (E17, 17-51, 9-74; ST, 5-60)

426-E. (Russian.) Use of Models and Analogy in Studying Centrifugal Castings. K. U. Tsvftnenko. *Liteinoe Proizvodstvo,* June 1959, p. 37-40.

(E14, 17-51)

427-E. Foundry Research and Development in the Post-War Period. J. G. Pearce. *Foundry Trade Journal (Special Exhibition Issue and Catalog* v. 106, May 1959, p. 9-14, 24.

(E-general, A9; CI, ST, EG-a38)

428-E. Foundry Melting Equipment Review—Trends in Nonferrous, Steel and Iron Foundries. Pt. 2. Foundry Steelmaking. T. A. Cosh. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 18-20.

Developments in electric furnace processes and oxygen injection practice. (E10r, D5, 1-52; ST)

429-E. (Italian.) Steel Casting by Means of Lateral Feeding Heads With Exothermic Lining. Eugene Ney. *Fonderia,* v. 8, June 1959, p. 223-228.

(E22n; ST)

430-E.* Survey of Foundry Practices: Modern Foundry Metals and Processes. Pt. 1. Steel Castings—Their Manufacture and Use. C. J. Dadswell. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 41-47.

Steelmaking, mold and core production, finishing processes, mechanical properties of carbon and alloy steel castings. (E-general, Q-general; CN, SS, 5)

431-E.* Survey of Foundry Practices: Modern Foundry Metals and Processes. Pt. 2. The Cast-Iron "Family" of Metals. W. W. Braidwood. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 47-51.

Mechanical properties of malleable, spheroidal graphite and special high alloy-cast iron. Applications. (E-general, Q-general; CI, 17-57)

432-E.* Survey of Foundry Practices: Modern Foundry Metals and Processes. Pt. 3. Technological Development in the Copper-Base-Alloy Foundry Industry During Post-War Years. A. R. French. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 52-55.

Alloys for marine propellers; melting practices; mold production; progress in high-tensile brasses. (E-general; Cu-b, *Zn, Sn, Al, Mn,* Cu-n)

433-E.* Survey of Foundry Practices: Modern Foundry Metals and Processes. Pt. 4. Aluminium-Alloy Founding: Review of Post-War Progress in the UK. F. H. Smith. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 55-59.

Types of alloys; melting and molding methods. (E-general; Al-b)

434-E.* Survey of Foundry Practices: Modern Foundry Metals and Processes. Pt. 5. Magnesium Founding—25 Years of Progress. P. A. Fisher. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 59-63.

Composition and typical tensile properties of Mg-base casting alloys; foundry methods. (E-general; Q27a, Mg-b, 5)

435-E.* Newer Processes in Mold and Core Production. J. B. McIntyre. *Foundry Trade Journal (Special Exhibition Issue and Catalog),* v. 106, May 1959, p. 67-72, 78.

CO_2 process, plaster and shell molding, die casting, investment casting, Alphax, Glascast, Shaw, Investment "X" and Mercast processes. (E-general)

436-E.* (French.) Treatment of Cast Iron Used for Ingot Molds With Sodium Carbonate. Andre Gibeau. *Fonderie,* no. 161, June 1959, p. 262-265.

Desulphurization of the melt and prolongation of ingot mold life by sodium carbonate additions. (E25q, W19c; CI)

437-E.* (Hungarian.) Designing Castings to Satisfy Specific Production Requirements. G. Gertz. *Kohaszati Lapok-Ontode,* v. 42, Apr. 1959, p. 100-108.

Principles and examples of correct design facilitating molding and casting and avoidance of defects. 16 ref. (E-general, 17-51)

438-E.* (Hungarian.) Metallurgical Applications of Hot Blast Basic-Lined Cupolas. S. Tunder. *Kohaszati Lapok-Ontode,* v. 42, Apr. 1959, p. 108-111.

Temperatures in the 1800° C. range occurring in a narrow zone of the furnace permit the use of low-grade charges without pig iron additions. (E10a)

439-E.* (Swedish.) Gas Contamination of Molten Aluminum Alloys by Air and combustion Gases. Claude Mascre and Andre Lefebvre. *Gjuteriet,* v. 49, no. 6-7, 1959, p. 175-176, 187.

An Al-Cu-Si melt tested for gas contamination. Degassing by holding at 700-800° C. (E25s, N16m; Al-b, *Cu, Si*)

440-E.* (French.) Modification of Cast Iron by Tin Additions. W. E. Hoare. *Metaux Corrosion Industries,* v. 34, May 1959, p. 197-203.

Effect of Sn on pearlite formation and shape of graphite in nodular iron. Variations of tensile strength, hardness and ductility as a function of Sn content. 4 ref. (E25q, Q23p, Q27a, Q29m, 2-60; CI, *Sn,* AD-p36)

441-E. (Danish.) Production and Planning of a Steel Foundry. Hans Thornberg Nielsen. *Gjuteriet,* v. 49, no. 6-7, 1959, p.161-172.

(E-general; ST, 18-67)

442-E. (French.) Charging a Cupola Furnace. M. Foulon. *Fonderie Belge,* v. 29, May 1959, p. 134-138.

(E10a)

443-E.* (English.) Influence of Vacuum Melting on the Structure and Mechanical Properties of Cast Iron. I. Iitaka and M. Kikuchi. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 1-10.

Crucible materials largely determine microstructure and tensile properties. Reticulate structure is most frequent after vacuum melting. (E10p, 1-73, M27, Q27; CI)

444-E.* (English.) Fundamentals of the Manufacturing Process of Calcium Treated S-G Iron and the Effects of the Combined Addition. T. Kusakawa. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 11-14.

Physical and chemical properties of Ca, Mg and Ce are investigated to establish their effectiveness as addition agents. Ca and Ce combined give best results with regard to structure and mechanical properties. 7 ref. (E25q; CI-r, AD-p36, *Ca, Ce, Mg*)

445-E.* (English.) The Effect of Moisture on Molten Cast Iron. N. Kayama, T. Ishino and K. Saito. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 15-20.

Experiments determined the degree of oxidation caused by moist air at temperatures of 1000 and 1400° C. Shrinkage cavities are related to the oxidation process which is accelerated by increases of moisture. (E25r, E10a; CI, 9-67)

446-E.* (English.) Effect of Oxygen Blowing on the Mechanical Properties of Cast Iron. I. Iitaka and K. Nakamura. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 21-23.

Experimental results show some improvement in tensile strength, elongation and wear resistance when O_2 is used instead of steel scrap. (E10, Q-general, Q9n; CI)

447-E.* (English.) Melt Quality and Fracture Characteristics of 85-5-5-5 Red Brass. S. Oya and U. Honma. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 25-30.

Absorbed gas can be removed efficiently by means of steam bubbling through the melt if deoxidation has been carried out previously. Changes in structure and mechanical properties accompany gas pickup. 4 ref. (E25s, Q26; Cu-n)

448-E.* (English.) Gases in Aluminum Bronzes. S. Oya and U. Honma. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 31-34.

Effects of steam and nitrogen degassing on the density of the ternary system Cu-Al-Fe studied at elevated temperatures. Addition of Ca to the melt leads to destructive gas pickup. (E25s, N16m, 2-62; Cu-s, *Al, Fe*)

449-E. (Pamphlet.) Die Casting With Zinc-Base Alloys. 31 p. 1959. Henning Bros. & Smith, Inc., 91-113 Scott Ave. at Randolph St., Brooklyn, N. Y.

(E13; Zn-b)

450-E.* The Inoculation of Solidifying Iron and Steel Castings by Means of Vibration. J. H. Gittus. *Iron and Steel Institute, Journal,* v. 192, June 1959, p. 118-131.

Effects of ladle inoculation and mold vibration on hardness and microstructure of cast iron balls. Theories of eutectic

solidification. 12 ref. (E25q, N12; CI, ST)

451-E.* (German.) Fifty Years of Development of the Electron Magnesium Casting Process. Wolfgang Buchen. *Giesserei*, v. 46, July 16, 1959, p. 428-429.
Chronological developments and applications. Mg is purified with concentrated Mg and chloride-containing salt additives and thus protection from oxidation is achieved. (E10; Mg)

452-E.* (Czech.) Improvements in the Technology of Investment Castings. J. Doskar. *Strojirenstvi*, v. 9, Jan. 1959, p. 47-50.
Technology of precision castings with the use of invested wax patterns. Comparison with other processes. (E15)

453-E. High Flying Quality Castings. Richard L. Hanson. *Modern Castings*, v. 36, Aug. 1959, p. 26-28.
Foundry practices used in Al and Mg alloy castings for guided missiles and jets. (E-general, T24e; Al, Mg)

454-E. Don't Alloy Your Iron With Water. F. L. Rietveld. *Modern Castings*, v. 36, Aug. 1959, p. 29-30.
Chemical-type system automatically controls moisture content of blast air fed cupola. (E10a)

455-E. (French.) Foundry Plant Maintenance. R. Hecquet. *Fonderie Belge*, v. 29, June 1959, p. 157-165.
(E-general, A5)

456-E. (Italian.) Automation in the Foundry. A. Bencaster. *Fonderia Italiana*, v. 8, Mar. 1959, p. 89-100.
4 ref. (E-general, 18-74)

457-E. (Italian.) Low-Cost Melting Furnace Efficiency. Roberto Allara. *Fonderia*, v. 8, July 1959, p. 265-267.
(E10)

458-E.* Solidification Times of Simple Shaped Castings in Sand Molds. J. Berry, V. Kondic and G. Martin. *Modern Castings*, v. 36, Aug. 1959, p. 39-66.
Experimental and theoretical studies of heat flow, defects of casting size and shape and mold, cast materials. Reasons for deviation from predicted killing power. 94 ref. (E25n)

459-E.* The Control of Quality in the Brass Foundry. Harry M. St. John. *Modern Castings*, v. 36, Aug. 1959, p. 67-75.
Schedule related to foundry technology and procedures for controlling casting quality. (E25; Cu-n)

460-E.* Aluminum Alloys Fluidity Test. M. C. Flemings, H. F. Conrad and H. F. Taylor. *Modern Castings*, v. 36, Aug. 1959, p. 86-97.
Effects of pouring temperature, alloy composition and various mold coatings and their thicknesses studied with a new spiral testing device. 25 ref. (E25p, 1-53; Al)

461-E.* (Italian.) Production of 3.5% Nickel Steel Castings for Use at Temperatures Down to -100° C. C. Galetto. *Fonderia Italiana*, v. 8, Feb. 1959, p. 45-46, 85.
Metal must be completely degassed and deoxidized with Mn, Si and Al to avoid presence of oxides and formation of nitrides and sulphides. Carefully controlled heat treatment produces castings of ferritic structure, free of austenite, having necessary ductility for low-temperature service. (E25s, 2-64, AY, SGB-r, Mn, Si, Al, Ni, AD-r)

462-E.* Some Methods of Reducing the Degree of Nucleation of a Grey Cast Iron in Relation to Sinking Under Bosses on Thin Plates. A. G. Fuller. *British Cast Iron Research Assoc., Journal*, v. 7, June 1959, p. 725-733.
Sinking and degree of nucleation of a gray cast iron may be reduced by bubbling oxygen through the furnace for 2 min.; poling with a green pole; holding the molten metal in the furnace at temperature; additions to the furnace of Ti with or without subsequent bubbling with carbon dioxide. (E25q, N2; CI-n)

463-E.* Repair of Ferrous Castings. Gray Iron, Malleable Iron and Steel. *Society of Automotive Engineers*, SP-22, n.d., 18 p.
Cleaning, preheat, welding and post heat procedures for repair using arc or gas welding methods. Nickel or Monel metal welding. Brazing, soldering, peening, sealing and rusting techniques. (E26, K-general; CI-n, CI-s, ST)

464-E. Foundry Characteristics of Mn-V-Mo Age-Hardening Austenitic Steel. N. C. Howells and E. A. Lange. U. S. Naval Research Laboratory. *U. S. Office of Technical Services*, PB 151539, Mar. 1959, n.p., $.50.
To develop new foundling methods for Mn-V-Mo age hardenable austenitic

steels, castings were poured at 2800° F. A gating system with a choke at the sprue base, an enlarged runner bar and an ingate entering the riser, were used. Precautions should be taken in choosing the gating and riser dimension. Sand mixtures differing from conventional mixtures were required to prevent mold-metal reactions. A 145,000 psi tensile strength, 110,000 psi yield strength, and 12% elongation were attained with an aging treatment of 8 hr. at 1300° F. (E-general, Q27a, 2-65; SS-e, *Mn, V, Mo*)

465-E.* (Czech.) Possibilities of Calculation of Internal Chills in Steel Castings. J. Kavka. *Slevarenstvi*, v. 7, Feb. 1959, p. 49-53.

Internal chilling depends on metal structure, surface conditions, temperature differentials and thermal conductivity. (E22r; ST)

466-E.* (Czech.) Pouring of White Cast Iron in Metallic Molds. K. Stransky. *Slevarenstvi*, v. 7, Feb. 1959, p. 53-57.

To increase graphitization rapid chilling is introduced. Tear formation is avoided by preheating the mold. Effect of pouring into metallic mold and heat treatment before malleablizing on the course of graphitization and on reduction of malleablizing time. (E23, J23b, N8s; CI-p)

467-E.* (Czech.) Study of Melting Process in the Cupola From the Viewpoint of Slag Quality and Its Effect on Cast Iron Properties. Ivan Pavlik. *Slevarenstvi*, v. 7, Mar. 1959, p. 121-126.

Effects of different slags on the structure and mechanical properties of cast iron investigated in an experimental cupola with cooled melting zone and blast preheating at 500 C. Properties of acid melted cast iron do not materially differ from those of basic melted material. (E10a; RM-q, CI)

468-E.* (Czech.) Production of Large Castings With 13% Chromium Steel. F. Maran. *Slevarenstvi*, v. 7, May 1959, p. 175-179.

Disadvantages encountered in melting processes using 13% Cr steel include shrinkage phenomena, tearing, cracking and formation of oxide films. Elimination of defects is achieved by controlled cooling of the casting in the mold, high pouring velocity and use of nitrogen as a protective atmosphere. (E10, E25n; SS, *Cr*, 9-71)

469-E.* (Czech.) Melting of Steel in Arc Furnaces With Acid Linings. Jan Plachy. *Slevarenstvi*, v. 7, June 1959, p. 213-215.

Melting techniques and casting procedures. Melting of steel in arc furnaces with acid linings increased steel production from 24 to 31 tons per 24 hr. (E10r; ST)

470-E.* (German.) Blows and Cold Shuts. H. Reininger. *Giesserei-Praxis*, no. 15, Aug. 10, 1959, p. 265-274.

Causes and nature of blows and cold shuts. 13 ref. (E11; CI, Al-b, ST, 9-71)

471-E.* (Czech.) Slag and Its Effect on Cast Iron in Cupola Melting. Bretislawv Sochor. *Slevarenstvi*, v. 7, Jan. 15, 1959, p. 33-40.

Acid and basic slags and effect of slag on melting process. The blast was preheated to 500° C. and the slags segregated at elevated Ca-O amounts. Modification of slags is achieved by Ti and Na compounds. Acid and basic refractories applied for patching and ramming are effective. (E10a; CI, RM-q)

472-E.* (German.) Melting Temperature, Inoculation Temperature and Quality of Cast Iron. *Giesserei*, v. 46, Aug. 13, 1959, p. GK 156.

Effect of inoculation temperature on graphite shape and relative hardness of cast iron. (E25q, E10r, Q29n, 2-61; CI)

473-E. (French.) Bronze Sand Castings. *Journal d'Informations Techniques*, no. 107, July-Aug. 1959, p. 1-5.

Molding and risering practice. (E19, E22q; Cu-s)

474-E.* (Italian.) Copper Additions to Cast Irons and Steels. P. Van Bleyeberghe and R. Coussement. *Fonderia*, v. 8, May 1959, p. 187-191.

Influence of 3% Cu addition in gray cast iron on hardness, structure and mechanical properties. Effect of 2% Cu addition in Cr-Mn steels on structure and abrasion resistance. (E25q, 2-60; CI, AY, *Cr, Mn, Cu*, AD-q40)

475-E.* (Italian.) The Control of Core Oil Binders for Sand. Pt. 4. Technical Green Properties of the Mixture. Dott. Rinaldo Cattaneo. *Fonderia*, v. 8, May 1959, p. 193-202.

Green strength as influenced by humidity, grain size, binders and compressability. Adhesion of the mixture to the core case. Baking of samples to time and temperature, grain-size. Air moisture content. (To be continued) (E18n)

476-E.* (Dutch.) Melting Control. *Gieterij-Centrum Berichten,* no. 4, July-Aug. 1959, p. 41-42.

Control of C, Si, Mn, S and P in cast iron. Determination of mold-filling capacity and the tendency to form shrinkage cavities. (E10, E11, 9-67; CI, 14-60, *C, Si, Mn, S, P*)

477-E.* (Polish.) Oxidation Losses in Liquid Aluminum and Aluminum Alloys. S. Balicki and J. Leitl. *Prace Instytutow Hutniczych,* v. 11, no. 2, 1959, p. 71-74.

X-ray analysis of oxidation losses of Al and Al-Zn, Al-Cu, and Al-Mg alloys (with alloying content up to 12%) during remelting at 700-900° C. Oxidation rate of Al-Zn and Al-Cu alloys was practically equal to that of Al. 7 ref. (E25q; Al, 14-60)

478-E. Improved Casting Properties From Ceramic Mold Process. *Australasian Manufacturer,* v. 44, Aug. 1, 1959, p. 44-49. (E16)

479-E. Core Practice in an Israelian Foundry. Joshua Pelleg. *Foundry,* v. 87, Sept. 1959, p. 156, 158, 160, 162. (E21g)

480-E. Packaged Foundries. Survey of the Hallsworth Automatic Molding System. H. B. Hallsworth, R. D. Mills and Peter Spear. *Iron & Steel,* v. 32, June 1959, p. 335-337.

(To be concluded.) (E19, 1-52)

481-E. (Dutch.) Foundry Pilot Plant and Laboratory Equipment. *Gieterij-Centrum Berichten,* no. 4, July-Aug. 1959, p. 37-40.

At the Gieterij-Centrum, Delft, Holland. (E-general, 1-53, A9j)

482-E. (Italian.) How to Improve the Quality of Investment Castings. G. Postogna. *Fonderia Italiana,* v. 8, Apr. 1959, p. 135-138.

Recent developments in the lost wax process. (E15)

483-E. (Booklet.) Casting Aluminum. C. P. Talbott. 31 p. 1959. Reynolds Metals Co., Richmond 18, Va.

Sand, permanent mold and pressure die casting. (E11, E12, E13; Al)

484-E. (Translation.) Casting With Sand Molds Produced Under High Pressures. V. M. Krivosheyev. *Engineers' Digest,* v. 20, July 1959, p. 280-281. (From *Liteinoe Proizvodstvo,* no. 5, 1959, p. 15-16.)

Castings of more accurate dimensions and improved surface finish are produced with a reduction in metal wastage. (E11)

485-E. (Translation—Brutcher no. 4633.) Resistance of Cast Steel to Hot Tearing and Ways of Improving It. N. S. Kreshchanovskii and M. P. Demin. *Liteinoe Proizvodstvo,* July 1958, p. 17-21.

See item 746-E, 1958. (E25q, 9-72; ST, Ti, AD-p)

486-E.* What Makes Cast Iron High-Quality? John Obrebski. *Metalworking Production,* v. 103, Aug. 7, 1959, p. 1203-1206.

Desirable structure and properties; influence of alloying elements on mechanical properties, microstructure and sensitivity to chilling. Cupola control and ladle inoculation; evaluation of castings; heat treatment. (E25q, Q-general, M27d, 2-60; CI)

487-E. (Russian.) Porosity of Mg-Al-Zn Alloys. M. V. Sharov and E. L. Bibkov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 1, 1959, p. 63-67.

Effects of composition ratio, hydrogen content and cooling conditions on the porosity of castings. 4 ref. (E25, 2-60, 2-61; Mg-b, *Al,* Zn, 9-68)

488-E.* (German.) Use of Gaseous Agents in the Melting of Copper and Copper Alloys. J. Muller and W. Buchen. *Giesserei,* v. 46, Aug. 1959, p. 497-508.

Chlorine and nitrogen as refining agents in Cu melts. Physical and chemical processes taking place after the chlorine and nitrogen additions. Improvements in quality result from use of the additives. (E25; Cu, AD-p35)

489-E.* (German.) Theoretical and Practical Aspects of Melting With Carbide Additives. W. Haas. *Giesserei-Technik,* v. 5, July 1959, p. 200-204.

Use of carbide additions in basic cupolas results in improved desulphurization, increased temperature range, higher output. Attention must be paid to regulation of air flow to assure an oxidizing

atmosphere, adjusted coke-air ratio and speciric carbide compositions. (E10a; AD-a)

490-E. BCIRA Work in Progress. *Foundry Trade Journal*, v. 107, Aug. 27, 1959, p. 69-76.

Items currently under investigation are shrinkage and porosity; white and chilled cast iron; foundry sands; cast iron for steam engineering; malleable iron; ingot-molds and bottom-plates; gases in cast iron. (E-general, A9)

491-E. How Hoover Produce Their New Cleaner. Peter Trippe. *Metalworking Production*, v. 103, Aug. 21, 1959, p. 1267-1270.

Cleaning die castings. (E24h, 5-61)

492-E.* Permanent Molds Can Handle Short Runs Too. W. A. Hamilton. *Product Engineering (Design Issue)*, v. 30, Aug. 31, 1959, p. 40-41.

Advantages which lower the break-even point are less process variables, standardization, better mechanical and weldability properties. (E12)

493-E.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Zinc-Base Alloy Castings. J. C. Fox. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 423-452.

Die casting machines and dies. Effect of alloying elements and impurities on properties of Zn die casting alloys. Influence of aging treatments and temperature on mechanical properties. Finishing and application of die castings. Casting Zn alloy dies for forming operations on variety of metals. 22 ref. (E13, E11, Q-general, 2-60, 2-61, 2-65, Zn-b, *Al, Cu, Mg*, 5-61)

494-E.* Ceramic Mold Technique Produces Accurate, High Quality Castings. Howard Simmons. *Western Metalworking*, v. 17, Aug. 1959, p. 39-42.

Advantages of ceramic molding for casting small lots of carbon and stainless steels. (E16; ST, SS)

495-E.* Principles of Gating. J. F. Wallace and E. B. Evans. *Foundry*, v. 87, Oct. 1959, p. 74-81.

Basic features of gating. Effects on pouring rate, fluidity, oxide skin formation, turbulence and sand erosion. 23 ref. (E22p)

496-E.* Vacuum Casting. R. H. Herrmann. *Foundry*, v. 87, Oct. 1959, p. 82-83.

Preparation of vacuum melted heat; vacuum investment-casting; cleaning and testing of vacuum-produced castings. (E15, E24, 1-73)

497-E.* Economical Casting of Ductile Iron. C. W. Gilchrist. *Foundry*, v. 87, Oct. 1959, p. 84-88.

Casting without risers by means of rigid molds, rapid pouring, gating into thin sections and correct metal composition. Effects on gross and interdendritic shrinkage. (E-general, P10c; CI-r)

498-E.* (German.) Influence of Various Mold Washes on the Surface Quality of Semi-finished Products. Arno Hensel. *Freiberger Forschungshefte*, v. B-36, May 1959, p. 48-62.

Influence of holding time of the coke and preheating time in furnace on the crack sensitivity of semifinished products. The time ratio of preheating and casting is analyzed with respect to surface quality; requirements, advantages and disadvantages of mold washes. (E19)

499-E.* (German.) Preparation of Cathode Core Materials for Long Life Tubes. Karl Kaiser, Gerhard Pupke and Felix Jablonski. *Neue Hutte*, v. 4, Aug. 1959, p. 484-493.

Preparation by melting Ni cathode sheet in an induction furnace. Contamination is avoided by a layer of liquid glass or an atmosphere of city gas, hydrogen or nitrogen, or by use of a magnesite-lined crucible. Vacuum degassing; effect of process on purity. 6 ref. (E10, T1j, 2-66; Ni)

500-E.* (Japanese.) Improvement of High Silicon Cast Iron. M. Okamoto, T. Fujii and K. Majima. *Japan Foundrymen's Society, Journal*, v. 31, July 1959, p. 637-645.

Mechanical properties as influenced by C, B, Ti, Ni, Cd and Mg additions. (E25q, 2-60; CI, Si, C, B, Ti, Ni, Cd, *Mg*)

501-E.* (Russian.) Properties of Molten Fluxes for the Melting and Purification of Aluminum. N. I. Grafas and A. I. Belyaev. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 72-81.

Effects of interfacial surface tension between flux and alumina and between the flux and the liquid Al on metal loss in melting and on purification of the melt from Al_2O_3 and gases. 28 ref. (E25r, P13h; Al, 14-60)

502-E.* The Casting Fluidity of Some Foundry Alloys. C. J. Cooksey, V. Kondic and J. Wilcock. *British Foundryman*, v. 52, Sept. 1959, p. 381-386.

Effect of superheat and impurities on the fluidity of high and commercial purity Al and An, Al-Si and Al-Cu alloys, cast iron, 60-40 brass. Relation of solidification mechanism to casting fluidity. (E25p, Al-b; Zn, *Cu*, CI, Cu-n)

503-E.* An Examination of Methods Used to Improve the Surface Finish of Shell-Molded Low-Carbon Steel Castings. D. B. James and J. M. Middleton. *British Foundryman*, v. 52, Sept. 1959, p. 387-395.

Effects of inorganic additions on shell molds and resins; Zircon-sand and olivine-sand shell molds; sodium silicate bonded shells; surface carburization. 4 ref. (E16c; CN)

504-E.* Investment Casting as Compared With Other Foundry Processes. L. N. Hocking. *British Foundryman*, v. 52, Sept. 1959, p. 395-400.

Limitations and merits of pressure and gravity die-casting; sand and plaster casting; CO_2 process; shell molding in relation to investment casting. (E15, E11, E16c, E16a)

505-E.* Surface Shrinkage Defects in Light-Sectioned Grey-Iron Castings. A. G. Fuller. *British Foundryman*, v. 52, Sept. 1959, p. 400-409.

Influence of composition, pouring temperature, casting and gating design and eutectic cell count sinking. Fundamental controlling factors are eutectic nucleation, metal-temperature conditions in mold. 11 ref. (E23, P10c, 2-60, 2-61; CI-n, 9-71)

506-E. Some Practical Considerations in Molding an 18-Ton Housing Bed in Green Sand. Harold Haynes. *British Foundryman*, v. 52, Sept. 1959, p. 409-412.

Weight of metal required; stress and strain on various parts of mold; lifting pressure; size, positions and number of runners and risers required. (E19a)

507-E. Selection of Die Casting Lubricants. Pt. 2. W. C. Kennedy and E. A. Day. *Die Casting Engineer*, v. 3, Sept. 1959, p. 15-17.

Defects caused by release agents; lubrication of toggles, wedges, core mechanisms, ejector pins, plunger tips and shot sleeves. (E13; NM-h)

508-E.* (Pamphlet.) Rigging Design of a Typical High Strength, High Ductility Aluminum Alloy Casting. Merton C. Flemings, Patrick J. Norton and Howard F. Taylor. 25 p. n.d. Massachusetts Institute of Technology, Cambridge, Mass.

Mechanical properties of unchilled 195 and 356 alloy aircraft castings can be improved substantially by careful chilling techniques. 4 ref. (E22s; Al-b)

509-E.* (Pamphlet.) Study of Techniques for Refinement of Cast Structures in Magnesium. 97 p. n.d. Massachusetts Institute of Technology, Cambridge, Mass.

Even with controlled conditions of gas elimination and temperature gradient during freezing, mechanical properties of Mg castings cannot equal those of forged metal. This is due to favorable anisotropy in wrought and extruded Mg, which condition cannot be obtained in casting alloys. Sb does not increase tensile properties or alter aging characteristics of these alloys. (E25, 2-60; Mg-b, *Sb*)

510-E.* (Japanese.) Vacuum Melting of Chromium Cast Iron. Masao Kikuchi. *Japan Foundrymen's Society, Journal*, v. 31, July 1959, p. 645-651.

The microstructure and mechanical properties of cast iron are affected by vacuum melting and the Cr, C and Si content. In both melting in a vacuum and atmosphere, tensile strengths of cast iron were increased with decrease of carbon equivalent value; for the same carbon equivalent value the tensile strength of vacuum melted cast iron was always about 5 kg./mm.^{2} higher than that of atmosphere melted cast iron. (E10, E25q; CI, *Cr*, *C*, *Si*)

511-E.* Centrifugal Castings. *Machine Design*, v. 31, Oct. 15, 1959, p. 156-160.

Design and application for cast cylindrical parts; which alloys to use and where to use them. (E14; CN, AY, SS, Cu-b, Ni-b)

512-E.* Ductile Iron Quality Control. S. F. Levy. *Modern Castings*, v. 36, Oct. 1959, p. 38-41.

Casting ductile iron and sample test procedure. Mold and core design, material composition control, melting and heat treat practice. (E25p, E25q; CI-s)

513-E.* Continuous Carbon Injection. J. E. Wilson and R. C. Shnay. *Modern Castings*, v. 36, Oct. 1959, p. 55-60.

Carbon content of gray iron melted in acid cupola controlled by injecting electric furnace grade graphite through a hollow graphite lance into the melt. Graphite powder seived to size, blown by low pressure dry N_2. (E10a; CI-n, C, 2-60)

514-E.* Structural Variables Influencing Mechanical Properties of High Strength Cast Steels. M. C. Flemings, R. Green and H. F. Taylor. *Modern Castings*, v. 36, Oct. 1959, p. 84-98.

Effect of solidification variables on structure and mechanical properties of high-strength cast steel. Cooling rates and thermal gradients during solidification of modified 4330 alloy. (E25n, N12b, Q27a, 2-61; AY-b)

515-E. Mold Cost as Affected by New Metal Casting Methods. J. A. Kavanagh. *Society of Plastics Engineers, 14th Annual Technical Conference*, v. 4, 1958, p. 665-669.

Shaw process of investment precision casting using a nonexpendable ceramic mold. (E15)

516-E. New Look in Steel Castings. W. H. Dunn. *Modern Castings*, v. 36, Oct. 1959, p. 30-32.

Steel casting by shell-molding or ceramic casting for high strength in thin wall sections. Alloys can be cast which formerly were only wrought. (E19c; ST-b)

517-E. Foundry Designing for Steel Castings. Alfred B. Steck. *Modern Castings*, v. 36, Oct. 1959, p. 103-104.

Requirements of foundry practice for minimizing casting defects, as hot tears and cracking, in both thick and thin sections. (E10b, E19, 5-60, 9-72, 17-51)

518-E.* (German.) Structural Parts Produced From Die Cast Nonferrous Metals. F. Lutz. *Industrie-Anzeiger*, v. 81, Sept. 8, 1959, p. 27-29.

Pressure casting of Zn, Al, Mg, Cu, Pb and Sn and their alloys is considered as the most convenient fabrication technique. Principal advantages are uniformity, precision in tolerance of cast parts and continuous production. (E13; Zn, Cu, Mg, Al, Pb, Sn)

519-E.* (German.) Copper Foundry Practice. E. Brunnhuber. *Maschinenmarkt*, v. 65, Aug. 1959, p. 34-39.

Strength characteristics, elongation, hardness, electrical conductivity, pressure tightness; influence of wall thickness on tensile strength and elongation of leaded red brass; micro and macro-shrinkage of Cu binary alloys. (E25q, Q27a, P15g; Cu)

520-E.* (German.) Properties of Alloy Cast Iron. A. Gabriel. *Industrie-Anzeiger*, v. 81, Sept. 8, 1959, p. 20-21.

Melting additives increase the tensile strength of cast iron up to as high as 70-90 kg. per sq. mm. Improved strength and elongation are achieved by addition of laminated graphite and by means of spheroidal formation of graphite. (E25q, Q27a; CI)

521-E.* (Japanese.) Properties of Nodular Cast Iron. Tsuneo Momose and Tohru Izu. *Japan Foundrymen's Society, Journal*, v. 31, Aug. 1959, p. 707-711.

Microstructure and mechanical properties are dependent upon the amount of Mg, Sb and Ti present. (E25q, M27, 2-60; CI-r, *Mg, Sb, Ti*)

522-E.* Gas Porosity in Aluminum Alloys. *Foundry Trade Journal*, v. 107, Oct. 1, 1959, p. 247-248.

Tensile strength, wear resistance and pressure tightness of castings are affected by gas porosity which occurs as a rssult of moisture entrapment during melting and casting. Precautions suggested are minimizing the gas absorption and degassing the molten metal with dry helium, argon or nitrogen. (E25s; Al-b, 5-60, 9-68)

523-E.* Plastics Patterns. *Foundry Trade Journal*, v. 107, Oct. 8, 1959, p. 289-290.

Material, equipment and procedure of making plastic patterns. (E17; NM-d)

524-E.* Production of Slugs and Forging Blanks. *Metal Treatment and Drop Forging*, v. 26, Sept. 1959, p. 331-332.

Use of an automatic die casting displacement-type machine. Method is economical and reduces scrap as compared with conventional shearing and die casting methods. (E13, 5-59)

525-E.* Thin Magnesium Castings Fill the Bill. A. J. Iler. *Modern Metals*, v. 15, Oct. 1959, p. 54-58.

Foundry techniques for production of thin Mg alloy castings. It is possible to form parts having less rigidity and weight than their wrought counterparts. (E11, T24; Mg-b, 5, 17-57)

526-E.* (German.) Properties of AZG Magnesium Sand Casting Alloy. H. Reininger. *Giesserei Praxis*, no. 16, Aug. 25, 1959, p. 281-286.

Pourability, strength and hardness of Mg alloy castings from purified and unpurified melts. The pourability and mold filling properties of purified melts were found to be remarkably superior as compared with unpurified metal. The difference is especially detectable at low casting temperatures. Increasing the setting time increases the pourability at temperatures up to 860° C. At higher temperatures no influence was observed. (E11, E25p; Mg)

527-E.* (German.) Die Casting. H. Kron. *Giesserei Praxis*, no. 16, Aug. 25, 1959, p. 286-291.

Strength properties and influence of wall thickness in Al, Mg and Cu alloys. Porosity decreased while strength increased in proportion to increases in wall thickness. (E13; Al, Mg, Cu, 9-68)

528-E.* Metallurgy of Die Cast Aluminum Alloys. Walter Bonsack. *Precision Metal Molding*, v. 17, Nov. 1959, p. 60-63.

Since die casting dies are rigid, they demand alloys which have the least possible shrinkage and are free from hot cracking. The Al-Si alloys fulfill these requirements best of all. Cu additions to these alloys in ranges up to 4% give quite good castability. Also in general use are 13% Si alloys and 10% Si, 0.5% Mg alloys. New alloys also being die cast are the high Si alloys with up to 25% Si. (E13; Al-b, *Si, Mg*)

529-E.* (German.) Surface Defects in Precision Investment Castings. E. Gunter Nickel. *Giesserei*, v. 46, Sept. 10, 1959, p. 528-532.

Principal defects include tolerance errors, tool-caused defects, flaws caused by casting aggregates, forming and casting defects, defects caused by mechanical influences at the working stage of the castings, heat treatment and the parent material. (E15; 9-71)

530-E. Gas—Foe or Friend of the Foundryman? N. L. Bush. *Castings*, v. 5, Sept. 1959, p. 13-35.

Detrimental effects of oxygen in foundry work. Beneficial results obtained by converting cupola melted Fe into steel by oxygen injection in the ladle. (E25)

531-E. Investment Casting in Shell Molds. Pt. 1. Silicate Shells. Paul E. Schlinkmann. *Precision Metal Molding*, v. 17, Nov. 1959, p. 66-67, 103-104.

Use of ceramic shell molds. (E16)

532-E. (Polish.) Production of a Spheroidal Graphite Cast Iron in a Sealed Ladle. Alojzy Jankowski, Jerzy Piaskowski and Jozef Kumor. *Przeglad Odlewnictwa*, v. 9, Apr. 1959, p. 89-93.

Spheroidal graphite cast iron is produced by the introduction of Mg or scrap into the ladle. (E25g; CI-r, *Mg*, AD-p36)

533-E. (Polish.) Cupolas With Automated Control and Regulation. W. S. Mysowski. *Przeglad Odlewnictwa*, v. 9, Apr. 1959, p. 94-97.

Automation based on temperature control, chemical analysis and weight control of blast mixture. (E10a; 18-74, ST)

534-E. (Polish.) Development Trends of the Cupola Process. Zbigniew Tyszko. *Przeglad Odlewnictwa*, v. 9, May 1959, p. 134-142.

Design of cupolas and use of fuel. (E10a, W18d; ST)

535-E. Manufacture of Waveguide Parts by Investment Casting From Frozen-Mercury Patterns. H. H. Scholefield, H. H. Green and R. E. Gossett. *Institute of Electrical Engineers, Proceedings*, v. 106, July 1959, p. 431-434.

Capabilities of process for production of cast parts. (E15, T1)

536-E. (Polish.) Casting Steel Flanged Armatures. Josef Pribyl. *Przeglad Odlewnictwa*, v. 9, June 1959, p. 165-168.

Feeding and gating techniques. (E22; ST)

537-E. (Polish.) Exothermic Materials Used in Feeders. Kazimierz Korecki and Tadeusz Welkens. *Przeglad Odlewnictwa*, v. 9, July 1959, p. 218-224. (E23)

538-E.* Shell Molding Developments in the Automotive Industry. H. C. Grant. *Modern Castings*, v. 36, Nov. 1959, p. 641-652.

Benefits to foundries, machine-shop and product engineer include high yield, ease of machining and accurate designing of the castings. (E16c; CI, 17-51)

539-E.* Indirect Arc Electric Furnace Production of Ductile Iron. L. Miller.

Modern Castings, v. 36, Nov. 1959, p. 653-660.

Furnace heats in a rocking-type electric furnace over a period of time. Composition and properties of the metal; chemistry control; plunger ladle advantages. (E10r; CI-r)

540-E.* Acid Cupola Melting for Ductile Iron. H. E. Henderson. *Modern Castings*, v. 36, Nov. 1959, p. 661-668.

Carbon pick-up, ladle additions, composition control, stabilizing elements in a shell mold cupola. (E10a; CI-r)

541-E.* Basic Cupola Melting of Ductile Iron. J. T. Williams. *Modern Castings*, v. 36, Nov. 1959, p. 669-670.

Slagging techniques, metal charge used, required basicity, slag analysis and advantages as compared to the acid cupola. (E10a; CI-r)

542-E.* Ramming, Superheat and Alloys (Type of Metal) Effects on Metal Penetration. G. J. Vingas. *Modern Castings*, v. 36, Nov. 1959, p. 671-675.

Penetration as influenced by metal mass, sand mass, superheat, metal flow, washes and veining in Al, brass, gray iron, steel and Wood's metal. (E19, E18; CI-n, Al, Cu-n, ST, Bi-b)

543-E.* Comparison of X-Ray Quality and Tensile Properties in Cast High Strength Steel. H. R. Larson, H. W. Lloyd and F. B. Herlihy. *Modern Castings*, v. 36, Nov. 1959, p. 676-684.

Microshrinkage is correlated with ductility and strength by radiographic examination of castings. (E25n, Q27a, S13e, Q23p; ST, 5-60)

544-E.* Application of Theory in Understanding Fluidity of Metals. J. E. Niesse, M. C. Flemings and H. F. Taylor. *Modern Castings*, v. 36, Nov. 1959, p. 685-697.

Data on fluidity of Sn, Sn-Pb, Al-Sn alloys and low-carbon steels employing heat flow and fluid flow relationships. 19 ref. (E25p; Sn, Sn-b, Al-b, CN-g)

545-E.* High Quality Structural 17-4 PH Castings. W. R. Roser and K. E. Kuschell. *Society of Automotive Engineers, Preprint* no. 104V, 1959, 6 p.

Low ductility of 17-PH castings, due to microshrinkage and dendritic-shaped ferrite, may be increased by control of the mold cooling rate, gating methods, chemical composition, foundry practices and heat treatment. (E22, E25, Q23p, 2-64; SS, 5-60, SGB-s)

546-E.* Modifying the Structure of Cast-Iron by Additions of Tin. W. E. Hoare. *Tin and Its Uses*, no. 47, Summer 1959, p. 4-8.

Evidence shows that the old belief that the presence of Sn in gray cast iron is detrimental to the microstructure and mechanical properties is mistaken. Data show that small additions of Sn often improve properties of the cast iron. (E25; AD-p, Sn)

547-E.* (German.) Casting of Magnesium Alloys in Sands Containing Waterglass. J. Nitsche. *Giesserei-Technik*, v. 5, Aug. 1959, p. 243-248.

Difficulties encountered in molding were premature reactions between the waterglass binder and the oxidizing protective additives. A new kind of waterglass of 37-40° Baumé is used with CO_2 and air. (E19c, E18; Mg-b)

548-E. Pattern Engineering. P. B. Croom. *Modern Castings*, v. 36, Nov. 1959, p. 38-41.

General instructions regarding formation of patternmaking team, pattern types, molding problems and core boxes. (E17)

549-E. Casting Design—a Modern Art. Alan R. Moore. *Modern Castings*, v. 36, Nov. 1959, p. 46-48.

Stress analysis, surface finish, grain structure, casting shape and mode of solidification in relation to well-designed castings. (E-general, 17-51)

550-E. (French.) Service Life of Permanent Molds From Nonferrous Metals. *Journal d'Informations Techniques des Industries de la Fonderie*, no. 109, Oct. 1959, p. 5.

(E12)

551-E. A Review of Modern Developments in Cupola Practice. H. J. Leyshon. *British Foundryman*, v. 52, Oct. 1959, p. 451-458.

Modern developments in hot blast, basic-lined cupola and water-cooled cupolas; oxygen enrichment of the cupola blast. (E10a)

552-E. Primer on Shell Molding. James J. Silk. *Modern Castings*, v. 36, Sept. 1959, p. 48-50, 136.

Recommended composition mixtures. (E16c)

553-E.* Some Observations on the Occurrence of Rust Staining on Copper-Base Alloys. G. W. Brown and C. B. Searles. *British Foundryman*, v. 52, Oct. 1959, p. 442-444.

Causes of the formation of rust stains on Cu-base alloys, both as well-defined isolated areas and as an over-all "bloom." Rust staining is due to the presence of free iron particles, either as grit or fines, and can seldom be attributed to oxide inclusions in the metal. (E25q; Cu-b)

554-E.* Radioactive Tracer Investigation of Inclusions in Alloy-Steel Castings. P. W. Clark and D. H. Houseman. *British Foundryman*, v. 52, Oct. 1959, p. 445-450.

Role of zircon mold materials in producing inclusions in alloy steel castings. Painted and unpainted radioactive zircon sands were used to determine the depth of penetration into the casting. (E19, 1-59; AY, 9-69)

555-E. (German.) New Soviet Processes in the Steel and Nonferrous Metal Industry. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 530-531.

Permanent mold casting under simultaneous application of pressure. (E12, 3-74; ST, EG-a38)

556-E. (Polish.) Effect of the Metal Stream on the Inner Surface of Sand Molds. Janusz Szreniawski. *Przeglad Odlewnictwa*, v. 9, no. 8, 1959, p. 233-244.
(E11, E25n)

557-E. (Polish.) Economics of the Shell Molding Process. J. Harpula, B. Smolka and Z. Wertz. *Przeglad Odlewnictwa*, v. 9, Sept. 1959, p. 261-267.
(E16c)

558-E. (Polish.) Criteria of Coke Efficiency in Domestic or Foreign Cupola Processes. Jan Wojtasik. *Przeglad Odlewnictwa*, v. 9, Sept. 1959, p. 267-275.
33 ref. (E10a; RM-j43)

559-E. (Polish.) Casting of 60-Ton Cast Iron Rolls. B. Raczynski. *Przeglad Odlewnictwa*, v. 9, Sept. 1959, p. 276-279.
(E-general, W23k; CI)

560-E. (Dutch). Casting With Green Sand Molds. *Gieterij-Centrum Berichten*, v. 7, Sept-Oct. 1959, p. 51-53.
(E11)

561-E. (Dutch.) Cupola Practice. *Gieterij-Centrum Berichten*, v. 7, Sept-Oct. 1959, p. 60-61.

Measurement of the blast air quantity with a Venturi-tube. (E10a)

562-E. (Hungarian.) Melting of Superheated Gray Iron in a Cupola. Marienbah Lev Mihajlovics. *Kohaszati Lapok-Ontode*, v. 92, Aug. 1959, p. 177-187.
(E10a; CI-n)

563-E. (Hungarian.) Constricted Gating Systems in the Production of Iron Castings. B. V. Rabinovics. *Kohaszati Lapok-Ontode*, v. 92, Sept. 1959, p. 203-209.
(E22p; CI)

564-E. (Hungarian.) Hot Blast Cupola Practice. V. Ferenc and W. Frigyes. *Kohaszati Lapok-Ontode*, v. 92, Sept. 1959, p. 209-215.
(E10d)

565-E. (Hungarian.) Use of Gating Systems With Restricted Sections in Iron Castings. Pt. 2. B. V. Rabinovics. *Kohaszati Lapok-Ontode*, v. 92, Oct. 1959, p. 232-243.
39 ref. (E22p; CI)

566-E. (Polish.) Dimensional Accuracy of Castings. P. P. Borg. *Przeglad Odlewnictwa*, v. 9, Mar. 1959, p. 67-70.

Formula permits calculation of permissible dimensional tolerances. (E-general, 17-55; ST)

567-E. (Russian.) Regenerative Air Heating in Cupolas. N. E. Ninea, V. T. Kumskov and K. F. Aksenov. *Liteinoe Proizvodstvo*, Sept. 1959, p. 27-29.
(E10a)

568-E. A Note on Magnesium Nitride as an Addition Agent for S. G. Iron Production. S. Ramamurthy. *Indian Institute of Metals, Transactions*, v. 12, Mar. 1959, p. 92-95.

Methods of addition designed to avoid floating, vaporizing and vigorous burning. (E25q; CI-r; *Mg*, AD-p36)

569-E.* Bonding Cast Iron to Aluminum Castings. *Light Metal Age*, v. 17, Oct. 1959, p. 17.

Bimetallic interlock bonding method developed by Doehler-Jarvis provides reliable low-cost bonding of metal inserts into castings of dissimilar metal by utilizing the die-casting process. (E13, L22; Al, CI)

570-E.* Introduction of Tentative Hot Shell Deformation Test. *Modern Castings*, v. 36, Sept. 1959, p. 51-54.

Correlated hot deformation with quality of casting surfaces. Shell molds are influenced by wall thickness, refractory grain composition, size distribution and configuration of grain; type and quality of phenolic binder, applied as powder mix or as precoat on refractory grain; degree of cure and effect of additives. 8 ref. (E16c, 3-68, 1-54)

571-E.* Mn-V-Mo Age-Hardening Austenitic Steel. N. C. Howells and E. A. Lange. *Modern Castings*, v. 36, Sept. 1959 p. 55-58.

Recommended techniques for melting, pouring, molding, heat treating and aging with new alloy. Mold materials and mixtures for producing quality surfaces. 5 ref. (E10, E19, E23, J27d; SS-e, *Mn, V,* Mo)

572-E.* Ductile Iron Castings Versus Carbon Steel Forgings and Weldments. J. L. Salbaing. *Modern Castings*, v. 36, Sept. 1959, p. 61-69.

Advantages of ductile iron castings from metallurgical, structural and production standpoint. (E-general; CI-r)

573-E.* New Aluminum Die-Casting Alloy. J. H. Moorman and E. V. Blackmun. *Modern Castings*, v. 36, Sept. 1959, p. 70-72.

Mechanical, physical and impact properties given for Alloy 364. Improved properties are produced by various types of heat treatment. (E13, 2-64, Q-general; Al-b)

574-E.* Some Principles for Producing Sound Al-7 Mg Alloy Castings. W. H. Johnson and J. G. Kura. *Modern Castings*, v. 36, Sept. 1959, p. 73-90.

Solidification data with recommended size, shape and location of risers, gates and chills for various basic shapes. 13 ref. (E22, E25n; Al-b, *Mg*)

575-E. (Book.) Foundry Engineering. Howard F. Taylor, Merton C. Flemings and John Wulff. 407 p. Oct. 7, 1959. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $9.75

Description (non-mathematical) of casting and foundry practice, intended as introductory college text and for in-plant training and vocational schools. (E-general)

576-E. (Translation.) High-Conductivity Copper Castings. E. Brunhuber. *Metal Treatment and Drop Forging*, v. 26, July-Aug. 1959, p. 261-263. (From *Radex Rundschau*, no. 7, 1958.)

See item 302-E, 1959. (E10, P15g; Cu-b, 5-60)

577-E. (Translation—Brutcher no. 4417.) Degassing of Aluminum Alloys by Ultrasonic Vibrations. M. B. Al'tman. *Izvestiya Akad. Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, Sept. 1958, p. 25-30.

Action of elastic vibrations of 20 kilocycles per sec. frequency on the degassing of a molten Al alloy containing 2% Cu, 0.8% Mg, 2.5% Si, 1.0% Ni, 1.0% Fe and 0.1% Ti. Introduction of ultrasonic waves, preparing and degassing of the alloy. (E25s; Al-b, *Cu, Si*)

578-E. (Translation—Brutcher no. 4468.) 'Shot' Injection of Charge and Alloying Additions Into Cupolas. A. Rexroth. *Giesserei*, v. 45, no. 15, 1958, p. 417-420.

(E10a)

579-E. (Translation—Brutcher no. 4610.) Improvement of Ingot Structure by Vibration of Solidifying Steel. A. A. Romanov and P. V. Umrikhin. *Izvestiya Vuz, Chernaya Metallurgiya*, July 1958, p. 37-43.

(E25n, M28h; AY)

580-E. (Translations—Brutcher no. 4651.) Inclusions in Magnesium-Treated Cast Iron and Ways of Suppressing Them. V. M. Korolev. *Liteinoe Proizvodstvo*, May 1959, p. 17-18.

See item 374-E, 1959. (E10, Q-general; 9-69, CI-q)

581-E. (Translation—Brutcher no. 4702.) Melting of Laboratory Specimens in a Vacuum or an Inert Atmosphere Without a Crucible. A. A. Fogel'. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 24-34.

The specimen is induction melted while suspended in an electromagnetic field. It assumes the shape of a sphere, the diameter of which is typical for each metal and composition. 4 ref. (E10b, 1-60, 1-73)

SECTION F

PRIMARY MECHANICAL WORKING

1-F.* (German.) Manufacture and Properties of Aluminum Wire. H. D. Feldmann. *Draht*, v. 9, Oct. 1959, p. 392-398.

Strength of drawn wire from 99.5% Al increased by Si and Fe (as admissible impurities totaling 0.5%). Influence of casting, rolling and extruding. Distribution of stresses in wiredrawing. (To be continued.) (F28, Q-general; Al, Si, Fe, 2-60, 3-70)

2-F. (Polish.) Forward Slip and the No-Slip Angle in the Rolling of Low-Carbon Steel. Zygmunt Wusatowski and Franciszek Kunert. *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 181-199.

8 ref. (F23; CN-g)

3-F.* (French.) Reheating of Ingots for Slabbing Mill in a Battery of Pit Furnaces. J. Leclerc and J. Goureau. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 697-709.

Interval between pouring of ingot, during which cooling occurs, and charging of pits, as well as weight and dimensions of ingot, are principal factors in establishing a mean soaking time that will produce material of proper temperature, and hence rollability, for slabbing rolls. However, because of other variables, heating scheduling and control should not be left to furnace tenders, but should be in charge of supervisory personnel capable of taking all factors into account. (F21b, W20g; ST, 5-59)

4-F.* Behind the Scenes With Foil. J. H. Williams. *Paper, Film and Foil Converter*, v. 32, Nov. 1958, p. 32-35.

Quality controlled production of Al foil. Gage, finish, properties, metallurgical characteristics. (F23q, W23; Al, 4-56)

5-F. Automatic Numerical Data Logging and Processing in the Steel Industry. R. M. Sills and G. E. Terwilliger. *Iron and Steel Engineer*, v. 35, Nov. 1958, p. 101-109.

Types of systems, terminology, components, analog and digital computers, input, storage and output devices. Application of system to cold strip mill and electrolytic tinning line. (F23q, L17, X14j, X14k, 1-52)

6-F. Feed Mechanism for Wire-Forming Machine. Karl W. Nittel. *Machinery (London)*, v. 93, Nov. 12, 1958, p. 1116.

(F28, 1-52)

7-F. Production Forming of Natural Uranium Metal. John A. Fellows. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1433, 1958, 18 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Types and origins of normal U metal; primary hot forming; forging of dingots; gamma extrusion of dingot metal; secondary hot forming; warm finishing; heat treatment of U. 35 ref. (F-general, J-general; U)

8-F.* (Rumanian.) Rolling Thin Sheets of Refractory Steel. R. Miculescu. *Studii şi Cercetări de Metalurgie*, v. 1, July-Dec. 1956, p. 339-348.

It was found possible to roll thin sheets of high-alloy austenitic (Cr, Ni and Ti) by applying reduction regimes identical with those for rolling thin sheets of ordinary carbon steel. 6 ref. (F23; SS-e)

9-F. Progress in Wire Drawing. *Mechanical World*, v. 138, Nov. 1958, p. 498-504.

Die design, drawing speeds, drawing machines, heat treatment. (F28, J-general)

10-F. How to Select Materials for Rotary Swaging. Lloyd A. Whiting. *Metalworking*, v. 14, Dec. 1958, p. 10-13.

(F25; SS, AL-b, Ni-b, Cu-b, CN-g, U, Ti, Zr, Re, W)

11-F. Spring Wire Gets a Lift. *Steel*, v. 143, Dec. 11, 1958, p. 70-71.

Produced by cross extrusion, it shows a substantial increase in service. (F24b, T7c; AY, SS, 4-61)

12-F. Profile-Rolling for Economy, Finish, Strength and Uniformity. Donald McNary and Kempton A. Whiting. *Tooling & Production*, v. 24, Dec. 1958, p. 50-52.

Cold rolling is suggested where difficult-to-work materials, close tolerances, high surface finish, sharp corners, thin sections, complex radii or intricate angles are involved. (F23, 1-67, 4-57)

13-F. (Polish.) Forming Railroad Rails in Existing Rolling Mills. Michal Musial. *Hutnik*, v. 25, July-Aug. 1958, p. 291-295.

Comparison of Polish rolling mills of older type. (F23, T23q)

14-F.* (French.) Heating Operations in the Hot and Cold Working of Zirconium. D. Whitwham, J. Boghen and J. Herenguel. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 79-88.

For hot working, heating in salt bath is given preference to heating in air. In salt bath no oxides can form and the heating time is shorter. In a gas or oil heated furnace there is danger of hydrogen contamination. 7 ref. (F21b, J2j, 1-66, 1-67; Zr-a, Zr-b)

15-F.* (German.) Technology of Forming. Pt. 1. W. Engelhardt. *Fertigungstechnik*, v. 8, Aug. 1958, p. 356-361.

Six stages in fabrication of metals: (1) preparation of material; (2) primary mechanical working and casting; (3) secondary deformation in the solid state; (4) separation cutting, boring, machining; (5) heat treatment, hardening, annealing, stress-relieving; (6) joining of materials or parts (soldering, welding, bonding.) Various processes of cold deformation classified. (To be continued.) (F-general, G-general, J-general, K-general)

16-F.* (German.) Surface Temperature of Upsetting Tools and Dies During Forging of Steel and Pantal in Cylindrical Shape. Gunter Beck. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 561-567.

Methods for estimating in advance the temperatures of tools and forgings during the process. (F22, 2-61; ST, Al-b, 4-60)

17-F.* (German.) Forging of Heat Resistant Metals. A. H. Wain and I. R. Rait. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 567-568.

Forging of Ti and other heat resistant metals and alloys based on Cr, Mn and Ni. (F22; Cr-b, Mn-b, Ni-b, SGA-h)

18-F.* (German.) Fundamentals of Static-Dynamic Forging and Some Characteristics of the Process. P. Stancovic. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 568-569.

Test machine which incorporates independently operated members for exerting static pressure and dynamic impact simultaneously in controlled relationship to each other. (F22, 1-52)

19-F.* (Polish.) Elongation and Spread in Hot Rolling of Low-Carbon Steel. Zygmunt Wusatowski and Bronislaw Hoderny. *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 161-179.

Rolling experiments with drafts of 50 to 90% performed to determine elongation, spread, forward slip, rolling velocity, pressure and torque of rolling. Formulas are derived to determine the coefficients of spread and elongation as a function of the draft coefficient. 7 ref. (F23; CN-g)

20-F.* Drop Forgings to Suit the Final Machining. Otto Kienzle. *Metal Treatment and Drop Forging*, v. 25, Aug. 1958, p. 315-321.

Forging must have uniformity of hardness, toughness and other qualities demanded by necessary finish-machining processes. Optimum tolerances and machining allowances vary according to method of machining. Drop forged items with cold pressed surfaces will already

possess finished accuracy in certain dimensions. 7 ref. (F22n; ST, 17-55)

21-F.* To Correct Extrusion Dies. H. D. Flicker. *Modern Metals*, v. 14, Aug. 1958, p. 38-42.

Fundamentals of extrusion flow with techniques of correcting the malfunctions of dies and of related equipment and operations. (F24, W24n; Al, 17-55)

22-F.* (Czech.) Industrial Use of Information About Internal Crack Formation in Large Forgings. Stanislav Burda and Michal Bakala. *Hutnicke Listy*, v. 13, no. 9, 1958, p. 786-795.

Summarizes statements published since 1919 concerning causes of internal cracks in forging. Influence of cooling methods on occurrence of cracks. Ultrasonic inspection; welding internal cracks by forging. 23 ref. (F22, Q26q, 2-61; ST)

23-F. (German.) Charts for Finding the Conditions of Minimum Cut-Off Waste in Cold Rolling of Nonferrous Sheet. O. Emicke. *Metall*, v. 12, Nov. 1958, p. 990-991.

(F23, 1-67; EG-a38)

24-F. Cold Working of Extruded Zircaloy Tubing. N. R. Gardner and P. Loewenstein. Nuclear Metals Inc. U. S. Atomic Energy Commission, NMI-1194, Apr. 30, 1958, 55 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

High frictional terms associated with cold drawing demand a satisfactory lubricant. Since even slight metal-to-metal contact between clean Zr and the tools will result in pickup on the die and scoring of the tube, it is imperative to introduce a continuous and reliable barrier layer. The most reliable technique involves the use of a conversion coating and a soap lubricant. (F26r, F24; 4-60, Zr-b)

25-F. (Translation—Brutcher, 4395.) Increased Forging Temperatures for Structural Steels 25 and 43N. M. P. Braun, N. I. Kon and E. I. Mirovskii. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 41-46.

Forging with a 2-ton steam hammer at 1150, 1200, 1250, 1280 and 1300° C. Raising the forging temperature from 1150 to 1300° C. increased the grain size. Large grain is easily reduced with plastic deformation and subsequent heat treatment. Forging temperature for stock prior to deformation can be raised to 1270 - 1280° C. for 25 STL and 1250 - 1260° C. for 43N steel. (F22, F21b, M27c, J-general; ST)

26-F. (Translation—SLA, ASLIB-GB41.) Automation of a 12-Roller Reversing Cold Rolling Mill. Herbert Schmale. *Stahl und Eisen*, v. 76, Dec. 13, 1956, p. 1698-1700.

See item 50-F, 1957. (F23, 1-67, S14, 18-74; ST)

27-F. (Translation—SLA, ASLIB-GB29.) Methods of Preparing Wire-Drawing. I. I. Voronov. *Metallurg*, no. 6, 1956, p. 36.

(F28)

28-F. (Translation—SLA, ASLIB-GB39.) Predetermination of the Deformation Forces in the Extrusion Pressing of Light Metal Sections. H. Hornauer. *Aluminium*, v. 32, no. 6, 1956, p. 350-356.

See item 157-F, 1956. (F24; Al)

29-F. Rotary Swaging. Lloyd A. Whiting. *Automatic Machining*, v. 20, Dec. 1958, p. 35-37.

Development of method. Properties required of materials processed (e.g., stainless steel, Al, Ni alloys, Cu and brass, metallic elements). (F25; ST, SS, Al-b, Ni-b, Cu, Cu-n, U, Ti, Zr, Re, W)

30-F. Reduce Manual Handling to Boost Forging Output. Herbert Chase. *Iron Age*, v. 182, Dec. 18, 1958, p. 102-103.

Mechanization and layout organization. (F22, 18-67, 18-74; ST)

31-F. Hot Rolling With the Planetary Mill. C. J Baker. *Sheet Metal Industries*, v. 35, Dec. 1958, p. 939-951.

(F23, W23; 1-66)

32-F. Here Are Two Shortcuts for Complex Parts. *Steel*, v. 143, Dec. 22, 1958, p. 64-66.

Metal gathering and flotrusion extend limits of hot upsetting and tube redrawing with improved one-piece shapes resulting. (F22j, F26r)

33-F.* (German.) Cold Extrusion of Steel. Heinz Eberspaecher. *Werkstatt und Betrieb*, v. 91, Oct. 1958, p. 605-608.

Influence of nonmetallic coatings on the cold extrusion behavior of steel blanks as a result of reduced friction between

external part surfaces and tools. Several pretreating processes, such as cold upsetting; different methods of heat treatment. Influence of extrusion speed on power requirements. Some ideas regarding materials and design of cold extrusion dies. (F24, 1-67; ST)

34-F.* (Russian.) Production of Tubes With Internal Plastic Coating. S. A. Grinberg. *Stal'*, v. 18, Nov. 1958, p. 1018-1020.

Production of plastic-lined tubes by polymerizing welding without drawing gives great saving in valuable alloy steels. Has many advantages over latter in protection against corrosion by aggressive acids. Use of Ti, Ni, Nb, Mo and Cr only slowed corrosion and often contaminated the liquids flowing through the tubes. However, vinyl is completely resistant to corrosion by all acids, alkali and salt solutions. (F26p, L26p, R-general, 2-60; ST)

35-F. (Czech.) Rolling Theory. Frantisek Wiesner. *Hutnicke Listy*, v. 13, Nov. 1958, p. 987-990.

14 ref. (F23)

36-F.* Forging and Heat Treating Practices for Armco 17-7 PH Stainless Steel. W. J. Davison. *Metal Treating*, v. 9, Nov-Dec. 1958, p. 6-8.

Designing forging procedures, solution, transformation, aging and conditioning treatments. Effect of amount of hot upsetting on the ductility of Armco 17-7 PH. (F22, J-general; SS)

37-F.* (Czech.) Rolling Thick Steel Sheets Clad on One Side With Stainless Steels. Milan Zidek, Bohumil Glatz and K. Gottwalda. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 679-687.

Casting compound ingots from carbon and stainless steels; pre-rolling in blooming mill; optimum conditions for rolling; relation between reduction of face metal and clad material. Effect of sheet thickness and finish rolling temperature; calculation of initial slab sizes. 12 ref. (F23, 2-61, 3-73; CN, SS, 4-53, 8-66)

38-F.* Combined Hot Forging and Cold Forming. *Metalworking Production*, v. 102, Dec. 19, 1958, p. 2220-2221.

Combined method, with zinc phosphate lubrication as a key step, uses less material, low-carbon steel. Heat treatment is more simple, machining reduced. (F22m)

39-F.* How to Design Stainless Steel Extrusions. Pt. 1. Process Characteristics. Richard E. Paret. *Machine Design*, v. 31, Jan. 8, 1959, p. 114-117.

Advantages in specifying extrusions include: great freedom of section design; reduction and elimination of machining operations; production of integral complex shapes; economical small production runs when demand does not justify rolling. Mechanical properties of extruded parts are superior to those of cast parts and roughly comparable to those of forged parts. (F24, 17-51; SS)

40-F.* Experiments in the Cold Extrusion of Rods of Non-Circular Section. W. Johnson. *Mechanics and Physics of Solids, Journal*, v. 7, Nov. 1958, p. 37-44.

Effects of section shape and punch speed on the necessary extrusion load and on the nature of the flow of metal within extruded pure Pb and Te-Pb rods. 5 ref. (F24; Pb-a, Te-a, 4-55)

41-F.* The Die Is the Key. Fred G. Schuler. *Precision Metal Molding*, v. 16, Dec. 1958, p. 30-31.

Properties and applications of extruded shapes in 1100, 3003, 6061, 6062 and 6463 Al alloys. Check list indicates requisites for effective die design. (F24, W24n; Al-b)

42-F. Manufacture of Welded Steel Tube. J. Gosse. *Australian Welding Journal*, v. 2, Oct. 1958, p. 50-55.

Cold formed welded carbon steel tubing; welded stainless steel tubing. (F26p; CN, SS)

43-F. Graphical Method for Determination of Parameters for Steel Wire Drawing. Bron. Kunda. *Wire Industry*, v. 25, Dec. 1958, p. 1139-1142.

(F28, P10; ST)

44-F. (Russian.) Change Over of 10-60 Tube Mill to Welding With High-Frequency Current. Yu. A. Mednikov. *Metallurg*, v. 3, Nov. 1958, p. 38-39.

Change from industrial a.c. frequency of 50 cycles per sec. to 100-150 cycles made possible with use of same equipment and without changes of production regime and resulted 14.2% increase in output with 2.3% cut in metal consumption. (F26p)

45-F. (Russian.) Kinetics of Transverse and Oblique Rolling. P. K. Teterin. *Stal'*, v. 18, Oct. 1958, p. 923-925.

5 ref. (F23)

46-F. (Russian.) Use of Fixed Mandrel in Piercing Unit of Tube Mill. A. N. Borovkov

and E. A. Svetlitskii. *Stal'*, v. 28, Oct. 1958, p. 926-927.

Tube rolling mills at Transcaucasian Steel Works consist of two annular furnaces for heating ingots of 170-350 mm. diameter, and six stands, two of which are automatic piercing units. Experiments conducted with fixed mandrels show that long-lasting mandrels with internal water cooling in the first piercing unit of the 400-mm. tube mill give very satisfactory results and arrangements are now being made to extend their use. (F26q, W23h; ST)

47-F. (Russian.) Successful Application of Open-Type Passes When Rolling Angles. V. K. Yatsura. *Stal'*, v. 18, Nov. 1958, p. 1020-1022.

(F23; ST)

48-F.* What the Designer Should Know About Production. Pt. 4. Hot Forging. R. B. Boswell. *Machinery*, v. 65, Jan. 1959, p. 131-139.

Forging presses, furnaces, dies and tools; application and design of forged parts; tolerances; metallurgical considerations. 5 ref. (F22, 1-66, 17-55)

49-F.* (German.) Properties and Manufacture of Aluminum Wire. Pt. 2. Heinz D. Feldmann. *Draht*, v. 9, Nov. 1958, p. 461-463.

Influence of die form and drawing velocity. Good lubrication very important, both liquid and solid lubricants employed. (To be continued.) (F28; Al-b, 18-73)

50-F.* (German.) Influence of Rolling Conditions on the Properties of Low-Carbon Hot Rolled Strip. Pt. 2. Mechanical Properties and Structures. Winfrid Dahl and Werner Lueg. *Stahl und Eisen*, v. 78, Dec. 11, 1958, p. 1793-1798.

Hot rolled strip of basic converter steel was cold rolled in several steps with intermediate annealing and strength and structure tested. Strip that was hot rolled at temperatures above the A_3 point showed higher strength and finer grain than material rolled at lower temperatures. Strength in transverse direction found to be higher than in longitudinal direction. 10 ref. (F23, 1-66, 1-67, 2-61; CN-g, 4-53)

51-F.* (German.) Drawing of Titanium Rods. Werner Lueg and Paul Funke, Jr. *Stahl und Eisen*, v. 78, Dec. 11, 1958, p. 1816-1822.

Determination of the most favorable drawing conditions and parameters by experimentally drawing rods from forged Ti-150. Structural transformations, especially formation of twin crystals. 21 ref. (F27, Q24b, Q29; Ti, 4-55)

52-F.* (German.) Residual Stress in Steel Wires Influenced by Redrawing and Straightening. Hans Buhler and Georg Altmeyer. *Stahl und Eisen*, v. 78, Dec. 11, 1958, p. 1822-1827.

By redrawing with a section reduction of 1.3% a stress relief of 35% was established by straightening; with 1.3% increase in section, the extreme fiber stress was reduced to 50%. Annealing for 1 hr. gave 22% stress relief for 300° C., 60% for 400° C., and 78-87% for 500° C. 19 ref. (F28h, J1, Q25h; ST)

53-F.* Theory and Experiment of Press Forging Axisymmetric Parts of Aluminum and Lead. S. Kobayashi, R. Herzog, J. T. Lapsley, Jr., and E. G. Thomsen. *American Society of Mechanical Engineers*, Paper no. 58-A-154, 1958, 9 p.

Mechanics of finishing in a press-forging operation. The idealized deformation mechanism assumed in a simplified theory of axisymmetric press forging yields forging pressures which are in good agreement with experiments on commercially pure Pb and Al. 18 ref. (F22; Pb, Al)

54-F. Grease for Hot Spots. *Southern Power & Industry*, v. 76, Nov. 1958, p. 54, 56, 58, 60.

Lubricating parts of crane stripper and soaking pit cranes. (F21a, W12q, 18-73)

55-F.* (Hungarian.) Distribution of Deformation Resistance Along the Arc Under Pressure. Sandor Geleji. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 70-72.

Calculations on behavior of steel in rolling. Method developed for hot rolling but, with slight alterations, can also be adopted for cold rolling. (F23, 1-66; ST)

56-F.* (Hungarian.) Some Important Factors Affecting the Heating of Steel. Daniel Dioszegi. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 80-85.

Factors influencing actual behavior of steel heated in furnaces as compared to theoretical calculations based on adiabatic conditions. The rate of heat transfer is different at various temperature ranges of the work. Continuous countercurrent

furnaces provide better heating conditions but are more difficult to compute in advance. 600° C. found to be the limit above which the admissible heating speed is usually dependent upon furnace capacity only. 9 ref. (F21b, P11k; ST)

57-F.* (Hungarian.) Determining the Power Requirements of Roller-Type Sheet Metal Straightening Machines. Sandor Geleji and Gyorgy Devenyi. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 111-117.

Practical method for calculating power requirements by assuming an average condition of waviness in the sheets and determining bending effort needed to straighten the sheets by letting them pass between rollers. 9 ref. (F29r, W23c)

58-F. (Translation — BISI, 889.) Design and Operational Results of a Modern Continuous Train Rolling Medium Strip. Herbert Severing. *Stahl und Eisen*, Feb. 20, 1958, p. 205-214.

See item 126-F, 1958. (F23, 1-61, W23c)

59-F. (German.) New Theory of Rolling. A. Geleji. *Acta Technica Academiae Scientiarum Hungaricae*, v. 19, 1957, p. 199-240.

Determination of forces of deformation in cold and hot rolling. Broadening forward slip and bending of cross-sections vertical to the longitudinal axis are important factors. Graphs comparing calculated and tested pattern of deformation resistance of cold and hot rolled Al. 19 ref. (F23; Al-b)

60-F. (Japanese.) Effect of Properties of Aluminum Slab Produced by Continuous Casting on Surface Patterns of Sheet. T. Morinaga and T. Takahashi. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 803-810.

Causes of the patterns are structure of Fe, method of rolling, heat treatment and presence of Si as an impurity. (F23, C5q, 2-64, 3-69; Al, *Si*, 4-53, 9-71)

61-F. (Polish.) Defects in Raw Steel and Their Effect on Quality of Wire. Zygmunt Steininger. *Hutnik*, v. 25, Sept. 1958, p. 340-346.

(F28; ST, 9)

62-F. (Ukranian.) D. C. Electrical Contact Heating for Turning. F. Ya. Zagabura. *Dopovidi Akademii Nauk Ukrainskoi RSR*, no. 8, 1958, p. 841-844.

Lines do not appear on the worked surface as is the case if heating is done by alternating current. (F21b, G17a)

63-F.* (French.) Phenomenon of "Superworking" in Extruding. J. Herenguel and P. Lelong. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1057-1064.

In the process of extrusion, certain zones within a block of Zl are exposed to a strong deformation by shear (superworking), causing phases usually considered as insoluble to disperse in the same manner as if they had been dissolved and reprecipitated in a fine state of division. (F24, N5f, 3-68)

64-F.* L-D Steels in Wire Manufacture. A. Legat and E. Fogy. *Wire Industry*, v. 26, Jan. 1959, p. 52, 53, 64.

Properties, annealing, thread rolling, rope wire manufacture, time-temperature-transformation range, wire for welding electrodes. (F28, G12, D10d, T7g; SS)

65-F.* (French.) Manufacture of Seamless Steel Tube by the Stiefel Process. J. Verdickt. *Technique Moderne*, v. 50, Sept. 1958, p. 395-401.

Starting material, process details, equipment. (F26s, W23h, ST)

66-F.* (Hungarian.) Lubrication Problems of High-Speed Wire Drawing. Lajos Mankher. *Kohaszati Lapok*, v. 13, no. 8, 1958, p. 374-379.

Metallic soaps, cooling of drums and utilization of hydroxide layers as lubricant carriers, cooling of wire and drums, use of metallic soaps as lubricants. 9 ref. (F28; NM-h)

67-F.* Static-Dynamic Forging. Principles and Some Characteristics. P. Stankovic. *Metal Treatment and Drop Forging*, v. 25, Dec. 1958, p. 489-494.

Static-dynamic action gives good flow of the material in both the direction of the force action and in the perpendicular which is a great advantage when forging in dies. Comparative results obtained by static only, dynamic only, and combined static-dynamic actions, together with results obtained by static-dynamic forging at various speeds. (F22)

68-F. Automated Forge Shop Saves GM 25%. *Steel*, v. 144, Jan. 9, 1959, p. 76-77.

Automatic techniques at GM's Saginaw Steering Gear Division in the hot forging of propellor shaft assemblies. (F22, 18-74, T7j)

69-F.* (German.) Properties and Production of Aluminum Wire. H. D. Feldman. *Aluminium*, v. 35, Jan. 1959, p. 13-20.

Factors affecting Al wiredrawing process, defects, equipment, die lubricants and die design. 7 ref. (F28, 1-52; Al)

70-F.* (Russian.) Causes of Flaws in Corners of Billets of Rimming Steels Occurring During Rolling. S. V. Makaev. *Metallurg*, v. 3, Dec. 1958, p. 32.
Conveying time from furnace to rolling stand and stresses affect the magnitude of the flaws. (F23; ST, 4-52, 9, 3-66, 3-67)

71-F. Trends and Development in Electrical Automation Systems for Steel Plant Processes. W. E. Miller. *Blast Furnace and Steel Plant* v. 47, Jan. 1959, p. 64-71.
Summary of automatic control processes in rolling mills. (F23, W23, 18-74)

72-F. New Brinsworth Mill. *Iron and Steel*, v. 32, Jan. 1959, p. 13-17.
Equipment and layout at Steel Peech and Tozer's new continuous strip plant in Brinsworth, England. (F23, 18-67; ST, 4-53)

73-F. Operations Research in a Metal Rolling Mill. A. P. M. Purdon. *Metal Treatment and Drop Forging*, v. 25, Dec. 1958, p. 503-507.
Application of operations research to problems of a Cu rolling mill. (F23, A9n; Cu)

74-F. Short-Run Forging Can Be Economic. E. Merrill Gardner. *Metalworking Production*, v. 103, Jan. 9, 1959, p. 53-56.
(F22, 17-53)

75-F. Automatic Handling May Triple Forging Rates. *Metalworking Production*, v. 103, Jan. 9, 1959, p. 68-69.
(F22, 18-74)

76-F. (German.) Properties and Manufacture of Aluminum Wire. H. D. Feldman. *Draht*, v. 9, Dec. 1958, p. 512-516.
7 ref. (F28h; Al)

77-F. (Hungarian.) Tube Manufacturing in Hungary. Jeno Ruhmann. *Kohaszati Lapok*, v. 13, no. 8, 1958, p. 362-366.
Mannesmann, Stiefel and Erhardt processes for producing seamless tubing. (F26)

78-F.* Fabrication of Refractory Metals. W. L. Bruckart. *Metal Industry*, v. 94, Jan. 23, 1959, p. 63-66.
Properties, forming and machining, applications for molybdenum. Room-temperature mechanical properties of Cb, Mo, Ta, Re and W. (To be continued.) (F-general, G-general, Q-general; Mo, Cb, Ta, Re, W, EG-d37)

79-F.* Forging Presses Strength Into Lightweight Castings. W. Rostoker. *Product Engineering (Design Issue)*, v. 30, Feb. 16, 1959, p. 61-63.
Follow-up forging improve parts cast from Al and Mg alloys. (F22, Q-general; Al-b, Mg-b, 5-61)

80-F. (Translation—BISI, no. 1130.) Use of Water-Cooled Plugs in the Piercing of Billets. M. M. Kaufman. *Stal'*, Feb. 1958, p. 144-151.
See item 167-F, 1958. (F26q, W23h)

81-F. (Translation—BISI, no. 1190.) Nomograms for the Determination of Rolling Efforts, Based on the Equation of S. Ekelund. Alfred Mathea. *Stahl und Eisen*, v. 78, Oct. 2, 1958, p. 1383-1389.
See item 338-F, 1958. (F23, U4q)

82-F. Improved Extrusion Lubricants. G.C. Giles. *Precision Metal Molding*. v. 17, Jan. 1959, p. 57-58, 73.
More accurate extrusions with better surface finish and longer die life result from the use of colloidal graphite suspended in water. (F24; NM-h)

83-F. How Theory Can Help the Cold Roller. E.L. Morgan. *Sheet Metal Industries*, v. 36, Jan. 1959, p. 53-61.
Insight into the factors affecting the rolling load can indicate the correct camber of roll to be used and maintain a uniform rolling load and uniform shape. (F23, 1-67)

84-F. Combines Mains-Frequency and High-Frequency Induction Heating for Forging. Y. Sundberg. *ASEA Journal*, v. 31, no. 8-9, 1958, p. 111-116.
(F21b, F22, 1-69)

85-F.* The Fundamentals of Wire Drawing. J. G. Wistreich. *Metallurgical Reviews*, v. 3, no. 10, 1958, p. 97-142.
Theoretical analysis of stress and strain distribution within confines of die and external forces. Influence of process variables. Heat development and temperature distribution; temperature measurement; surface finish; coefficient of friction; lubricants and lubrication; mechanism of die wear; effect of drawing on properties of

wire. 93 ref. (F28, F2, 2-61, 3-66, 3-68; ST, Cu-b, Al-b, NM-h)

86-F.* Properties of Extruded Alloys. *Precision Metal Molding,* v. 17, Feb. 1959, p. 44-45.

Fabricating characteristics, corrosion resistance and types of finishes for some six Al alloys. (F24; 4-58, Al-b)

87-F. (German.) Power Consumption in the Manufacture of Seamless Steel Tubing. A. Geleji, E. Kiss and G. Devenyi. *Acta Technica,* v. 22, no. 3-4, 1958, p. 395-412.

Computation of power consumption based on measurements carried out during manufacture. (F26; ST)

88-F.* (Russian.) Process of Production of Seamless Tubes From High-Alloy Boron Steels. V.S. Rudoi, N.S. Alferova and V.P. Konovalov. *Stal',* Jan. 1959, p. 68-73.

Low temperature of piercing of hot rolled seamless tubes. 4 ref. (F26q, 1-67; SS, *B*)

89-F.* (Russian.) An Increase in Strength and Reduction of Weight of Welded Tubes Made of MK Steel. A.V. Prokhorov. *Stal',* Jan. 1959, p. 88-91.

Uniformity of properties of MK alloy steel and its high strength and ductility make it possible to reduce the wall thickness of steel pipe 7 to 8 mm., provided low-alloy electrodes are used for welding. (F26p; SS-b, 4-60)

90-F.* Control of the Shape of Metal Strip by Camber Variation During Rolling. A. R. E. Singer. *Sheet Metal Industries,* v. 36, Feb. 1959, p. 134-139.

Causes of camber and shape variation, methods of compensating for camber deficiencies, existing schemes for shape control by camber variation during rolling, development of a variable-camber mill and effectiveness of shape control by means of roll cambering forces. 5 ref. (F23, W23c; 4-53, 17-51)

91-F. (Russian.) Quality of Cast Steel for Rolling 9.75-Ton Rail. S. Yn. Skoblo, E. A. Kazachkov and E. G. Pereverzeva. *Metallurg,* Jan. 1959, p. 19.

Chemical, physical, structural and mechanical properties of steel stock used in rolling 9.75-ton rail. (F23, Q-general; 5-59, ST)

92-F.* Tungsten Is Forged, Extruded, Even Deep-Drawn. *Iron Age,* v. 183, Mar. 19, 1959, p. 126-127.

Using hot tungsten carbide tools and fast equipment, W can now be extruded, drawn, spun, forged and deep drawn, but loses its ductility below 400° C. (F22, F24, G-general, Q-general; W)

93-F.* Forgeability of Steels. G. P. Contractor and W. A. Morgan. *Metal Treatment and Drop Forging,* v. 26, Feb. 1959. p. 65-71.

Hot torsion tests indicate reliably the best temperature for hot working. The number of twists to failure, when related to temperature, normally shows a maximum; the temperature at which it occurs is the optimum forging temperature. Hot workability curves are shown for a high-carbon toolsteel and Type 304 stainless. Curves indicate that the number of revolutions required for fracture increases as the temperature is raised until an optimum or a maximum temperature is reached. 43 ref. (F22, 17-52; SS, TS)

94-F.* (Russian.) Strength of Welded Gas Pipes. M. P. Anuchkin, N. I. Anenkov and G. V. Shakhovskaya. *Svarochnoe Proizvodstvo,* Feb. 1959, p. 21-22.

Pipe manufacture from hot rolled strip and cold flaring brings about, in some cases, a complete disappearance of plastic properties. Normalizing, elimination of inclusions and lamination in the steel, and reduction of deformation during flaring, are suggested remedies. 200 ref. (F26p, J24; ST, 4-60)

95-F. (Translation--BISI no. 744.) Heating Alloy Steel Ingots in Soaking Pits. O. A. Semchenko. *Stal',* Oct. 1957, p. 915.

See item 72-F, 1958. (F21b, W20g; AY, 5-59)

96-F. (Translation--BISI no. 909.) Manufacture and Properties of Hot Rolled Tubes in Steel EI595. N. S. Alferova, G. P. Pishchikov and V. P. Konovalov. *Stal',* Jan. 1958, p. 60-66.

See item 183-F, 1958. (F26s, Q26s; ST)

97-F. (Translation--BISI no. 1037.) Production of Alloy Steel Light-Pressure Boiler Tubes. S. I. Borisov. *Stal',* May 1958, p. 442-446.

See item 218-F, 1958. (F26s; AY)

98-F. (Translation--BISI no. 1200.) Calculation of Metal Pressure on Rolls. Yu. M. Chizhikov. *Stal',* v. 18, May 1958, p. 428-433.

See item 216-F, 1958. (F23, 4-52, 4-53, 10-51)

99-F.* Non-Slip Angle and Forward Slip During Rolling Involving Spread. Z. Wusatowski and Z. Szalajda. *Iron and Steel*, v. 32, Feb. 1959, p. 61-67.

Effect of rolling pressure, temperature and spread on forward slip during rolling of carbon steel, using measurements of forward slip. 8 ref. (F23)

100-F.* Metallurgical Factors in the Hot Working and Cleaning of Hot Rolled Strip and Their Influence on the Cold Reduced Annealed Product. R. D. Hindson. Paper from "Annealing of Low Carbon Steel, Proceedings", Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 9-17.

Influence of finishing and coiling temperatures on grain size, effects of carbide distribution and mechanical properties of the final annealed product. Variations in hot strip mill practice for special steels and cleaning or pickling of hot rolled strip. 13 ref. (F23q, M27c, L12; CN-g)

101-F.* Cold Rolling of Steel Strip. G. A. Finch. *Sheet Metal Industries*, v. 36, Mar. 1959, p. 211-222.

Rolling of strip and sheet, types of mills, types of rolls, instrumentation. (F23, W23k, X-general, 1-67; ST, 4-53)

102-F.* (Rumanian.) Quality as Influenced by the Entrance Angle of Rolling Pass. R. Fischgold and L. Dragan. *Studii si Cercetari de Metalurgie*, v. 3, no. 3, 1958, p. 345-358.

Determination of entrance angles for three types of steels and nodular cast iron. 6 ref. (F23, 17-51; CN-g, AY-n, SS, CI-r)

103-F. Erase Draft While Forging to Save Machining Steps. Herbert Chase. *Iron Age*, v. 183, Feb. 26, 1959, p. 98-100. (F22n; ST)

104-F.* Production of Zinc Wire. A. G. Arend. *Wire Industry*, v. 26, Mar. 1959, p. 251, 270.

Effect of Al content in rolling and on the properties of the wire. (F23q, 2-60; Zn, *Al*, 4-61)

105-F.* Rolling of Metals. J. L. Greenberger. *Iron and Steel Engineer*, v. 36, Mar. 1959, p. 99-107.

Basic engineering and operating problems involved in hot and cold rolling, particularly with regards to flat rolling. (F23, W23)

106-F.* Improved Lubrication in Cold Strip Rolling. J. C. Whetzel, Jr., and Sayre Rodman. *Iron and Steel Engineer*, v. 36, Mar. 1959, p. 123-132.

For a given amount of lubricant, increasing its viscosity up to a certain value reduces rolling loads. Water-soluble chemicals and mixtures were found to be the best lubricants. 5 ref. (F23, 18-73; ST, NM-h, 4-53)

107-F.* Welding Aluminum Tube at 400 Ft. Per Min. *Metalworking Production*, v. 103, Mar. 13, 1959, p. 463-464.

High-frequency welding equipment combined with a tube forming mill. (F26p, K5j; Al)

108-F.* (Hungarian.) Crowning Rolls for the Hot Rolling of Aluminum and Aluminum Alloys. Imre Kohler and Gyula Schultheisz. *Kohaszati Lapok*, v. 91, Oct-Nov. 1958, p. 483-391.

Duo-type ingot rolling mills for Al-Mn, Al-Mg, Al-Mg-Si and Al-Cu-Mg alloys. Calculation of type and dimensions of roll convexity based on effective roll width and lubricant used. Comparison of oil and emulsion type lubricants. (F23, W23k; Al-b, *Mn, Mg, Si, Cu*)

109-F.* (Russian.) Production of Riveting Stock Wire From 30KHGSA Alloy Steel. Ya. Kh. Sartan. *Metallurg*, Feb. 1959, p. 32-33.

Wiredrawing methods; heat treatment; calibration and bundling. Structure must be that of granular pearlite. Commercial name for such wire is "Cromansil" (Cr-Mn-Si steel). (F28; AY, *Cr, Mn, Si*)

110-F.* High-Frequency Resistance Welded Tubes. *Light Metals*, v. 22, Mar. 1959, p. 94-95.

Strip is formed into an unwelded tube. High-frequency current is then induced in the tube by shoes on either side of the gap. At a point about a $1\frac{1}{2}$ in. beyond these shoes a pair of pinch rolls brings the tube together and applies pressure to form the weld. (F26p, 1-69; Al, 4-53)

111-F.* Forgeability of Steels. Pt. 2. G. P. Contractor and W. A. Morgan. *Metal Treatment and Drop Forging*, v. 26, Mar. 1959, p. 107-114.

Effect of alloying elements on the hot workability aspect of the fabrication of stainless steels and to indicate how changes in the forgeability characteristics may be predicted by laboratory tests. (Concluded.) (F22, 17-52, 2-60, 1-54; SS)

112-F.* High Speed Production of Light Alloy Tube. C. W. J. Vernon. *Welding and Metal Fabrication*, v. 27, Mar. 1959, p. 80-82.

New machine roll forms and high-frequency resistant welds Al strip in continuous operation. (F26p, 1-52, 1-69; Al)

113-F.* Precision Forgings: Solution or Delusion? Alfred G. Jones. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 174, American Society of Tool Engineers, Detroit, 1958, 5 p.

Development of precision forgings in stainless steel and Ti alloys; die materials. (F22, 17-55; Ti-b, SS; 4-51)

114-F. The Extrusion Process for Converting Zircaloy-2 Ingots to Strip. W. H. Friske and E. L. Richards. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 1-8. U. S. Office of Technical Services, Washington 25, D. C.

Stringers and stringer-type corrosion are not eliminated or minimized by the process of extruding atmosphere-melted Zircaloy-2 ingots at an all-beta temperature (1900°F.) and hot rolling the resultant slabs at an all-alpha temperature (1475°F. max.) The over-all conversion of ingots to strip by this process is considered to be competitive with conventional blooming or forging techniques with respect to both yield and conversion costs. (F24, F23; Zr-b)

115-F. (Czeck.) Computations on the Utilization of Ingot Heat and Additional Heating in Soaking Pits. Zdenek Volf and Erich Gladys. *Hutnicke Listy*, v. 14, Feb. 1959, p. 98-104.

22 ref. (F21b, W20g)

116-F. (Russian.) Rationalization of Roll Pass Design for Continuous Billet Mills. N. I. Boyarshinov and I. P. Shulaev. *Stal'*, Feb. 1959, p. 137-141.

(F23, 1-61, W23, 17-51)

117-F. (Russian.) Flame Scarfing of Stainless and Heat Resistant Steels. D. I. Gololdbov and B. M. Litvinov. *Stal'*, Feb. 1959, p. 145-147.

Scarfing of various steels with high Cr and Si content by means of oxy-acetylene flame rather than mechanical trimming. (F21e, SS, *Si, Cr*, SGA-h)

118-F. (Russian.) Nature of Fissures in 1KH18N9T Steel. L. D. Kossovskii, V. A. Khorosh and M. A. Mukhina. *Stal'*, Feb. 1959, p. 147-148.

Principal cause of fissures is water used in cooling the rolls. Fissure formation is reduced by preventing the water from falling upon steel during rolling. (F23; SS, 9-72)

119-F.* Improvement of Castings by Press Forging. Digest of "Development of a Method to Improve Castings by Press Forging". Andrew H. Murphy and Lyle L. Clark. Air Force Contract Report. *Metal Progress*, v. 75, Apr. 1959, p. 147-148, 149A, 150.

Al, Mg and Ti casting alloys tested to establish the best forging conditions to obtain optimum properties and to investigate the feasibility of casting dies to shape for press forging parts. A range of forging deformations was used at each temperature and for each heat treated condition. (F22; Al-b, Mg-b, Ti-b)

120-F.* (English.) Study on Rolling of Metals and Alloys With Sendzimir Reversing Cold Strip Mill. Pt. 1. Pattern of Waves Appearing on Metal Foils. Eihachiro Tanaka and Tadatsugu Yoshiki. *Tohoku University, Science Reports of the Research Institutes*, v. 10A, no. 6, 1958, p. 405-413.

Occurrence of the waves was dependent on the front tension, but not essentially on the back tension. These waves were thought to be a kind of the center buckling of strip. 4 ref. (F23; CN, 4-56)

121-F.* Light Sheet-Metal Containers. W. Panknin. *Sheet Metal Industries*, v. 36, Apr. 1959, p. 257-267, 280.

Processes and equipment for the manufacture of cans; collapsible tubes and aerosol containers. (F26s, G5, T10g, 1-52; ST, Sn, Al-b, 4-53, 8-62)

122-F.* Control of the Cold Rolling Process. J. D. Heys. *Sheet Metal Industries*, v. 36, Apr. 1959, p. 281-297, 299.

Requirements of steel strip, techniques for control of properties and dimensions. (To be continued.) 8 ref. (F23, 1-67, X20; ST, 4-53, 18-74)

123-F.* (German.) Production of Zigzag Spring Wire. Phillip Gunther. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 366-367.

Wire drawing, patenting and surface treatment, test methods applied to the finished wire. (F28)

124-F. Cavity Formation and Enfolding Defects in Plane Strain Extrusions Using a Shaped Punch. W. Johnson. *Applied Scientific Research*, v. 8A, no. 2-3, 1959, p. 228-236.

4 ref. (F24a; 4-58, 9)

125-F. (German.) Rolling Tests on Four-Stand Broad Strip Cold Rolling Mill. Hans

Gunter Muller and Werner Lueg. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 325-331.

Possibilities and limitations of final strip thickness control on high-speed multiple-stand rolling mills. Theoretical interpretation of thickness variations caused by changes in roll setup and coefficients of friction. 10 ref. (F23q, W23g, S14; CN)

126-F. (German.) Methods of Bar End Pointing for Cold Drawing. Fritz Kottmeier. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. p. 332-337.

Comparison of merits and limitations of two basic methods, milling and hot rolling. Costs of the two methods are approximately equal. (F27, F23q, G17b)

127-F. (German.) Comparing Pilger-Type Cold Rolling of Tubes With Cold Drawing. Oskar Pawelski. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 365-366.

Comparison of factors such as adaptability, material reduction, wall thickness deviations, material losses and tool requirements leads to the conclusion that both processes have special merits for particular applications. (F26r, F26s; ST)

128-F. (Japanese.) Metal Flow in Forging. Pt. 7. Forging of Steel Balls. Taikichi Awano and Masao Ochiai. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Mar. 1958, p. 155-163, v. 8, Mar. 1959, p. 151-159.

20 ref. (F22; ST)

129-F.* Design Limits Control Costs in Forming Steel Tubing. *Iron Age*, v. 183, Apr. 16, 1959, p. 126-128.

Limits for swaging, expanding, beading, flanging, flaring, spinning and upsetting welded steel tubing. (F26, F25; ST, 17-51)

130-F.* (German.) Predetermining the Tensile Strength When Manufacturing Steel Wire. C. Coates and M. Hempel. *Draht*, v. 10, Mar. 1959, p. 92-93.

Tensile strength as function of length ratio. Variations due to chemical composition, heat treatment and area reduction per draw. (F28, Q27a, 2-64; ST)

131-F. (Russian.) Production of Pipes for Gas and Oil Mains. R. I. Lashkevitch. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 4-6.

Forming and welding processes. 7 ref. (F26p)

132-F. (Ukrainian.) Effect of Lubricant Composition During Cold Rolling on the Coefficient of Expansion of Thin Strip Steel. M. S. Rasechnik and N. A. Kaminskii. *Dopovidi Akademii Nauk Ukrainskii RSR*, Jan. 1959, p. 49-51.

(F23; ST, 4-53, NM-h)

133-F.* High-Speed Drawing of Carbon Steel Wire. W. Holloway, Jr. *Wire Industry*, v. 26, Apr. 1959, p. 353-355, 357.

Requirements, technique, costs, equipment. (F28, W24k, 17-53; CN)

134-F.* (German.) Plastic Deformation Process in Drawing Precision Shapes of Steel. F. Boehm. *VDI-Berichte*, v. 39, 1959, p. 26-31.

Drawing irregular shapes of steel wire to satisfy high accuracy requirements by methods based on analysis of the plastic deformation taking place in the metal. Pointing, descaling, drawing processes, lubricants, drawing dies, passes and percentage of reduction, drawing speeds and heat treatment during and after drawing. 9 ref. (F28, Q24; ST)

135-F.* (Swedish.) The Use of the Hot Torsion Test for Determining the Forgeability of Steel. G. Wallquist and Jan-Christer Carlen. *Jernkontorets Annaler*, v. 143, no. 1, 1959, p. 1-28.

Torsion tests made on 20-mm. test bars of various steels at temperatures ranging from 700 to 1250° C. and with twisting speeds from 10 to 200 rpm. The number of twists to fracture give a good indication of the relative forgeability of the steels. 27 ref. (F22, 17-52, Q1, 1-54, AY)

136-F.* (German.) Developments in Extrusion. W. Linicus. *Industrie-Anzeiger*, v. 81, Apr. 21, 1959, p. 113-115.

Cable sheaths of Al extruded with new type equipment. Russian method using oil as a pad behind the piston and for lubrication. Powdered ZK60XB alloy as a starting material for light metal extrusions. Hydraulic presses used for extruding steel. 7 ref. (F24, 1-52; Al, ST, Mg-b)

137-F.* (Russian.) New Rolling Processes. A. I. Tselikov, E. S. Rokotyan and E. R. Shor. *Metallurg*, Mar. 1959, p. 23-25.

Specially designed mobile welder for butt welding of pipes moves simultaneously with the rolled stock and permits the use of increased billet weight and a larger area reduction per pass. (F26p)

138-F.* (Hungarian.) Semi-Automatic Forging of Axles and Shafts. I. Latinak and G. Pohm. *Kohaszati Lapok*, v. 91, Dec. 1958, p. 564-568.

Impact is applied to the part in rapid sequence from three or four points located at equal radial spacing in the same plane and acting simultaneously, the axial movement being performed by the part. By adjusting the stroke of the impactors dimensional accuracies of 0.008 in. can be attained in hot forging. (F22, T7j)

139-F.* (Hungarian.) Crowning in the Hot Rolling of Aluminum and Aluminum Alloys. Pt. 2. Imre Kohler and Gyula Schultheisz. *Kohaszati Lapok*, v. 91, Dec. 1958, p. 555-558.

Power requirements and influence of lubrication on optimum temperature range for hot rolling of Al-Mg_3, Al-Mg_5 and Al-Cu-Mg alloys. 7 ref. (F23; Al-b, *Mg, Cu*)

140-F. Tube Manufacture From Cold-Rolled Strip. *Light Metals*, v. 22, Apr. 1959, p. 106.

(F26p, 1-52; Al)

141-F. (Russian.) Preparation of Round Thick-Walled Hollow Stock on Tube Rolling Stands. A. P. Ivanov. *Metallurg*, Mar. 1959, p. 28-31.

(F26)

142-F. Effect of Deformation of the Surface Texture on Rolling Resistance. J. Halling. *British Journal of Applied Physics*, v. 10, Apr. 1959, p. 172-176.

Variation of the coefficient of rolling resistance with increasing load for hard rollers on a variety of steel surfaces. 4 ref. (F23, 3-68; ST)

143-F. Some Factors Involved in Forging Titanium and Titanium Alloys. R. B. Rich. Watertown Arsenal. *U. S. Office of Technical Services*, PB 131945, n.d., 36 p. $1.

Effect of temperature, lubrication and strain rate. (F22, 2-61, 3-68; Ti-b, NM-h)

144-F. (Book.) Introduction to Stress Analysis. Charles O. Harris. 330 p. 1959. Macmillan Co., 60 Fifth Ave., New York, $7.50.

Text for engineering students. (F2, G25)

145-F. (Book-German.) Die Forging of Steel. Kurt Lange. 379 p. Sept. 1958. Springer-Verlag, Berlin, Gottingen, Heidelberg, Germany. DM54.

Deformation mechanism of die forging. Hammering, pressing, upsetting, rolling and other die forging processes. Deburring, piercing and other subsequent treatments; defects; materials, design and manufacture of dies. (F22n, W22a, 17-51)

146-F.* (Japanese.) Experiments in Cold Strip Rolling. Hiroo Takahashi and Satoshi Miyoshi. *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 1-11.

Roll loads and torques in rolling of annealed and prestrained steel strip at various reduction rates. Observed values are higher at low reduction and lower at high reduction than the theoretical values. With an increase of the number of passes, coefficient of friction decreases due to work hardening and thin oxide layers. (F23; ST)

147-F. Extrusion Cladding of NRU Fuel Element. H. S. Milne. Chalk River, Ont. *Atomic Energy of Canada Ltd.*, AECL 519, Nov. 14, 1958, 37 p.

Process for extruding the Al sheath directly on the core material is accomplished by a vertical hydraulic press forcing preheated Al billets into a converging chamber of a die-block arrangement. Metal flows around the core material and welds into a continuous sheath over the core as the core is guided horizontally through the die. The size of the die aperture determines the thickness of the cladding. (F24, L22, T11g; Al)

148-F. Fabrication of Uranium Welding Rod. E. L. Brundige, G. S. Hanks and J. M. Taub. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission*, LA-2225, Sept. 9, 1958, 27 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Optimum results are achieved by the extrusion of uranium from a cast billet in the gamma range. The extruded rod is swaged to the desired size and coiled on a graphite mandrel. The coiled wire is then electrolytically cleaned and plated with a 4 to 6 mil coating of Ag. The Ag plate eliminates oxidation problems during storage and materially reduces oxidation during welding. (F24, F25, L17; U, *Ag*)

149-F. The Rolling Pressures of Uranium Sheet and Plate. J. E. Hockett. Los Alamos Scientific Laboratory, *U. S. Atomic Energy Commission*, LA-2233, Jan. 8, 1959, 159 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $3.

Uranium specimens tested in compression at several constant true strain rates and temperatures. From load and time measurements, true stress versus true strain curves are calculated. The method takes into account both roll flattening and inhomogeneity of deformation to calculate the roll pressure distribution along the arc of contact during the rolling of depleted uranium into sheet and plate. (F23, 3-74; U, 4-53)

150-F. (Russian.) Rolling of Twinned Ingots in 1150 Mm. Blooming Mill. A. P. Chermrev, V. I. Meleshko and V. L. Pavlov. *Stal'*, Mar. 1959, p. 243-247.

Major precautions are maintenance of proper rolling rate and avoidance of overloading of motive power of rolling drives. (F23q)

151-F. (Russian.) Rolling of Shapes With Automatic Repeaters. G. P. Klimenko. *Stal'*, Mar. 1959, p. 248-252.

Use of automatic repeaters when rolling shapes reduces labor, rejects and electric power consumption. (F23q)

152-F. Some Metallurgical Considerations in Forging Molybdebum, Titanium and Zirconium. Harry B. Goodwin. *Defense Metals Information Center*, Memorandum no. 12, Mar. 25, 1959, 41 p.

Review of forging temperatures, changes in grain size and transformation structures. (F22, N5, 2-61; Mo, Ti, Zr)

153-F.* Forging of Molybdenum and Its Alloys. J. J. Russ. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 169-173.

Grain size and room-temperature mechanical properties of forgings produced from sintered compacts. Inspection techniques; problems associated with volatilization of Mo trioxide. (F22g, Q-general; Mo-b, 4-51)

154-F.* (Italian.) Production of Cold Rolled Strip With Good Surface Appearance and Mechanical Properties. L. Dainelli and L. Cocciolo. *Metallurgia Italiana*, v. 51, Apr. 1959, o. 145-153.

Cupping and tensile tests on three low carbon steels subjected to various degrees of cold rolling and a range of annealing temperatures. (F23, Q23q, Q27, 1-67; CN-g, 4-53)

155-F.* (German.) Effects of Extruding Conditions and Recrystallization Retarding Agents on Strength and Yield Point of Wrought Aluminum Alloys. Bruno Beyer and Hellmut Seliger. *Neue Hutte*, v. 4, Mar. 1959, p. 165-173.

"Double extrusion" applied to the production of small shapes does not produce any increase in strength. Neither is it achieved with extrusions from ingots when the degree of deformation surpasses a limit. By Zr additions a promotion of the limit to higher deformation degrees and an increase in strength, even with double extrusion, can be obtained. Extruded round bars show the best strength properties. 34 ref. (F24, Q23b, 3-68, 2-60; Al-b, *Cu, Mg, Zr*)

156-F. (Russian.) Finished Mill Products Obtained Directly From Molten Metal With the Elimination of Rolling Operations. Pt. 2. A. L. Shakh-Buragov and A. V. Stepanova. *Zhurnal Tekhnicheskoi Fiziki*, v. 29, no. 3, 1959, p. 394-405.

Mechanical properties of light and heavy strip; rods of different diameters and pipes experimentally produced directly from molten metal are not inferior to mechanical properties of finished products obtained by conventional rolling practice from billets. 5 ref. (F-general, C5q, A9)

157-F. The Forging Industry: Past, Present and Future. G. H. Jackson. *Metal Treatment and Drop Forging*, v. 26, May 1959, p. 191-197.

Press forging; reducer rolls; upsetting; light-alloy forging; hot brass pressing; electrical upsetting; steel and defects; future requirements; spark erosion; cold extrusion of steel and other new forming methods. (F22, G-general; ST, Cu-s)

158-F. (Japanese.) Cold Rolling by the Pilger Process. Toyohiko Okamoto. *Sumitomo Metals*, v. 10, Oct. 1958, p. 258-264. (F26q)

159-F. (Russian.) Machines for Separation of Pack Rolled Sheets. I. B. Rubinshtein. *Stal'*, Apr. 1959, p. 344-347.

Steel sheets produced by pack rolling were successfully separated by specially designed roller equipment, thereby eliminating a number of manual operations. (F23q; ST)

160-F. (Russian.) Automation of Heating in Soaking Pits. I. I. Sterlikov. *Metallurg*, May 1959, p. 42-44.

The conventional practice of measuring the temperature of combustion products

escaping from the top of the pit and then to determine the temperature of the bloom was replaced by a radiation pyrometer which measured the temperature of both the near and the far side of the pit. (F21b, S16b)

161-F.* 1958 Review of Metal Processing Literature (Plastic Working). F. W. Boulger. *American Society of Mechanical Engineers,* Paper no. 59-PROD-5, 1959, 4 p. $.80.

Sheet rolling, cold working, warm working, hot working and extrusion. 47 ref. (F23, F24, G4, G5; 4-53)

162-F.* (Russian.) Effect of Deformation Rate on the Distribution of Specific Pressure During Rolling. M. L. Zaroshchinskit. *Stal',* v. 19, May 1959, p. 433-436.

The rate of deformation has the greatest effect on the specific pressure of the curve of the bite, when the mean height of the rolled bar approximately equals the length of the curve of the bite. 12 ref. (F23, 3-68, 3-74)

163-F. A Summary of the Work Associated With the Solution and Understanding of Stringer-Type Corrosion in Zircaloy-2 and 3. J. G. Goodwin, L. S. Rubenstein, J. D. Grozier and F. L. Shubert. Bettis Plant. *U. S. Atomic Energy Commission,* WAPD-212, Apr. 1959, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Gas-voids formed during inert atmosphere melting become stringers during fabrication, while the walls of the gas-voids are covered with a precipitate which is formed either during the solidification or during fabrication of the ingot. The voids do not seal during fabrication becasue of the pressure built up by the entrapped inert gas. 27 ref. (F23, E10; Zr-b)

164-F. Application of Data-Logging and Programming Techniques to Steel-Mill Processes. R. W. Barnitz and G. E. Terwilliger. *American Society of Mechanical Engineers,* Paper no. 59-AUT-5, 1959, 8 p. $.80.

Automation in rolling mills. (F23, S13, S14, W23p, 18-74; ST, 4-53)

165-F. (Russian.) New Process for Manufacturing High Alloy Tubes. O. A. Plyatskovskii. *Stal',* May 1959, p. 436-441.

Production methods for seamless tubes of medium (102 mm.) and large (209 mm.) diameter increased extension rates and improved tube quality. 9 ref. (F26s; SS)

166-F. (Russian.) Concerning Maximum Angles of Bite During Rolling. A. P. Chermarev, A. A. Dinnik and A. P. Grundev. *Stal',* May 1959, p. 444-447.

Mathematics of the angle of bite. 7 ref. (F23)

167-F.* (French.) Research in Forging at the B.I.S.R.A. (British Iron and Steel Research Assoc.) J. G. Wistreich. *Revue de Metallurgie,* v. 56, May 1959, p. 418-424.

Maximum deformation effected by large press tools occurs at the center of the workpiece while narrow press tools cause deformation appearing close to the surface. (F22, F2; ST)

168-F. (Russian.) Determination of Deformation Resistance by Uniform Upsetting at High Temperature. M. V. Rasteraev. *Zavodskaya Laboratoriya,* v. 25, May 1959, p. 595-597.

This technique is more dependable than the method of approximate computations to determine directly the resistance and specific work of deformation from experiments on plastic and partially plastic alloys. (F22j, Q24)

169-F. (German.) Equipment for the Drawing, Straightening and Bending of Wire. *Draht,* v. 10, May 1959, p. 212-215.

(F28, 1-52)

170-F.* Future Trends in Rolling-Mill Practice and Design. W. M. Larke and D. Bell. *Sheet Metal Industries,* v. 36, May 1959, p. 367-377.

Soaking pits, primary mills, continuous strip mills and rod mills. (F23, W20g, W23, 17-51)

171-F.* (German.) Effect of Carbon, Manganese, Chromium, Nickel and Molybdenum on the Spreading of Steels During the Rolling Process. Walter Grosse and Heinrich Gottwald. *Stahl und Eisen,* v. 79, June 1959, p. 855-866.

Bars and slabs of various carbon and alloy steels were rolled to study the spreading mechanism, influence of alloying elements and rolling temperature. (F23, 2-60, 2-61; CN, AY, *Mn, C, Cr, Ni, Mo,* 4-52, 4-55)

172-F.* (Rumanian.) Rolling of S.G. Cast Iron. S. Bercu, I. Dragan and C. Rizescu. *Studii si Cercetari de Metalurgie,* v. 4, no. 1, 1959, p. 73-82.

Rolling starts from bars heated to 800-1000° C. Optimum temperature lies somewhere between 850 and 975° C. When the

deformation to be achieved exceeds 20%, rolling in several stages is recommended. 6 ref. (F23, 1-66, 2-61; CI-r)

173-F.* (French.) Arsenic, Copper and Traces of Other Elements in Ores, Cast Iron and Steel. *Revue de Metallurgie*, v. 56, June 1959, p. 23-29.

Ways of eliminating Cu, As, Sb, Sn from ores or melts. Harmful effects on forgeability and ductility. (F22, Q23p, 3-69; CI, ST, *Cu, As, Sb, Sn*)

174-F. "Roll Extrusion", a New Metal-Forming Technique. Adolph W. Ernestus. *American Machinist*, v. 103, June 29, 1959, p. 84-86.

Metal is displaced in compression rather than by shearing to produce integrally stiffened panels, cylinders, cones, and other special shapes in heat resistant alloys and light metals. (F24; EG-a39, SGA-h)

175-F.* Forging and the Space Age. J. H. Jackson and H. B. Goodwin. *Metal Progress*, v. 76, July 1959, p. 65-71.

Improved techniques designed to cope with new high-strength materials. (F22)

176-F.* Forging With King-Size Presses. A. E. Favre. *Metal Progress*, v. 76, July 1959, p. 76-79.

Alcoa's large forging presses, which include a 35,000 and a 50,000-ton model, are used to make precision forgings for aircraft and missiles. Higher initial costs are more than compensated for by savings in machining. (F22, W22p; Al)

177-F. Automation in Forging. S. C. Winfield-Smith. *Metal Treatment and Drop Forging*, v. 26, June 1959, p. 231-236.

(F22, 18-74)

178-F. (Translation—Brutcher No. 4567.) Effect of Low-Temperature Rolling on Mechanical Properties of Austenitic Steels. N. N. Lyucheva and N. V. Pisareva. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, April 1959, p. 19-22.

Cold rolling at subzero temperatures increases strength of steel by 20-30%. With low-temperature rolling steel acquires high plastic properties, independently of previous rolling at higher temperatures. Plastic deformation is accompanied by a martensite formation along three planes of an octahedron. Data for 18-8 stainless at 100, 20 and -183° C. 3 ref. (F23q, 2-63, N8p, Q24; SS-e)

179-F. (Russian.) Hot Rolling of Wide Thin Strip on a Stand With a Coiler in the Reheat Furnace. V. I. Bairakov, V. P. Fedin, V. G. Drozd and S. D. Markova. *Metallurg*, June 1959, p. 23-26.

Newly developed installation for rolling 1.5 to 5.5-mm. thick and 600 to 1000-mm. wide strip. (F23, 1-66; AY, 4-53)

180-F. (Russian.) Rolling of Angle Bars Through a Repeater. V. K. Yatsura. *Metallurg*, June 1959, p. 26-30.

(F23; CN)

181-F.* (Chinese.) Lamination Defects in Rimming Steel Slabs. Shao Hsiang-Hua. *Acta Metallurgia Sinica*, v. 4, Mar. 1959, p. 16-21.

Serious lamination defects that often occur in slabs are due to the presence in large rimming steel ingots of inner cavities which contain gases at high pressure and are surrounded by heavily segregated metal. In most cases such discontinuities are sealed during subsequent rolling into plates. (F23; ST-d, 4-52, 5-59, 9-71)

182-F. Forging Characteristics and Properties of HM21XA and EK31XA Magnesium Alloy Production Forgings. J. F. Pashak. Dow Chemical Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151536, Nov. 1958, 171 p. $3.

Forging methods and characteristics of EK31XA (alloy of Mg with Nd and Pr) and HM21XA (alloy containing Mg, 2% Th and 0.6% Mn). Heat treatment and mechanical properties of forgings at room and elevated temperatures. (F22, Q-general, 2-62, 2-64; Mg-b, *Th, Mn, Pr*, 4-51, *Nd*)

183-F. (German.) Deformation Measurements in Re-Rolling. Joseph Billigmann, Josef Lenze and Dieter Schonert. *Stahl und Eisen*, v. 79, no. 14, July 9, 1959, p. 977-989.

Re-rolling parameters influencing the elastic limit and hardness of deep drawing steel strip and baling hoops. 45 ref. (F23, Q21e, Q29n, 3-68; CN, 4-53)

184-F. (Russian.) Rolling of Wide Heavy Steel Plate With Vertical Edging Rolls. M. E. Kugaenko, A. M. Meleshko and M. V. Kovynev. *Stahl'*, June 1959, p. 533-538.

To obtain true parallel edges after cross rolling on a vertical edging stand, the ends of the plate must be widened

before rolling. This compensates for the possible tapering off in the ends and eliminates cropping the narrowed ends as scrap. 7 ref. (F23q, 4-53; CN)

185-F. (Russian.) Roll Pass Design and Rolling of Light-Weight Channels. I. I. Kuchko and Kudrryavtsev. *Stal'*, June 1959, p. 538-543.

Improved roll pass design and the use of closed box passes on a 900-mm. rolling line makes it possible to roll a large (400-mm.) lightweight channel. (F23q, W23k, 17-51)

186-F.* Processing and Properties of Selected Experimental Molybdenum-Base Alloys. T. K. Redden. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 292-305.

High-alloy Mo ingots were successfully converted to bar stock by extrusion and rolling at temperatures somewhat higher than those used commercially. Binary Zr-Mo alloys in range of 0.2 to 0.5% Zr have equal or better strength than commercial 0.5% Ti alloy, and 200 to 500° C. higher recrystallization temperature. Outstanding resistance to recrystallization of 5.0 Ti, 0.25% carbon alloy indicates possibility of developing improved alloys having higher strength and recrystallization temperatures over 3000° F. 6 ref. (F23, F24, N5, 2-60, 2-62; Mo-b, *Zr, C, Ti*, 5-59, SGA-h)

187-F.* (French.) Casting, Extruding and Rolling of Uranium. J. A. Stohr. *Metaux Corrosion Industries*, v. 34, May 1959, p. 179-196.

Effects of working process on properties and structure. (F24, F23, E12; U)

188-F. Target: Beryllium Extrusions. John A. Van Hammersveld. *Machine Design*, v. 31, Aug. 6, 1959, p. 29-30.

Development of methods for bare extruding of Be to aircraft quality. (F24; Be)

189-F.* (French.) Swaging of Copper. Andre Roos. *Cuivre Laitons Alliages*, no. 49, May-June 1959, p. 11-18.

New techniques and equipment used in production of Cu tubes, gas cylinders and nozzles. (F25; Cu)

190-F. Metal Working Lubricants. *Lubrication*, v. 45, July 1959, p. 85-100.

Selection and utilization of lubricants in rolling, forging, drawing, cutting and grinding of metals. (F-general, G-general, NM-h)

191-F.* (French.) Importance of Lubrication in Hot Deformation. Bernard Jaoul and Jacques Sejournet. *Metaux Corrosion-Industries*, v. 34, June 1959, p. 221-235.

Use of vitreous materials in extrusion and upsetting processes. Lubrication rate is determined by deformation speed, modifications of the viscosity in preheating and by tool shape and design. Importance of lubricants for friction reduction, homogeneity of deformation and heat flow. (F24, F22j, G5; NM-h)

192-F.* (French.) Extrusion of Zirconium and Its Alloys With Glass as a Lubricant. G. Leclerc and J. Buffet. *Metaux Corrosion-Industries*, v. 34, June 1959, p. 236-246.

Extrusion at temperatures ranging from 600-900° C.; areas to be lubricated; factors influencing the process in relation to Zr and Zr alloys. Structure of ring-shaped blanks for the extrusion of tubing after hot broaching, and texture of extrusions. (F24, M26; Zr-b, NM-h, NM-f42)

193-F. (Translation—BWRA.) Coiled Flat Aluminum Tube. R. I. Barbanel, I. G. Martinov, and B. F. Lebedev. *Avtomaticheskaya Svarka*, v. 66, Jan. 1959, p. 19-27.

Flat Al tube formed by hot rolling of semi-continuously cast hollow cylindrical ingots. Tolerances and mechanical properties of tubing. Use of flat-coiled tubes. 6 ref. (F26s, Q-general; Al-b, 4-60)

194-F.* Causes and Correction of Extrusion Die Failures. *Precision Metal Molding*, v. 17, Aug. 1959, p. 32-33.

Common failures of Al extrusion dies; types, causes and corrective measures in relation to such tool failures as cracking, caving, heat checking and upsetting. (F24, 1-52, W24n; TS)

195-F.* (German.) Times Allowed for the Production and Control of Grinding and Deseaming of Billets Based on Performance Data. Josef Wolf. *Stahl und Eisen*, v. 79, July 23, 1959, p. 1075-1079.

High time allocations for different billet dimensions are caused by total surface grinding and deseaming of quadratic billets. Estimates are made by means of reference tons determined by time and motion study. Statistical analysis taking into account surface finish and weight per unit. (F21e, F21f, S12; 4-52)

196-F. (Russian.) Rolling of Square Sections With Sharp Edges. I. B. Litovchenko, N. I. Sirazitdinov and I. P. Shulaev. *Metallurg*, July 1959, p. 22-24.

Sharp-edged square sections are obtained when the grooves in the rolls of the last four passes are of the rhombic square design on the diagonal axis with sharp acute angles. The rhombic pass before the last finishing pass has an apex contour that results in a finished square with the desired sharp edge. (F23q; ST)

197-F. (Russian.) Roll Design for Bars. I. M. Konovalov and I. F. Revenko. *Metallurg*, July 1959, p. 25-36.

The most efficient roll design for bars to reduce the number of passes is the rhombic-rhombic contour of roll grooves. It is possible to eliminate two passes by using rhombic-rhombic design. (F23q, W23k, 17-51; ST)

198-F.* New Techniques Broaden Forging Picture. Pt. 1. J. H. Jackson and H. B. Goodwin. *Metal Progress*, v. 76, Aug. 1959, p. 97-102.

Several new forging methods offer much promise. Of these, the counter-blow hammer, the "impacter", the precision forging process, the "continuous grain flow" process and roll forging are discussed. (F22, 1-52)

199-F.* (English.) Drawn Special Carbon and Alloy Steels. *Aciers Fins et Speciaux*, no. 32, July 1959, p. 22-24.

For the fabrication of toolsteel care must be taken to avoid surface defects such as scale, cracks and lines from drawing operations. In rough rolled bars elimination is possible during the machining process. For heat treatable steels surface decarburization must be held to a minimum since heat cannot be subsequently eliminated. (F27, 2-64; SS, TS, 9-71)

200-F.* (English.) The Gueugnon Forging Plant. *Aciers Fins et Speciaux*, no. 32, July 1959, p. 88-102.

Stainless and special sheet production; blooming mills; hot and cold rolling of sheet; strip rolling; annealing and pickling line. Tinning and lead coating equipment. Ferritic, austenitic and heat resisting austenitic sheet compositions. (F22, F23, J23, L16; SS, 4-53, *Sn*)

201-F.* (Italian.) Manufacture of Large-Diameter Tubes. *Fonderia*, v. 8, July 1959, p. 297-301.

Properties required for the steel sheet as a starting material, such as geometric shape, state of surface, with reference to scale and defects. Effect of internal defects and inclusions on quality of tubes. (F26p, 3-73; ST, 4-53, 9-71, 9-69)

202-F.* Unitized Forming + Welding Raises Tube Production. David G. Osterer. *Modern Metals*, v. 15, July 1959, p. 60, 62, 64.

High-frequency resistance welding tools in tube mill produce small-bead welded ferrous and nonferrous metal tubes. (F26p, K5j, 1-52)

203-F. Continuous Trip From Molten Metal to Coiled Strip. *Modern Metals*, v. 15, July 1959, p. 70-71.

Casting and rolling line for continuous production of Al strip. (F23, C5q; Al-b)

204-F. Aluminum Forgings for Precision Tolerances. D. D. Erhard and S. J. Krajewski. *Product Engineering (Design Issue)*, v. 30, Aug. 17, 1959, p. 51-53.

Tolerances are closer than with steel forgings because of the lower forging temperatures, and usually are precise enough to be used "as is"—with machining reserved for only a few of the more critical dimensions. (F22; Al, 4-51, 17-55)

205-F.* (Polish.) Principal Problems in the Production of Heavy Forgings. Zenon Krzekotowski. *Hutnik*, v. 26, June 1959, p. 223-237.

Manufacture and classification of heavy forgings. Choice of the grade of steel; ingot casting; forging and pressing; heat treatment following forging. 10 ref. (F22, D9; ST)

206-F.* (Polish.) Prevention of Flake Formation in Heavy Steel Forgings. W. Luty. *Hutnik*, v. 26, June 1959, p. 237-245.

Factors affecting flake formation originate in the melting processes and pouring but the formation itself takes place during cooling following hot plastic deformation. Preventive measures include continuous casting and heat treatment after forging. 9 ref. (F22, D9; ST, 9-70)

207-F. Inflatable, Seamless Metal Tubing Could Alter Many Fabricating Methods. *Steel*, v. 145, July 27, 1959, p. 106-108.

Metal can be made in foil-thin or regular wall thicknesses, in small or large diameters. Shipped in ribbon form, it's inflated at point of use. (F26)

208-F.* Billet Slicing Marks a Giant Step in Beryllium Fabricating. Clark R. Bennett. *American Machinist*, v. 103, July 13, 1959, p. 103.

Slicing large sintered Be ingot with bandsaw. (F29p, Be, 5-59)

209-F.* New Machine Spirals Welds on Tubing at High Speeds. *Iron Age*, v. 184, Aug. 6, 1959, p. 79-80.

High-frequency resistance welding of steel, Al, Cu or Zr tubes. (F26p; ST, Al, Cu-b, Zr)

210-F.* Application of Stretch Reducing of Tubes for Greater Production and Economy. William Rodder. *Iron and Steel Engineer*, v. 36, July 1959, p. 100-106.

Reductions in diameter and wall of tubes achieved by hot rolling without inside mandrel. Types of stretch reducing mills. Typical rolling schedule. (F26s; ST)

211-F.* High Temperature Mechanical Working of Arc-Cast Molybdenum. D. O. Pickman and E. W. Ward. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 116-124.

Equipment for hot working; data on rolling and extrusion. (F23, F22, F24; Mo)

212-F.* (German.) Pressing of Small Precision Parts With the Help of High Frequency. Roland Hubner. *Industrieblatt*, v. 59, July 1959, p. 293-296.

Blank is heated with high frequency and then hot pressed. Favorable effect of rapid heating on structure. (F22; CN, EG-a39)

213-F. Form Tubing by Inflating Strip Makes Compact System That's Easy to Install. *Iron Age*, v. 184, Aug. 6, 1959, p. 88-89.

(F26)

214-F.* Metal Working Lubricants. *Lubrication*, v. 45, July 1959, p. 85-100.

Properties and characteristics of oils used for hot and cold rolling of Cu and brass, forging, drawing, cutting and grinding. (F-general, G-general; NM-h)

215-F.* (Czech.) Plasticity and Deformation Resistance During Forging. Antonin Vach. *Hutnicke Listy*, v. 14, Aug. 1959, p. 667-670.

Deformation resistance of a material is shown as a function of temperature, modulus of elasticity and direction of deformation in relation to the lattice. 5 ref. (F22, Q23p, Q21a, 3-68, 3-71, 2-61)

216-F.* An Investigation of Aluminum-Copper Composites Prepared by Solid-State Bonding. J. M. Williams and M. B. Bever. *American Society for Metals, Transactions*, v. 52, Preprint no. 175 1959, 13 p.

Composites of Al and Cu were made by a two-step process in which thoroughly cleaned bars were rolled together under heavy reductions and the resulting "green bond" was strengthened by sintering. The processing variables were time and temperature of sintering; two surface conditions were used. Tensile tests with specially designed specimens showed that the bond strength went through a maximum with sintering time. 9 ref. (F23, K5k, Q27; Al, Cu, 7-58, 4-55)

217-F.* Calculation of Rolling Forces Using the Orowan Theory. John E. Hockett. *American Society for Metals, Transactions*, Preprint no. 149, v. 52, 1959, 19 p.

Early theories of rolling and objections to them. Objections to the use of the Orowan "exact" theory; means of overcoming these objections by modifications of the theory and use of electronic computation. Modifications such as corrections for inhomogeneity of deformation and for elastic deformation of the roll enhance the value of the original theory and improve the accuracy of the results. 18 ref. (F23, 10-51)

218-F.* The Effect of Rolling Variables on the Hot Rolling of Titanium and Titanium Alloys. Frank R. Larson and John Nunes. *American Society for Metals, Transactions*, Preprint no. 153, v. 52, 1959, 14 p.

Hot rolling characteristics of Ti-75A, Rc-130A, Ti6A1-4V and Rc-130B alloys rolled at two speeds of 30 and 195 surface ft. per min. at rolling temperatures of 1000 to 2000° F., and reductions ranging from approximately 10 to 50%. Rolling load, specific pressure, lateral spread and forward slip increase with increasing reductions. Increases in rolling load with reduction were most pronounced in the low-temperature range (below the beta transus). (F23, 1-66; Ti-b, *Al, V*)

219-F.* For Best Results Draw-Bend and Braze Stainless Missile Tube Assemblies. H. M. Jenkins. *Tooling & Production*, v. 25, Sept. 1959, p. 60-64.

How and why to draw-bend and braze tubing and fittings where close tolerances and leak-proof joints are required. Use of ball mandrel prevents tube collapse. (F26r, K8; SS)

220-F. (Russian.) Computation of the Coefficient of Friction in the Rolling of Titanium and Its Alloys. I. M. Pavlov and A. E. Shelest. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 105-112.

Coefficient as a function of rolling temperature. 5 ref. (F23, 1-66, Q9p, 2-61; Ti)

221-F. This Man Rolls Metals Ghost Thin. *Steel*, v. 145, Sept. 1959, p. 166-167.

How to roll metals to thicknesses of 0.000085 in. Rolling is performed on a 2-high Sendzimir mill. (F23q)

222-F.* Fabrication of a Zirconium Core Tank. E. C. Miller and G. M. Adamson. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". Pergamon Press, Inc., New York 22, 1959, p. 159-166.

The main pressure-containing vessel is spherical and 5 ft. in diameter, made of 4-in. thick SAE 212 steel clad internally with 0.4-in. Type 347 stainless steel. Inside, and more or less concentric with the pressure vessel, is a 32-in. diameter Zircaloy-2 core vessel. Forming and welding techniques. (F-general, K-general, T11, T26q; Zr)

223-F.* Fabrication of Uranium Base Alloy Fuel Plates for the Experimental Boiling Water Reactor. Robert E. Macherey and Charles H. Bean. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 261-279.

The EBWR is currently fueled with a uranium-base alloy containing 5 % Zr and 1.5% Cb. The fuel is protected from water corrosion and fission product loss by Zircaloy-2 bonded by a hot rolling process. Manufacture of the cladding components from Zircaloy-2 ingot, processing of the cladding billets, and roll bonding heat treatment and finishing of the fuel plates. 13 ref. (F-general, L22, T11g; U-b, *Zr, Cb*)

224-F.* New Techniques Broaden Forging Picture. Pt. 2. J. H. Jackson and H. B. Goodwin. *Metal Progress*, v. 76, Sept. 1959, p. 89-94.

Cored forgings, a unique multiple-ram forging technique, high-energy forming and improvements in conventional methods make better forgings at lower cost. (F22)

225-F.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Rolled Zinc. R. K. Martin and Lewis S. Somers. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 523-533.

Casting slabs and bars; rolling sheet, strip, plate and rods. Photo-engraving plates, dry battery sheels, lithography plates and other applications of rolled Zn. 14 ref. (F23, C5, T9n; Zn-b)

226-F.* Wet Wiredrawing. J. K. Annandale. *Wire Industry*, v. 26, Aug. 1959, p. 741-746.

Wet drawing of steel wires in galvanized, coppered or bright conditions; surface finishes; pretreatments and lubricants; dry and wet wire-drawing machines. (F28h, W24k; ST, 8-65, 8-69)

227-F. (Russian.) Heating Process in a Recuperator Soaking Pit With Central Burner. N. M. Itskovich. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 109-116.

(F21b)

228-F. (Russian.) Determination of the Internal Friction Coefficient. E. F. Sharapin. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 145-149.

9 ref. (F22, Q22)

229-F.* Fabrication of Zircaloy-2 Channels for Vallecitos Boiling Water Reactor Fuel Assemblies. C. N. Spalaris. *Nuclear Science and Engineering*, v. 6, July 1959, p. 37-43.

Process and fixture development for fabrication of square Zircaloy-2 channels. Bundles were welded and then irradiated for various exposures. Corrosion resistance and mechanical integrity proved to be of a high order. (F-general, K-general, T11g, 2-67; Zr-b)

230-F.* An Experimental Approach to Some Control Problems of Multi-Stand Rolling Mills. H. Gill. *Society of Instrument Technology, Transactions*, v. 11, June 1959, p. 97-105.

Model mill of three two-high stands having a 1-hp. main drive was built to study the cold rolling of thin sheet steel in tandem mills. (F23q, W23; ST, 4-53)

231-F.* (German.) Rolling Forces and Torsion Moments Imposed on Low-Carbon Steels During Hot Rolling. Harald Kraut. *Freiberger Forschungshefte*, v. B-36, May 1959, p. 63-82.

Theoretical calculation of imposed rolling forces and torsion moments occurring during hot rolling are compared with actual measured results from the strip section. Resistance to changes in shape was proved to be temperature dependent. (F23, 3-74; CN-g)

232-F.* (German.) Rolling of Flat Products With Increased Direct Pressures and Forming Moments. Georg Juretzek. *Freiberger Forschungshefte*, v. B-36, May 1959, p. 108-126.

Direct pressure is applied as result of vertical pressure to the rolling axis; indirect pressure is achieved by pressure in the direction of the rolling axis. Both direct and indirect rolling pressures are angle dependent. Results show that the rolling pressure remains unchanged up to 30-40° measured from the rolling plane. The influence of the indirect pressure becomes obvious when the specific rolling force is increased which in turn increases resistance to plastic flow. (F23, 3-74)

233-F. (German.) Terms Used in Wire Manufacture and Simplified Methods for Calculation of Processes. A. Mohrnheim. *Draht*, v. 10, Aug. 1959, p. 345-348. 7 ref. (F28)

234-F.* Some Problems in Working Zirconium and Its Alloys. A. A. Kiselev, I. D. Nikitin, I. I. Kornilov, V. A. Fedorchenko, D. D. Sokolov and T. I. Mozhaiskaya. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 52-59.

Annealing, drawing, tube rolling, cold rolling, extrusion, forging and hot rolling of Zr alloys. 5 ref. (F26, F23, F24, J23, Q24; Zr-b)

235-F.* Properties and Production of Aluminum Wire. H. D. Feldmann. *Draht (English Edition)*, no. 42, Aug. 1959, p. 86-93.

Common Al alloys with reference to mechanical properties, available sizes and shapes. Effect of wiredrawing, extruding and roll forming methods, temperature, composition and heat treatment on strength. Theoretical principles of the wiredrawing of Al. (F28, G5, G11, 2-60, 2-61, 2-64, 3-73; Al-b)

236-F.* The Effect of Process Variables on Extrusion Pressures of Lead. J. Frisch and E. G. Thomsen. *Journal of Engineering for Industry (ASME Transactions, Series B)*, v. 81, Aug. 1959, p. 207-216.

Experimental report of effect upon extrusion pressure—displacement diagram of variation in die shape, ram speed, eccentricity of die and number of bars extruded. Both direct and indirect extrusion at constant extrusion ratio. (F24a, F24b, 3-73; Pb-a, 4-55)

237-F.* Approximate Solutions to a Problem of Press Forging. S. Kobayashi and E. G. Thomsen. *Journal of Engineering for Industry (ASME Transactions, Series B)*, v. 81, Aug. 1959, p. 217-277.

Measurement of incremental displacement in step-wise forging and comparison with disk and slip-line theory. Hodographs are constructed for both, assuming axial symmetry. Total forging pressure is derived in dimensionless form. (F2, F22g)

238-F. Development and Properties of Coextruded Zircaloy-Clad Uranium Fuel Elements With Integral End Seals. H. F. Sawyer. Nuclear Metals, Inc. *U. S. Atomic Energy Commission*, NMI-4710, Nov. 6, 1958, 83 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.25.

Fabrication techniques and effect of fabrication variables on the end product. Efforts to produce successful end closures, uniform cladding and metallurgical bonds. 18 ref. (F24, L22, T11g; U, Zr-b)

239-F. Definitions and a Simplified Method of Calculating Wire Processing. A. F. Mohrnheim. *Draht (English Edition)*, no. 42, Aug. 1959, p. 84-86.

Relationships used in wiredrawing practice; process terms; slide-rule methods for the solution of common wiredrawing problems. (F28)

240-F. Rotary Swaging—What It Is—What Can Be Swaged. Pt. 1. Keith Bernhardt. *Tooling & Production*, v. 25, Oct. 1959, p. 56-57.

A fast forging technique. (F25)

241-F. (Russian.) Specialization of Continuous Rod Rolling and Small Section Rolling Stands. I. S. Kagan and V. S. Chernov. *Stal'*, July 1959, p. 636-637.

In rolling rounds of 10-16 mm. diameter it is expedient to switch from short bar rolling to continuous rolling. (F23; 4-55)

242-F.* (Polish.) Forces and Torques Effective in the Hot Rolling With High Drafts of Low Carbon Steel. Zygmunt Wusatowski and Bronislaw Hoderny. *Archiwum Hutnictwa*, v. 4, no. 2, 1959, p. 161-180.

Effects of working temperature and degree of deformation on rolling forces. Mean deformation resistance as a function of temperature. 7 ref. (F23, 1-66, Q23q, 2-61, 3-68; CN-g)

243-F.* Development of New Extruding Techniques for Pure Beryllium and High Temperature Steel. Lyle M. Christensen. *Society of Automotive Engineers*, Preprint no. 98U, 1959, 25 p.

Extrusion of thinner (0.06-0.09 in.) and more accurate sections for use in air and space vehicles is facilitated by use of glass die lubricants, precise temperature control methods and advanced die design and material selection; mechanical properties of extrusions. (F24; ST, Be-a, SGA-h)

244-F. The Structure of Steel. Pt. 13. Structural Effects of Mechanical Working. Edwin Gregory and Eric N. Simons. Edgar Allen News, v. 38, Sept. 1959, p. 200-201.

(To be continued.) (F-general, 3-68; ST)

245-F. (Russian.) Calibration of the Rolling Pass for the Cold Rolling of Tubing. M. Z. Ermanok. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 131-141.

Computations. 13 ref. (F23, 1-67; 4-60)

246-F. (Russian.) Forces Effective in the Extruding of Tubing From TsAM 9-1.5 Alloy. I. L. Perlin and V. K. Korol'. *Tsvetnye Metally*, no. 7, 1959, p. 69-74.

15 ref. (F24, 4-60)

247-F. (Russian--Book.) Rolling and Heat Treatment of Plates. P. G. Islent'yeva, Editor. 152 p. 1959. Metallurgizdat, Moscow. (Available from Library of Congress, Washington, D. C.)

Manufacturing process of rolling carbon and alloy steel plates and modern two-stand tandem, continuous and semi-continuous plate mills; methods of removing defects from billets and slabs and of heating metal in continuous furnaces. (F23, J-general; 4-52, 4-53, CN, AY)

248-F. (Translation--Brutcher no. 4628.) Hydrogen Content and Flakes in Blooms Used in the Production of Heavy Profiles. D. Ya. Povolotskii and A. N. Morozov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 37-41.

Alloy steel was rolled into blooms, allowed to cool to 200-500° C. and then annealed at 660-700° C. for 90-140 hr. Profiles were forged from the treated blooms and subsequently air cooled. Profile sections showed no flakes. 4 ref. (F23, 1-66, F22, N15e, 9-70, 2-64; AY, 4-57)

249-F. (Translation—PERA.) An Electrical Contact Method for Removing the Defect Layer From Ingots. A. L. Livshits and M. E. Yukhvid. *Stanki i Instrument*, v. 30, no. 4, 1959, p. 14-17.

Experimental production process for stripping ingot surface of inclusions before rolling. A rotating disk electrode traverses the ingot surface with a high current a-c. arc discharge, fusing the separated surface. (F21a; 9-69)

250-F.* Application of Press Forged Castings. P. Gouwens, T. Watmough and J. Berry. *Modern Castings*, v. 36, Oct. 1959, p. 47-54.

Experiments substituting an austenitized casting for a last-stage forging blank. Slow forging is a form of cold working at higher temperatures. Strength and hardness are controlled by aging temperature and time to quench to forging temperature. (F22g, E25q, N8f; SS-b, SS-e, 2-64, 2-65)

251-F. Swaging Thin-Wall Super Alloy Tubing. *Western Metalworking*, v. 17, Sept. 1959, p. 44.

Brief description of cold drawing technique used for reducing one end of 2 in. diameter, 0.01 in. wall M-252 tube to 0.5 in. diameter. (F25, G4, 1-67)

252-F.* Forging the Beryllium-Heat Sink. *Light Metal Age*, v. 17, Aug. 1959, 18-20.

Preparation of a Be saucer-shaped disk 80 in. in diameter and 3 in. thick from a 62-in. QMV Be brillet. (F22; Be)

253-F.* Hot Forming Sheet Metal Parts. Alfred F. Hofstatter. *Metal Progress*, v. 76, Oct. 1959, p. 97-99.

Fabrication of parts from 17-7 PH stainless, and commercially pure titanium Ti-75 A. Techniques are outlined which eliminate erratic springback. (F22n; SS, Ti-b)

254-F.* High-Energy Forming With a Machine Tool. Ralph G. Monsees. *Metal Progress*, v. 76, Oct. 1959, p. 111-113.

With high-velocity action, material is formed in only a fraction of the time required by traditional methods. This ultrashort forming cycle allows simplified tooling at lower initial cost, reduces die wear and inhibits growth of scale. Apart from forging, its advantages are generally applicable to other areas of forming, such as extruding and compacting. (F-general, F22, F24)

255-F.* Hot Extrusion. Ahthur B. Tesmen. *Metal Progress*, v. 76, Oct. 1959, p. 114-117.

Process in which metal in the plastic state assumes the shape of the die orifice. Limitations of extruded shapes with respect to size, weight and shape are determined by cross-sectional area, circumscribing circle, length, complexity, thickness, thickness-to-width ratio, extrusion die limitations and required mechanical and metallurgical properties. (F24, 1-66)

256-F.* Characteristics Influencing the Production of Quality Molybdenum Mill Products. Pt. 1. *Industrial Heating*, v. 26, Sept. 1959, p. 1762, 1764, 1766, 1768.

Abstracts of seven papers presented at two sessions on the fabrication of Mo held as part of the "William Park Woodside Panel Conferences" sponsored by A.S.M. during the 40th National Metal Congress, Cleveland, Oct. 1958. (F-general; Mo)

257-F.* Improvement in the Anodizing Properties and Corrosion Resistance of Aluminum Alloys by Hyper-Hotworking. J. Herenguel and P. Lelong. *Metal Finishing Journal*, v. 5, July-Aug. 1959, p. 275-282.

Microstructures present in different shearing zones of direct extruded Al-1% Fe alloy. Effect of structural reorganization resulting from hyper-hot working on pattern of defects developed by anodic oxidation and resistance to corrosion by high-temperature water. 9 ref. (F24a, M26b, Q24m, L19, R4e, 2-62; Al-b, *Fe*)

258-F.* New Tubing Alloy. *Modern Metals* v. 15, Oct. 1959, p. 74, 76.

Development of new Alcan tube-alloy which may be heat treated and exhibits higher strength than extruded 6063 Al alloy. (F24; Al-b, 4-60)

259-F. (Russian.) Metal Flow at the Points of Maximum Deformation During Rolling. I. M. Pavlov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, p. 245-281.

21 ref. (F23, Q24)

260-F. (Russian.) Stress Computation for the Cold Rolling of Tubing. I. M. Pavlov and D. I. Piryazev. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 326-353.

9 ref. (F23, 1-67, F2)

261-F. (Russian.) Combination of the Drawing and Annealing Processes in the Manufacture of Copper Wire. N. K. Laman. *Tsvetnye Metally*, no. 2, 1959, p. 70-74.

4 ref. (F28, J23; Cu)

262-F.* (Japanese.) Cold Rolling of Aluminum. Takashi Ikeno. *Light Metals*, v. 9, July 1959, p. 5-12.

Hardness, hardenability, microstructure and recrystallization as influenced by annealing temperature, pressure during rolling and reduction rate. (F23, 1-67, N5, Q29n, 3-74, 2-64; Al-b, 4-53)

263-F. Contribution to the Present State of Knowledge in Cold and Hot Shaping Processes. Otto Kienzie. *Microtecnic*, v. 13, no. 2, 1959, p. 51-65.

(F23p, 1-66, 1-67; Al, Cu, ST)

264-F. Some Experience in Tube Extrusion. G. Sachs and A. Draper. *Microtecnic*, v. 13, no. 2, 1959, p. 66-76.

7 ref. (F24; Pb, SS, 4-60)

265-F. (Russian.) Effectiveness of the Cold Rolling of Nonferrous Tubing as Compared With Cold Drawing. Yu. F. Shebakin, D. G. Butomo, A. V. Koshurin and Z. L. Sergeeva. *Tsvetnye Metally*, no. 4, 1959, p. 57-63.

4 ref. (F23, G4, 1-67; EG-a38, 4-60)

266-F. (Russian.) New Methods to Produce Sheet From Aluminum and Its Alloys. A. I. Kolpashnikov, Dzya-Min-Guan and V. D. Korolev. *Tsvetnye Metally*, no. 5, 1958, p. 62-70.

Hot and cold rolling. (F23; Al, Al-b)

267-F. (Russian.) Forging of Semiproducts of an Oblong Shape From Low-Plasticity Alloys. L. N. Moguchii. *Tsvetnye Metally*, no. 4, 1958, p. 66-70.

9 ref. (F22, Q23p)

268-F. (Russian.) Drawing of Tubing Without a Mandrel. M. Z. Ermanok. *Tsvetnye Metally*, no. 5, 1958, p. 70-77. 12 ref. (F26r; Al-b)

269-F. Recent Progress in the Field of Heavy Steel Forgings. Paul G. Bastein. *Junior Institution of Engineers, Journal*, v. 69, July 1959, p. 322-351.

Action of vacuum, control of temperature, inspection and testing by ultrasonics. (F22, 1-73, S13g; ST, 4-51)

270-F. Straightline Non-Slip Wire Drawing With Electrical Equipment Using Alternating Current. Robert H. Geiss. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1361, 1380-1381.

Data on high-carbon steel. (F28; CN-r)

271-F. (Polish.) Calculation of Carbon Content of Cast Iron in a Cupola. Roman Krzeszewski. *Przeglad Odlewnictwa*, v. 9, June 1959, p. 169-172.

Method of calculation of carbon content in the charge. (E10a; CI)

272-F. (Russian.) Rolling of Tubing From Aluminum Alloys. I. A. Fomichev, N. F. Sai and B. F. Rumyantsev. *Tsvetnye Metally*, no. 6, 1959, p. 75-79. (F26s; Al)

273-F.* How to Get Stronger Parts From Work-Hardened Sheet Metal. Herbert A. Jahnle. *Product Engineering (Design Issue)*, v. 30, Oct. 26, 1959, p. 76-78.

Effect of rolling direction; effective design for welded sheet metal joints. (F23, K-general; 17-51, 4-53)

274-F.* Production of Pressed-Steel Bath Tubs. *Sheet Metal Industries*, v. 36, Oct. 1959, p. 631-636.

Prestressing, finishing, drawing, rolling, pressing, hardening, enamelling and spraying procedures. Automatic feed guarantees uniformity in sheet thickness. (F27, F23; ST)

275-F.* Fully Automatic Cold Rolling. *Sheet Metal Industries*, v. 36, Oct. 1959, p. 657-659.

Greater strip quantity per shift, better maintenance of gage tolerance limits and reduced influence on gage of periods of acceleration and deceleration of the mill contribute the main advantages of the fully automatic cold rolling process. (F23q, 1-67; 4-53, ST)

276-F.* Forces on the Rolls of a Four-High Driven Back-Up Mill. C. W. Starling. *Sheet Metal Industries*, v. 36, Oct. 1959, p. 667-674.

In thin strip rolling of hard alloys the use of small diameter work rolls is used. Power reduction is achieved together with the possibility of light gage production with a minimum of passes. Equations show the relationship between the rolling load and the reaction on each back-up roll. (F23, W23c; ST, 4-53)

277-F.* The Drawing and Handling of Long Production Run Wire Coils. Uno V. Johnson. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1281-1283, 1402-1405.

Process for welding, patenting and cold drawing carbon steel rod. (F28, K3n; CN, 4-61)

278-F.* Trends in Copper and Copper Alloy Rod and Wire. Richard J. Christine. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1285, 1288, 1405-1407.

Data on brass and some newer Cu alloys; properties affecting their processing into wire and rod. (F28; 4-61, Cu-b, Cu-n)

279-F.* Some Metallurgical Factors in the Manufacture of Fine Wire. C. M. Jackson, J. G. Dunleavy and A. M. Hall. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1349-1352, 1396-1401.

Melting, casting, hot working, annealing, cleaning. Effects of process variables on ductility, drawability and general quality of the finished product. (F28, E-general, F-general, 2-64, Q23p; 4-61)

280-F.* (German.) Rolling Load and Rotation Moments in the Hot Rolling Process. R. B. Sims. *Freiberger Forschungshefte*, v. B46, 1959, p. 1-115.

Determination of required rolling loads for the hot rolling of flat passes. Deformation strength is a function of temperature, deformation velocity and alloy composition. 12 ref. (F23, 1-66, 3-68)

281-F. (Russian.) Reliability of Tube Drawing With a Drawing Plate and a Floating Mandrel. I. L. Perlin. *Tsvetnye Metally*, no. 9, 1958, p. 58-61. (F26r)

282-F. (Russian.) Cold Rolling of Profile Tubes. Yu. F. Shebakin and A. M. Rytikov.

Tsvetnye Metally, no. 12, 1958, p. 70-77. 4 ref. (F26s, 1-67; EG-a38)

283-F. (Russian.) Strength Properties of a Titanium-Aluminum Alloy With 5% Aluminum Under the Conditions of Hot Deformation by Pressure. S. N. Dontsov and S. I. Berman. *Tsvetnye Metally*, no. 11, 1958, p. 71-77.

12 ref. (F22, F23, Q27a, 2-62, 3-68, 3-74; Ti-b, *Al*)

284-F.* (Japanese.) A Study on the Deformation of the Second Phase in Two-Phase Alloys by Cold Rolling. Shigeo Muromachi and Shigenori Hori. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 433-437.

Deformation by cold rolling of Sn-Al, Sn-Sb, Cu-Zn, Cu-Al, Al-Si and Al-Fe-Si alloys. Influence of crystal structure on hardness and deformation. 4 ref. (F23, 1-67, Q24, M26, 3-68; Sn-b, Al-b, Cu-b, *Zn, Sb, Si, Fe*)

285-F.* (Japanese.) Hot-Cold Work and Bending Creep Property of 16-15-6 Type Alloys. Masazo Okamoto, Ryohei Tanaka, Akira Sato and Takeo Ishizuka. *Tetsu to Hagane*, v. 45, May 1959, p. 517-522.

Hardness becomes higher by hot-cold working than by cold working and this becomes significant with increasing nitrogen and carbon content. Hot-cold worked specimens maintain higher hardness than those solution treated even after aging at 700° C. for 500 hr. The hardness distribution of the specimens became heterogeneous and the hardness in the outer layer was considerably higher than that in the inner layer. 10 ref. (F23, 1-66, 1-67, Q29n, Q5, 2-65; ST, *Cr, Ni, Mo, Mn*)

286-F. (Czech.) Extension of Tubes. E. Streska. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 856-861.

Extension by transverse rolling, drum extension and chuck and special methods. (F26)

287-F. (Czech.) Heat Resistant Austenitic Cr-Mn Stainless Steel for the Economical Production of Seamless Tubing. F. Poboril. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 861-864.

(F26q; SS-e, *Cr, Mn*, SGA-h)

288-F. (Czech.) Statistical Methods for Quality Control in Tube-Rolling Mills. M. Knotek and R. Vojta. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 871-875.

Use of mathematical statistics in analysis and control of production processes. (F26s, S12)

289-F.* Piercing and Extruding an Aluminum Billet. T. L. Bertier, Jr. *Light Metal Age*, v. 17, Oct. 1959, p. 14-15.

Tubing up to 80 ft. long can be successfully produced from a billet of 6063 Al by piercing and extruding with a hydraulic press. (F24; Al, 4-52, 4-60)

290-F.* Preforming Now Permits Drop-Hammer Use. *Metalworking*, v. 15, Nov. 1959, p. 77-79.

Newly developed preforming technique allows drop forging high-strength steels, Ti, Al, Mg and other difficult to form metals. (F22n; ST, SGB-a, Ti, Al, Mg)

291-F.* Fabricating Techniques for Reactor Components. M. J. Glavez and John J. Mueller. Paper from "Metals for Nuclear Reactors". American Society for Metals, Metals Park, Novelty, Ohio, 1959, p. 63-93.

Toxicity and pyrophoricity problems. Materials and fabricating techniques for fuel elements, control rods and moderators. Welding Al alloys, austenitic stainless steels, stainless-clad carbon steels and Zr. Brazing of Al alloys and stainless steels. (F-general, K1d, K3, K8; U, Al-b, SS, ST, Zr)

292-F. (Translation.) Some Experiments on the Cold Strip Rolling. Hiroo Takahashi and Satoshi Miyoshi. *Journal of Mechanical Laboratory of Japan*, v. 5, no. 1, 1959, p. 35-43. (From *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 1-11.).

See item 146-F, 1959. (F23; ST)

293-F. (Translation—Brutcher no. 4439.) New Method of Determining Forgeability of Metals. D. I. Berezhkovskii. *Zavodskaya Laboratoriya*, v. 24, no. 7, 1958, p. 858-860. (F22, 17-52)

294-F. (Translation—Brutcher no. 4485) Vibro-Forging of Aluminum Alloys. M. Ya. Karnov and S. N. Shestakov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 57-59.

Conditions for vibrational press working by cold or hot upsetting of hot pressed Al alloys. (F22j; Al-b)

295-F. (Translation—Brutcher no. 4488.) Apparatus for Drawing Metals and Rolling Them With Free-Running Rollers in a Liquid Under High Hydrostatic Pressure. B. I. Beresnev. *Tsvetnye Metally*, v. 31, no. 8, 1958, p. 61-63.

(F28, F24, F23, 3-74)

SECTION G

SECONDARY MECHANICAL WORKING

1-G.* Thread and Form Rolling. D. H. Seymour and F. M. Lomas. *Machinery (London)*, v. 93, Sept. 17, 1958, p. 673-677.

Development of materials with improved forming properties and in the design and construction of thread rolling machines. Techniques considered are rolling of worm gears, splines and knurled surfaces, burnishing and straightening operations. (G11, G12)

2-G.* Operations on Components for Missile Guiding Equipment. F. A. Cuthbertson. *Machinery (London)*, v. 93, Oct. 8, 1958, p. 818-823.

Small pivots are rough machined on Tornos Swiss-type automatics, and after hardening and electrochemical cleaning, are finished on a Hauser pivot-burnishing machine. The pivot portion is first semifinished with a ceramic wheel, then finished with a tungsten carbide wheel. Precision-boring of the Al alloy gimbals is performed on a battery of six Heald Bore-Matics. A Barber-Colman hobbing machine is used to cut fine-pitch gears. (G17, T24e)

3-G.* (Japanese.) Machining Performances of Domestic Ceramic Tool and Its Wear Processes. Hidehiko Takeyama and Teruni Murai. *Journal of Mechanical Laboratory*, v. 12, July 1958, p. 118-124.

Tests were performed comparing machining performance and wear processes of ceramic tools with carbide tools. For Meehanite cast iron ceramic tools gave substantial increases in cutting speed and tool life. Results indicate need for increased tool toughness. (G17, Q9, T6n; CI-b, SGA-j, 17-52)

4-G.* (Japanese.) Photo-Elastic Analysis of Machining Stresses. Pt. 1. Distribution of Frictional and Normal Stresses on Rake Face. Eiji Usui, Hidehiko Takeyama, Shoji Shimamura and Toshiaki Oguchi. *Journal of Mechanical Laboratory*, v. 12, July 1958, p. 125-130.

The photo-elasticity of a special epoxy resin tool was used to ascertain the distribution of stresses on the rake face of the tool while machining Pb. The frictional stress was uniformly distributed over a wide range of tool-chip contact length, transistionally near point of separation. Normal strength was extremely high near the cutting edge but rather stationary in the middle part of the tool-chip contact length and decreased gradually to zero in the rest of the tool-chip contact length. 6 ref. (G25, G17, Q9p, T6n; Pb)

5-G. Machining Titanium. Pt. 2. M. C. Shaw, P. A. Smith, B. Colding and N. H. Cook. Massachusetts Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131536, Feb. 1957, 100 p.

Machining characteristics of clamped carbide tools when machining Ti alloys and AISI 4340 steel are compared. The relative machinability values (based on relative machining cost per part) were determined. Optimum tool life for the eight-edged clamped carbide tool was about 17 min. for any of the Ti alloys. A hard finishing grade cast iron type carbide was superior in machining Ti provided it did not chip. Ceramic tools gave poor results. Unlike steel under identical conditions the relative amount of rake wear decreased when a Ti alloy was machined at increasing speed. (G17k, Q9, T6n, 1-59; ST, Ti-b, SGA-j, NM-h)

6-G. Producing Electrical Components on Automatic Machines. *Machinery*, v. 93, Oct. 8, 1958, p. 815-817.

One machine is arranged for the automatic production of plug pins from coiled brass wire, and the second machine carries out secondary operations on previously turned terminal sleeves. (G17, T1, 18-74; Cu-n)

7-G. Large Extrusion Press Rams Reconditioned by the Master-Hone Process. *Machinery*, v. 93, Oct. 8, 1958, p. 843-844.

(G19n, W24g, 18-72)

8-G. Machining Blades for Gas Turbine Units. Pt. 3. *Machinery*, v. 93, Oct. 29, 1958, p. 976.

Methods and equipment for machining master cams for the aerofoil milling, grinding and polishing machines. (G17, T7h; SS, 18-74)

9-G. (German.) Precision Stamping. Hans Stadtman. *Industrielle Organisation*, v. 27, no. 5, 1958, p. 135-142.

(G3)

10-G. (German.) Practical Tips for Cutting Stainless and Heat Resisting Steels. Pt. 1. *Technica*, v. 7, June 20, 1958, p. 751-754

Composition of rustproof, heat resisting, and scale resistant steels. Physical, mechanical and chemical properties of three sample steels. Difficulties in machining. Tools and machine tools used. (To be continued.) (G17; SS)

11-G.* An Analysis of the Mechanism of Orthogonal Cutting. Keiji Okushima and Katsundo Hitomi. *Kyoto University, Faculty of Engineering, Memoirs*, v. 20, Apr. 1958, p. 95-116.

Theoretical analysis of mechanism of orthogonal cutting based on the flow region concept; data obtained with orthogonal dry cutting of such materials as lead and brass which produce a simple continuous chip. 8 ref. (G25; 10-51, Pb, Cu-n)

12-G.* Contribution to the Study of Ceramic Cutting Tools. R. Weill. *Microtecnic*, v. 12, no. 2, 1958, p. 51-63.

Composition, properties of ceramic tools. High cutting speed, ability to machine abrasive materials, simple construction noted. (G17, T6n, SGA-j, 6-70)

13-G. Electrolytic Saw. M. Metzger. *Review of Scientific Instruments*, v. 29, July 1958, p. 620-621.

Strain-free cutting of metallic crystals at moderate rates can be obtained by localized electrochemical dissolution using a wire cathode. The width of the attacked zone is limited by applying a protective plastic film. Clean, sharp cuts cannot generally be expected. (G24d; Al)

14-G.* Explosive Forming Breaks Fabrication Bottleneck. Irwin Stambler. *Space Aeronautics*, v. 30, Nov. 1958, p. 50-52, 54-55.

Material to be formed is held in place over a large, bowl-shaped, portable metal mold backed in ordinary concrete. Air is pumped from mold to form a partial vacuum and an explosive charge is suspended above the blank. (G-general; ST, NM-k34)

15-G. Development and Application of Trepanning. Arthur C. Heidenreich. *American Society of Mechanical Engineers*, Paper no. 58-A-183, 1958, 8 p.

(G19r)

16-G. Red Ring Broaching Process for Cutting External Gears. *Machinery (London)*, v. 93, Nov. 12, 1958, p. 1121-1122.

(G17g)

17-G. Metal-Working Processes and Equipment. Pt. 1. A. G. Thompson. *Welding and Metal Fabrication*, v. 26, Nov. 1958, p. 405-411.

Survey of machines, including purpose, principles of operations, range of application, typical machines. (G-general; 10-54)

18-G.* Improving Punchability of Silicon Steel. C. S. Wukusick and R. S. Zeno. *Tool Engineer*, v. 41, Dec. 1958, p. 63-70.

Punchability can be improved if scale is removed before punching or treatment is such to obviate scale. Punchability is function of material properties and punching practice. 5 ref. (G17k; AY-b, *Si*, SGA-n)

19-G.* (German.) Flame Gouging in Production and Repair Work. H. H. Grix.

Schweissen und Schneiden, v. 10, Oct. 1958, p. 395-400.

Equipment and operation. Properties of gouged welds show improvement in tensile strength up to 10%, reducing need for final grinding. Applications in large welded vessels of wall thickness up to 5 in. and length up to 25 ft. Cost of weld finishing up to six times less than for similar mechanical processes. Grooves of uniform depth and width easily obtained; particular importance in automatic welding. (G22, K9p)

20-G.* (German.) Problems in Machining Titanium Alloys. Milton C. Shaw. *Technische Mitteilungen*, v. 51, May 1958, p. 211-216.

Nature of Ti alloys. Comparison of properties of Ti with steel, stainless steel and Al. Chemical and mechanical properties of four Ti alloys. Equation for estimating influence of material properties and cutting conditions on cutting temperature. Tool life for Ti compared with steel and Al. Cutting power and specific work for Ti compared with steel. (G17k, G18; Ti-b)

21-G.* (French.) How to Improve Your Processes of Cylindrical Finish Grinding. J. A. Mueller. *Machine Moderne*, no. 594, Sept. 1958. p. 21-24.

Basic factors are transverse speed, cutting speed, approach, depth of pass and retraction. Transverse speed determines rhythm of production: too high deteriorates grinding wheels, raises costs, makes poorer surfaces. With increased cutting speed finishing is less accurate, grinding wheel deteriorates. Best result in finish is to reduce transverse speed, increase cutting speed to make a slower approach. If spindle power is weak, lower grade grinding tools are necessary and operation becomes costly. Retraction must be equal to or less than approach, or pitting results in grinding wheel. Total condition of the machine and outside vibrations affect performance. Cutting liquids (oil or detergent) must be chosen for metal and grinding wheel and used generously. (G19q, W25s)

22-G. Capabilities and Limitations of Chemical Milling. *Australasian Manufacturer*, v. 43, Oct. 4, 1958, p. 54, 56-57.

Comparison with machine milling. (G24b)

23-G. Machining Stainless Tough? Try Unorthodox Methods. *Carbide Engineering*, v. 10, Nov. 1958, p. 21.

Negative rake angles, high speeds, high feeds and soluble-oil coolant used with small throw-away inserts increase tool life 400%. (G17; SS)

24-G. Mechanics of Orthogonal Machining. W. B. Palmer and P. L. B. Oxley. *Chartered Mechanical Engineer*, v. 5, Nov. 1958, p. 419-420.

4 ref. (G17)

25-G. Step Cutter Mills Tough Jobs With Indexable Carbide Tips. *Iron Age*, v. 182, Nov. 20, 1958, p. 108-109.

Progressive "bites" with sets of throwaway carbide wafers let this tool cut faster, smoother and at less cost. (G17b; ST, 6-69)

26-G. New Techniques for Grinding Sintered Carbides. E. Zmihorski. *Machinery (London)*, v. 93, Nov. 19, 1958, p. 1186-1188.

Raising temperature of the tool to between 750 and 850° C. prior to grinding, and maintaining it at this temperature during the operation, materials can be ground with standard corundum or silicon carbide wheels. Finish grinding done by an electrolytic method. (G18, T6n; 6-69)

27-G. Interblanking of Metals. O. C. Hermann. *Metalworking Production*, v. 102, Nov. 14, 1958, p. 1991-1994.

An insert, either harder or softer, can be blanked into a base metal to act as a bearing surface or other function. (G2h; Cu, ST, Al-b, Cu-n)

28-G. Latest Progress in the Field of Electro-Erosion Machining. Y. S. Kroundycheff. *Microtechnic*, v. 12, no. 4, 1958, p. 206-209.

Two principal methods are continuous action of the current and action of a make-and-break current. The former is used primarily for destructive pruposes, the latter in all electro-erosion machines. (G24a)

29-G. Deep Drawn Shells for Magnesium Luggage. Louis Degen. *Modern Metals*, v. 14, Nov. 1958, p. 60, 62-63.

(G4b, T10k; Mg-b, 4-53, 4-58)

30-G. Testing Soluble Cutting Oils. Edmond J. Ritter and Jo Ann Amspaugh. *Production*, v. 42, Nov. 1958, p. 66-67.

(G17; NM-h)

31-G. Special Machine Jacks Up Quantity and Quality. *Steel*, v. 143, Nov. 24, 1958, p. 104-105.

Specially converted milling machine for bronze castings. (G17b, W25r)

32-G. Modern Methods of Fabricating Structural Steelwork. M. F. Palmer and R. J. Fowler. *Structural Engineer*, v. 36, Nov. 1958, p. 365-376.

Flame cutting and electric-arc welding; radiographic inspection. (G22, K1, S13e; ST)

33-G. Superalloys Formed With Explosives. Paul J. Wolf. *Tool Engineer*, v. 41, Dec. 1958, p. 78-82.

Forming, swaging, forging, extrusion, bulge forming, cutting and flattening by explosive. (G-general; NM-k34, SGB-a)

34-G. (French.) Operational Techniques on Multispindle Screw Machines. G. J. Granger and R. Clausse. *Pratique des Industries Mecaniques*, v. 44, Aug. 1958, p. 203-207.

Boring and drilling defined; types of reamers and drills; speeds, feeds, chip formation. (To be continued.) (G17)

35-G. (Japanese.) Machinability of Ceramic Tools. Pt. 1. Ulta-High-Speed Lathe for Machinability Studies of Ceramic Tools. Hisao Mii, Kunio Yamada Noboru Nakayama, Eiichi Ota, Hiroshi Kajiwara and Seisuke Sakai. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Sept. 1958, p. 8-12.

(G17k, T6n; SGA-j)

36-G.* Machining of Cobalt Superalloys. *Precision Metal Molding*, v. 16, Nov. 1958, p. 36-37.

Drilling, turining and facing, milling, broaching, reaming, shaping and cutoff operations. Many of the machining techniques used with austenitic stainless steels work with the superalloys. (G17; Co-b)

37-G.* (German.) Influence of Speed on the Deformation Limit in Deep Drawing. J. Novotny. *Fertigungstechnik*, v. 8, Aug. 1958, p. 361-365.

Deep drawing of steel, brass, stainless steel and Al can be considerably speeded up if high-quality lubricants are used. Best lubricants are Mo-sulphide base. (G4b; ST, SS, Cu-n, Al-b, NM-h)

38-G.* (German.) Hammer Pressing of Hemispheres From Sheet Metal. H. Gross. *Fertigungstechnik*, v. 8, Aug. 1958, p. 366-367.

Deep drawing of hemispheres from thin and medium sheet metal varies with thickness of material and diameters of hemispheres. The lower the ratio the more difficult the processing. Recommends material of high strength and low elasticity. (G4d; 4-53)

39-G.* (German.) Application of Oxy-Acetylene Cutting and Flame Shaping in Hammer Forging Practice. E. Pflaume and W. Winter. *Fertigungstechnik*, v. 8, no. 10, 1958, p. 444-454.

Preparation of semifinished raw materials for hammer forging by autogenous cutting opens new fields of application. Use for the oxy-actylene flame is the shaping of finish-forged pieces following the forging process to eliminate blemishes and to smooth the surface. 14 ref. (G22g, F21, F22)

40-G.* (German.) Slab Milling With "Porcupine-Type" Cutters. G. Schroter. *Fertigungstechnik*, v. 8, no. 10, 1958, p. 463-465.

Combined effect of staggered roughing teeth and plain finishing blades in the slab milling cutter produces high rate of chip removal and smoothly machined surfaces. Design principles regarding dimensions and spacing of cutter teeth for proper load distribution. (G17b, T6n, 17-51)

41-G.* (German.) Establishment of Cutting Speeds and Feeds for Carbide Milling. H. in der Wiesche. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 529-531.

Instructions for designing graphs showing life expectancy of tools and for determining the most favorable service life for the cutter. (G17, Q9, T6n; 6-69)

42-G.* Surface Finish--Metallurgical and Mechanical Aspects. K. G. Lewis. *Metal*

Treatment and Drop Forging, v. 25, Aug. 1958, p. 335-342.

Various expressions used in study of surface finish, with important machine and material variables which affect them. Chip formation and formation of built-up edge; influence on surface finish. Formation of "smear metal" and means for its removal. 31 ref. (To be continued.) (G17, S15; ST, 1-52, 17-52)

43-G.* Chemical Milling Broadens Magnesium-Thorium Alloy Use in Missiles. *Modern Metals*, v. 14, Aug. 1958, p. 62-64.

New techniques reduce costs, eliminate health hazards, simplify machining processes in fabrication of aircraft and missile components. New alloys retain high mechanical properties in 350 to 500° F. range. (G24b, T24e; Mg-b, *Th*, 17-57)

44-G.* (Slovak.) Cutting With a Tungsten Electrode Under a Protective Gas Atmosphere. Michal Matejec. *Zvaranie*, Sept-Oct. 1958, p. 303-307.

Directions for cutting; amperages, voltages, gas flow, welding speed for different thicknesses of Al-Mn, 99.5% Al and Al-Mg. (G22h; Al-b)

45-G.* A Photo-Elastic Analysis of Machining Stresses on Rake Face. Biji Usui and Hidehiko Takeyama. *Journal of Mechanical Laboratory of Japan*, v. 4, no. 1, 1958, p. 6-14.

Frictional stress on the lead rake face is distributed uniformly over a wide range of the tool-chip contact length but decreases rapidly near the point of chip-separation on the rake face. Normal stress has peak near the cutting edge, being rather stationary in the middle part of the contact length and decreasing gradually towards point of chip-separation. 4 ref. (G17, G25; Pb-b)

46-G.* (English.) Analysis of Mechanism of Orthogonal Cutting. Keiji Okushima and Katsundo Hitomi. *Kyoto University, Faculty of Engineering, Memoirs*, v. 20, Apr. 1958, p. 95-116.

In orthgonal cutting a simple continuous chip is produced. Instead of conventional shear plane a transitional range or flow region is assumed to exist between the rigid region of the workpiece and the plastic region of steady chip. Derivation of expressions which can be applied to a wide range of cutting conditions. Experimental data for Pb and brass. The starting boundary line of the flow region situated under conventional shear line and the ending boundary line above it. Influence of rake angle and depth of cut, on strain of chip, the inclination angles of boundary lines and the sector angles of flow regions. 8 ref. (G17, G25, Q24h, Q2j; Cu-n, Pb)

47-G. A Guide to Rough Grinding Carbide Tools. Richard A. Parke. *Grinding and Finishing*, Nov. 1958, 28-30.

Grinding by silicon carbide and diamond grinding wheels. (G18, Tbn, 6-69)

48-G. Better Diamond Dressing for Precision Grinding. H. B. Patterson. *Grinding and Finishing*, Nov. 1958, p. 32-34.

(G18; NM-k37)

49-G. Machining With Chemicals. D. J. Fishlock. *Metalworking Production*, v. 102, Nov. 21, 1958, p. 2045-2048.

(G24b)

50-G.* (French.) Compression in Pressing Operations. J. Guyot and P. Mercier. *Revue de Metallurgie*, v. 55, Sept. 1958, p. 801-814.

Pressing of sheet metal entails not only deformation by extension but also deformation under compression. Simple test designed to determine behavior of metal under compression uses tension test machine and "flat drawing" accessory. Coefficients of compression bear no relation to coefficients of elongation. Results on several grades of steel and Cu, brass and Al sheet. (G1, Q28g; Al-b, Cu-b, ST, 4-53)

51-G. (Book-Russian.) Technology of Cold Stamping. A. N. Malov. 375 p. 1958. Oborongiz, Moscow, USSR. 19 R.

Stamping machinery and techniques. (G3, 1-67, W24g)

52-G.* (Russian.) Technology and Economics of Air-Arc Cutting. I. S. Shapiro. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 33-34.

The greater the current value, the greater the effectiveness. (G22h)

53-G. Machining Operations on Honeycomb Structures. R. G. Kellner. *Machinery*, v. 93, Dec. 3, 1958, p. 1295-1300.

Milling, grinding and sawing; filler material. (G17; 7-59)

54-G. Indenting and Embossing. Arnold Throp. *Sheet Metal Industries*, v. 35, Dec. 1958, p. 917-922.

Processes and machinery. (G3p, W24n)

55-G. Progress in the Application of Carbide-Tipped Gun Drills. Watervliet Arsenal. *U. S. Office of Technical Services*, PB 131644, n. d., 40 p. $1.25.

One of the outstanding features attributed to this drilling technique is that potentially any component, regardless of size, can be gun drilled. It is possible to produce a hole in one pass that will have less than 0.002 in. per ft. runout, a diameter within 0.0005 in. of the prescribed dimension, and a surface finish smoother than 16 micro-in. (G17e, T6n; AY, 6-69)

56-G.* (German.) Economical Machining of Gas, Water and Special Fittings. Robert Richter. *Werkstatt und Betrieb*, v. 91, Oct. 1958, p. 609-612.

New method based on appropriate equipment developed for machining fittings made of different materials in the most diverse and intricate shapes. Machining proceeds entirely automatically and is equally adaptable for medium and large lot sizes. The parts are machined from three angles simultaneously, clamping is included in the cutting time and carbide tools are used. (G17, T6n; 6-69)

57-G.* (German.) Deep Drawing of Metals. Alfred Harer. *Werkstatt und Betrieb*, v. 91, Oct. 1958, p. 625-629.

Survey of rules governing design of drawing tools and methods used to determine dimensions of blanks. Drawing ratios for various metals, edge radii for drawing rings and punches, tool clearances, down holders, power requirements of drawing operations, lubricants and special drawing methods; formulas for designers, supported by practical examples. (G4b)

58-G. (German.) Improved Spark Erosion Process. *Werkstatt und Betrieb*, v. 19, Oct. 1958, p. 619.

Simplified version of frequently applied production process designed particularly for removal of broken tool stubs. (G24a)

59-G. (German.) Shaving, a Method in Pressworking of Metals. Rene Haag. *Werkstatt und Betrieb*, v. 91, Oct. 1958, p. 624.

In certain cases hole diameters can be made within a tolerance of ± 1 micron and the distance between hole centers within a tolerance of 3 microns. Shaving tools made of carbide produce surface finishes equivalent to ground surfaces. (G2)

60-G. (German.) Duplicate Cutting of Sheet Metals by the Nibbling Process. *Werkstatt und Betrieb*, v. 91, no. 11, 1958, p. 667.

Permits cutting out complex shapes of metal sheets without previous layout or scribing, because patterns used are duplicated by the machine. (G17; 4-53)

61-G.* (French.) How to Select Soluble Oils According to Machining Needs. S. C. Zylstra. *Machine Moderne*, v. 596, Nov. 1958, p. 34-46.

Increased feeds, speeds, tool life and quality of surface finish result from use of high-output soluble oils. Chemical or synthetic cutting liquids contain from 50 to 60% water. Their pronounced lubricating propriety diminishes wear and improves surface finish. Factors to be considered in selecting soluble oils are price, mixing ratio of oil to water, flexibility of application, and possibility of adding bactericides. (G17; NM-h)

62-G.* (French.) Machining of Refractory Alloys. A. B. Albrecht. *Machine Moderne*, v. 596, Nov. 1958, p. 41-44.

Based on composition and machinability, four categories of refractory alloys are compared: (1) ferritic steels containing Cr and Cr-Ni, (2) austenitic alloys of Cr-Ni-Mo, (3) age hardening alloys of high Ni content, and (4) cobalt alloys. Variables influencing deformation of machined object are analyzed. Analysis of tools according to grades and profiles, and cooling liquids according to alloys machined. (G17; SS, Co-b, Cr-b, Ni-b, EG-d)

63-G.* (German.) Mechanics of Metal Cutting. Gerhard Rohlke. *Werkstatt und Betrieb*, v. 91, Aug. 1958, p. 473-483.

Method of carrying out orthogonal machining allows the share of rake friction in the cutting force to be calculated from three measurable force components. Relationship of rake angle, shearing angle with shearing angle stress and cutting

force. Evaluation of four different shearing angle equations. 14 ref. (G17, G25; CN)

64-G.* Machining Irradiated Uranium. D. Shaw and W. G. Hufton. *Nuclear Power*, v. 3, Dec. 1958, p. 600-601.

Depth of cut that could be applied to the irradiated bar was smaller than that for unirradiated U. Cuttings from the irradiated bar were smaller than those from the unirradiated bar, and there was no tendency for long curled turnings to be formed; otherwise there was little difference in machinability. (G17; U, 14-70)

65-G. Diamond Machining and Thread Cutting on Aluminum. K. Sterl. *Industrial Diamond Review*, v. 18, Nov. 1958, p. 206-209.

(G17; Al, NM-k37)

66-G. (French.) Application of Ceramic Tools to Manufacturing Operations. Robert Derny and J. L. Guedeu. *Machine Moderne*, v. 596, Nov. 1958, p. 15-23.

Case studies on turning and milling castings and steels. Higher speeds, wider speed ranges, reduced wear, versatility, shock resistance and improved surface finishes are possible. Disposal of chips and choice of tool-holder present problems. (G17, T6n, 6-70)

67-G. (French.) Using Atomized Liquid Lubricants as Coolants in Turning Operations. J. G. Proskourjakoff and W. A. Koulikowsky. *Machine Moderne*, v. 596, Nov. 1958, p. 45-47.

Special atomizing device provides three types of cooling processes within cutting zone: pressurized liquid, compressed air and a cooling-air emulsion mixture. Optimum effect is obtained when rate of liquid flow is 100-200 g. per hr., air flow 3 sq. m. per hr. and air pressure 4.5 atm. (G17, NM-h)

68-G. (Russian.) Ultrasonic Machine for Machining Hard Metals. M. G. Kogan and V. A. Tuzlukova. *Vestnik Mashinostroeniya*, v. 38, Nov. 1958, p. 92-95.

Used for processing brittle and hard metal, the machine is vibrated by magnetostriction conversion of the PMS-7 type. Nominal vibration frequency is 22 cycles, maximum required power is up to 2 kwt. Can be operated with ordinary industrial ultrasonic generator of UZP-10 type. (G24c, 1-52, SGB-q)

69-G.* Application of Spark Erosion Machining. A. J. Lawrance. *Institution of Production Engineers Journal*, v. 37, Nov. 1958, p. 694-709.

Advantages and limitations of the process of electrosparking and its application to automatic machining. (G24a, 18-64; W, 6-69)

70-G.* Trouble-Shooting in the Press Room. Blanking of Large Pieces. Federico Strasser. *Iron & Steel*, v. 31, Dec. 1958, p. 579-581.

Difficulties involved in the stamping of large blanks can often be avoided by substituting contour-sawing, square-shearing, composite construction and changing the shape. (G2h)

71-G.* Hardened Bearing Races Machined With Cemented-Oxide Tools. H. J. Siekmann. *Machinery*, v. 65, Jan. 1959, p. 109-111.

Turning, boring and facing SAE 52100 steel with hardness range of Rockwell C-60 to 63 using cemented oxide tools. Tool characteristics, speeds, feeds, tool life, surface finish. (G17, T6n, T7d; AY, 6-70)

72-G.* Titanium Drawing Is Both Cold and Hot. R. A. Lanciano. *Machinery*, v. 65, Jan. 1959, p. 120-121.

Ti sheet first drawn cold in progressive steps then heated for final draw in production of turbine casting. (G4b, W11n; Ti-b)

73-B.* Fabricating Stainless Steel. Pt. 1. Machining. Richard E. Paret. *Tool Engineer*, v. 42, Jan. 1959, p. 62-68.

Characteristics of austenitic, ferritic and martensitic steels. Cutting tools, speeds, feeds and lubrication for turning, milling, drilling, tapping, reaming and sawing operations on the various types of stainless steel. (G17; SS)

74-G.* Speed Drills Versus Test Drills. Test Results. B. E. Logsdon. *Tool Engineer*, v. 42, Jan. 1959, p. 70-71.

Comparative German test on SAE 8620, 4140 and 1117 steels; Hy-Pen toolsteel and cast iron. Results and recommendations. (G17e, W25p; AY, CI, TS)

75-G.* Heavy Plate Cutting. B. Brasseur. *Welding and Metal Fabrication*, v. 26, Dec. 1958, p. 443-448.

Use of oxygen-cutting for profiling steel in thicknesses of 4 in. and upward is growing as means of replacing complicated

forgings or avoiding lengthy machining. Basic factors involved when cutting are size of cutting jet, oxygen and fuel gas pressures, cutting speed. Typical faults are listed with corresponding causes and remedies. (G22g; ST, 4-53)

76-G.* (German.) Extrusion of Steel Profiles. Hermann Preussler. *Draht*, v. 9, Nov. 1958, p. 435-440.

In cold extrusion reduction of 10 to 25% per pass permissible, sometimes requiring several passes. Resulting finish requires minimum machining. Very accurate dimensions obtainable. (G5; ST)

77-G.* (German.) Parameters Controlling Spark-Discharge Machining. H. Rossa. *Fertigungstechnik*, v. 8, Nov. 1958, p. 497-501.

Current as function of spark frequency characteristic for performance. Rate of material removal strongly influenced by current fluctuations. Other controlling parameters are work area, penetration depth, electrode material, purity and type of dielectric (usually transformer oil). Rapid material removal produces poor surface finish. (G24a)

78-G.* Observations on the Angle Relationships in Metal Cutting. D. M. Eggleston, R. Herzog and E. G. Thomsen. *American Society of Mechanical Engineers*, Paper no. 58-A-138, 1958, 17 p.

Orthogonal-cutting experiments using SAE 1112 free-cutting steel, 2024-T4 and 6061 T6 Al alloys, and alpha brass (85% Cu, 15% Zn), at feeds of 0.002 to 0.010 in. per revolution, were performed on a lathe with 18-4-1 high-speed steel cutting tools. The angle between the shear plane and the resultant tool force R was only approximately constant for each test condition and varied with cutting speed. (G17; Al-b, Cu-n, ST)

79-G.* Some Observations on the Shearing Process in Metal Cutting. S. Kobayashi and E. G. Thomsen. *American Society of Mechanical Engineers*, Paper no. 58-A-139, 1958, 12 p.

Shearing stresses on the shear plane for SAE 1112 free-cutting steel and for the test conditions investigated appear to be independent of normal stress, finite strain and strain rate. Shearing stresses for the remainder of the alloys (i.e., 2024-T4 and 6061-T6 Al alloys and alpha brass) also were constant, but the range of cutting conditions was not as extensive as that for SAE 1112. 29 ref. (G17; Al-b, Cu-n, ST)

80-G.* Self-Excited Vibrations in Metal Cutting. Nathan H. Cook. *American Society for Mechanical Engineers* Paper no. 58-A-189, 1958, 4 p.

Metal-cutting vibrations can be excited by a variety of mechanisms. At high frequencies, the negative slope of the friction-velocity curve is apparently responsible. At low frequencies, the variation of shear angle may be the important factor. Damping can take place in the mechanical system and also in the shear plane. Amplitude limitation can occur by the chip leaving the tool face or by interferences on the clearance face. 5 ref. (G17, Q9p)

81-G. Progress in Spark Machining. *Australasian Engineer*, v. 50, Oct. 7, 1958, p. 67-69.

Increased cutting speeds and better finishes of tungsten carbide. (G24a; 6-69)

82-G. Thread and Form Rolling. *Australasian Manufacturer*, v. 43, Nov. 22, 1958, p. 44-50.

Thread rolling is essentially a cold forging process, in which the required thread form is impressed on the workpiece by rolling it between hard metal dies. (G12)

83-G. Grinding—an Ancient Art as Applied to Alloy, High-Speed and Die Steels in the Tool Room. D. H. Currie. *Automatic Machining*, V. 20, Jan. 1959, p. 49-53.

(G18, W25c; ST)

84-G. Spark Machining by Electro-Erosion. W. O. Norton. *Engineer and Foundryman*, v. 24, Oct. 1958, p. 63-69.

Electrolytic maching, electro-arcing and electro-sparking. (G24a, G24d)

85-G. High-Speed Machining With Disposable Inserts. C. S. Currie, Jr. *Machinery*, v. 65, Jan. 1959, p. 95-96.

(G17, T6n; SS, 6-69)

86-G. Reed Coining Goes Through Interesting Die Development. A. P. Jurnak and E. W. Nelson. *Machinery*, v. 65, Jan. 1959, p. 112-115.

(G3n; Ni-b, Fe, 4-61)

87-G. Metal-Working Processes and Equipment. Pt. 2. A. G. Thompson. *Welding and Metal Fabrication*, v. 26, Dec. 1958, p. 449-454.

Punching, shearing, cropping, notching and nibbling techniques as performed on standard equipment. (G2, W24m)

88-G. (German.) Spark-Discharge Drilling of Very Small Holes. M. Dorfel, H. Klemm and H. Wappler. *Fertigungstechnik*, v. 8, Nov. 1958, p. 501-503.

Spark-discharge machine for drilling holes 0.008 to 0.020 in. in nozzles of diesel fuel pumps. (G24a, G17e, 18-74)

89-G.* Study of Machinability of Metals. H. Takeyama and E. Usui. *American Society of Mechanical Engineers*, Paper no. 58-A-161, 1958, 4 p.

Machinability in terms of chip formation is closely related to the ratio of shearing strain to shearing stress near fracture point of the ratio, the poorer the machinability from the viewpoint of chip formation. (G17k)

90-G.* (German.) Relationship Between Chip Formation and Tool Life. Gunter Weber. *Stahl und Eisen*, v. 78, Nov. 13, 1958, p. 1678-1690.

Investigations regarding behavior of carbide - tipped tools as characterized by cratering and flank wear when turning steels of different composition and preliminary heat treatment. Influence of machinability on tool life expectancy and a simple method for calculating relationship between feed rate and admissible cutting speed for maintaining 60-min. net cutting capability. 26 ref. (G17, G17k, T6n; 6-69)

91-G. (Translation — Brutcher, 4432.) New Method of Working of the Contact Surfaces of Machine Parts. I. V. Kudryavitsev and N. A. Balabanov. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 44-50.

Cold working by multiple impact strikes from a heavy hammerhead results in formation on the surface of grooves, flutes or corrugations in the form of furrows. This treatment increases the surface hardness by 40%, with favorable residual constricted stress. It is possible to double the ultimate fatigue strength. (G23n, Q7a, Q29n)

92-G.* Lubricants in the Forming of Aluminum. Marco Petronio. *Lubrication Engineering*, v. 14, Dec. 1958, p. 510-522.

Lubricants evaluated in slow-speed draw test of 2024, 5052, 7075 and R303 Al alloys. Condition of surface found highly significant. Surface pretreatments, (alkali, phosphating, treatments, oxidation) evaluated. (G4c, L12, L13p; Al-b, 18-73)

93-G.* (French.) Cutting of Ferrous and Nonferrous Metals. E. Sellier. *Revue Universelle des Mines*, v. 14, Oct. 1958, p. 359-372.

Theory of classic oxygen cutting processes, influence of metallurgical and physical factors; cleanness and precision of cut, structural changes and physical properties of cut surfaces of ferrous metals. Processes using combustible and noncombustible powders. Heliarc process, application to nonferrous metals. Equipment and applications of all processes. 9 ref. (G22)

94-G. Theory of Metal Cutting. P. H. Black. *Current Engineering Practice*, v. 1, Nov. 1958, p. 11-13.

Fundamental physical aspects and mechanics of the metal cutting process. (G17)

95-G. Grinding Sintered Carbide, Especially Sintered Carbide Cutting Tools, With Diamond Grinding Wheels. G. Pahlitzsch and G. Rafflenbeul. *Industrial Diamond Review*, v. 18, Dec. 1958, p. 225-234.

(G18, T6n, 6-69, W25c; NMk-37)

96-G. Cemented Carbide Tools, Their Application for Increased Productivity in Heavy and General Engineering. D. C. Rodgers. *Institution of Production Engineers Journal*, v. 37, Dec. 1958.

Carbide tools used in various machining operations on Mo-V, Ni-Cr-Mo, Cr-C and W-Cr-Mo steels. Results of tests. (G17; AY, SS, 6-69)

97-G. Ceramic Tools Take on Big Job. J. W. Rodd and G. A. Hutson. *Iron Age*, v. 183, Jan. 22, 1959, p. 61-63.

Rough turning of gun forgings at Watervliet Arsenal. (G17a, T6n; AY, Al, 4-51, 4-56; SGA-j)

98-G. Methods of Hot-Sizing Titanium Parts. *Machinery (London)*, v. 93, Dec. 31, 1958, p. 1518-1520.

Commercially pure Ti heated to 1000° F., shaped by hydraulically operated dies, to produce accurate aircraft components. (G9, T24a, Ti-a)

99-G. Broaching Carbine Barrels in One Operation. Peter Trippe. *Metalworking Production*, v. 103, Jan. 2, 1959, p. 3-6.

(G17d, T2m)

100-G. Die Sinking Costs Drastically Reduced by Magnetic Tape Control. *Tooling & Production*, v. 24, Jan. 1959, p. 58.

(G16, G17b, W25r, 18-74)

101-G. (German.) Electrolytic "Grinding" of Refractory Materials. J. S. Spizig. *Werkstattstechnik und Maschinenbau,* v. 48, Dec. 1958, p. 641-644.

Process and machines. 10 ref. (G24d; W25s, EG-d)

102-G. (Russian.) Material and Heat Balance of Oxygen Cutting. S. G. Gruzov. *Svarochnoe Proizvodstvo,* Dec. 1958, p. 13-17.

6 ref. (G22g)

103-G. (Russian.) Equipment for Oxy-Acetylene Cutting of Pipes. Ya. A. Galperin. *Svarochnoe Proizvodstvo,* Dec. 1958, p. 30.

(G22g, 1-52; ST, 4-60)

104-G. (Russian.) Action of Lubricants in Metalworking Under Pressure. S. Ya. Veiler and V. I. Likhtman. *Zhurnal Technicheskoi Fiziki,* v. 28, no. 9, 1958, p. 2025-2034.

8 ref. (G17, F28; NM-h)

105-G.* An Elementary Consideration of Some Extrusion Defects. W. Johnson. *Applied Scientific Research,* v. 8, no. 1, 1958, p. 52-60.

The best upper bounds to the load in direct extrusion when the fault known as piping is anticipated are less than the best upper bounds obtainable by the use of similar deformation patterns, when piping is expected not to occur. Similar data are presented in the case of a short slug being pierced by unequal size punches which results in faults at the container wall. 7 ref. (G5)

106-G.* Fabrication of Modern Heat-Resisting Materials for the Gas Turbine Industry. H. Roberts. *Welding and Metal Fabrication,* v. 26, Dec. 1958, p. 435-442, 454.

Cr-Ni austenitic steels, and the Ni-based Nimonic alloys. Forming and fabrication, spinning and blanking data. Welding is best achieved by the metal-arc, the inert-gas arc and the electrical resistance processes. Riveting is also used. (G-general, K-general, W11m; SS, Ni-b)

107-G.* (Swedish). Influence of Various Factors on Metal Removal and Abrasive Consumption in Grinding Steel With Pendulum Grinding Machines. G. Wallquist, B. Hamrin and H. Lund. *Jernkontorets Annaler,* v. 142, no. 9, 1958, p. 541-569.

Metal removal per hour in grinding rolled steel billets increases with pressure and periphery speed. Consumption of abrasives increases with grinding pressure and metal removal. The most effective way of reducing the grinding cost is by means of the installation of larger grinding motors to permit use of higher grinding pressure. (G18, 3-74, W25s)

108-G.* (French.) Zirconium Sheathed Uranium Fuel Elements Produced by Co-Extrusion. R. Monfagne, A. Winogradzki, C. Sauve and J. Buffet. *Revue de Metallurgie,* v. 55, Nov. 1958, p. 1073-1078.

New method for sheathing U elements with Zr by simultaneous extrusion. Heat treatment after extruding increases adhesion of sheath. (G5, K5k, T11g, 2-64; U, Zr)

109-G. Copper Alloys for Those Small Tubular Parts. D. S. Granniss. *Product Engineering (Design Issue),* v. 30, Feb. 2, 1959, p. 44-46.

Bending, fabricating, beading, cutting, joining and matched-die gouging. (G6, G17; Cu-b, Cu-s, 2-60)

110-G.* Why Explosive Forming Works. John S. Rinehart, Vasil Philipchuk and John Pearson. *Steel,* Jan. 9, 1959, p. 62-65.

Under explosive pressures metals are formed plastically and do not become fluid, moving through the elastic into the plastic range and taking permanent set in a few millionths of a second. An explosive force distributes itself far more evenly than the forces in a conventional forming die to provide even penetration into every crack and crevice. It is possible that an explosion affects the atomic force relationship in rearranging crystal slip planes. (G-general, NM-k34)

111-G*. (German.) Poor Machinability of Light Metal Castings. *Giesserei-Praxis,* Dec. 24, 1958, p. 482-483.

Caused by Si crystals and improved by treatment of the melt with Na or Na-containing fluxes. A high percentage of Fe also reduces machinability. Careful molding, risering and avoidance of sand-containing charges prevent the penetration of sand particles. (G17k, E-general; EG-a39, 5)

112-G. Grinding Operations on Compressor Vanes. *Machinery (London),* v. 94, Jan. 14, 1959, p. 77-83.

Machining AMS 5613 and 5616 stainless steel precision forgings for jet propulsion unit. (G18k, G18m, T24b; SS)

113-G. High Speed Bending of Aluminum Tubes and Shapes. W. A. Osterland. *Modern Metals*, v. 14, Jan. 1959, p. 50, 52.

Hydraulic machines increase production of tubing, shapes, bars and rods. Anodized or precoated materials may be bent. (G6; Al-b, 4-55, 4-57, 4-60)

114-G.* (German.) Powder Cutting. Valentin Trunschitz. *Schweisstechnik*, v. 12, Nov. 1958, p. 148-152.

Stainless steel cannot be cut by conventional oxygen methods because of refractory Cr oxide in the kerf. Two methods were tested: (1) iron powder; (2) mechanical acting powder consisting of about 82% $CaCO_3$ and 16% $MgCO_3$. (G22g; SS)

115-G. (French.) Plastic Stamping Dies Reinforced With Steel Fiber. *La Machine Moderne*, v. 53, Jan. 1959, p. 51-53.

(G3, W24n; ST, NM-d, 9-69)

116-G. Plasma Heat Newest Addition to Welding's Product Lineup. *Welding Engineer*, v. 44, Feb. 1959, p. 50, 52.

(G22h, K1c)

117-G. Metal Bonding Aids Spinning. Harold Marks. *Product Engineering (Design Engineering)*, v. 30, Feb. 16, 1959, p. 63.

(G13, L22; SS, Ti, 4-53)

118-G. (Russian.) Cutting With Lubricants During Cold Working of Metals. V. D. Kuznetsov, A. I. Loskutov and S. N. Pavlova. *Doklady Akademii Nauk, SSSR*, v. 123, no. 2, 1958, p. 272-724.

Drilling of brass, Cu, Al, Zn and Cd with stearic acid of various concentrations, vaseline grease and oleic acid as lubricants. Presence in the lubricant of surface-active products has practically no effect on strengthening of metals. Best strengthening results were obtained when the lubricant was a mixture of stearic acid in toluol. 10 ref. (G17e; NM-h, Al, Zn, Cd, Cu-n, Cu)

119-G. (Russian.) Best Conditions for Spark Machining High-Temperature Nickel Alloys. V. P. Alexandrov and B. I. Zolotukn. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 99-100.

(G24a; Ni-b)

120-G. (Russian.) Reliability of Metal Cutting Processes. M. E. Elyasherg. *Izvestiya Akademii Nauk SSSR*, Sept. 1958, p. 37-52.

Theory formulated on auto-vibration of metal cutting based on conditions of metal deformation during machining and pressure of shaving on surface of cutters. 7 ref. (G17)

121-G.* (French.) Cold Heading. Theodore B. Smith. *Machine Moderne*, v. 52, Oct. 1958, p. 9-15.

Capabilities of process, design principles for tools and products, selection of split or solid dies. Grain texture of upset parts, increased tensile strength, product material savings, examples of typical parts produced. (G10p, 1-67)

122-G.* Grinding Sulfurized Tool Steels. L. P. Tarasov. *Tool Engineer*, v. 42, Feb. 1959, p. 77-80.

Surface and form grinding tests to determine affects of sulphur additions to high-vanadium of high-speed steels. Influence of hardening temperature, grinding fluid, V content and sulphur on grindability. (G18k, G18m, 2-60, 2-64; TS-m, 17-52)

123-G.* Fabricating Stainless Steel, Pt. 2. Forming. Richard E. Paret. *Tool Engineer*, v. 42, Feb. 1959, p. 97-100.

Procedure and problems in drawing, punching, blanking, brake forming, tube bending or spinning various types of stainless steels. (G-general, 2-60; SS)

124-G.* Hot-Forming Titanium With Adjustable-Section Dies. Ed Selmer. *Tool Engineer*, v. 42, Feb. 1959, p. 101-104.

Dies for forming corrugations in 0.039-in. Ti sheet at 1200° F. (G4d; Ti-b)

125-G. (Translation—BISI, no. 1107.) Die Stamping and Drop Forging. W. Engelhardt. *Neue Hutte*, v. 3, March 1958, p. 165-173.

See item 309-G, 1958. (G3, F22n, W24n)

126-G.* Electro-Erosion Makes Tools for Valve Parts. Peter Trippe. *Metalworking Production*, v. 103, Jan. 30, 1959, p. 179-183.

Carbide progression dies and punches for small high-precision parts, with much increased life and reduced use of skilled labor. (G24a, W24n, W24p; W, *C*, 6-69)

127-G.* Modern Machining Methods. Digest of seven papers presented at the William Park Woodside Panel Conference, American Society for Metals". Oct. 1958. *Metal Progress*, v. 75, Feb. 1959, p. 138, 140, 142, 145-146.

New cutting tool materials (carbides and sintered alumina); advantages of constant speed machining; selection of quick-change, preset tooling; trends in high-speed machine tools; roll forming and electrical machining methods; machining of steels at high strength levels; machining of arc-cast Mo. (G-general, W25; Mo)

128-G. New Method Speeds Machining of Honeycomb Core Material. *Iron Age*, v. 183, Feb. 5, 1959, p. 94-95.

Interrupted arcing in electrolytic solutions. (G24a; SS-e, Al-b)

129-G. Metal Gathering Builds Up Thin Round Parts. Alfred H. Peterson. *Metalworking Production*, v. 103, Jan. 23, 1959, p. 153-154.

Heat and pressure are used to form tube ends into heavy sections that can be machined as flanges and threaded necks. This results in an integral end structure that provides strength and rigidity in parts built up from thin-wall tubing. It is an alternative to using drawing and swaging methods. (G1; 4-60)

130-G.* Turning Alloy Steels With Ceramic and Carbide Tools. *Machinery (London)*, v. 94, Feb. 11, 1959, p. 325-335, 341.

Tests to determine suitability of the tips for stock removal and finish turning after preliminary tests to determine suitable cutting conditions had been performed. Supplementary tests to ascertain effects of cutting edge side rake and cutting speed on tool life, chip formation. (G17a; AY, SGA-y; 6-69, 6-70)

131-G.* (Japanese.) Effect of Lubricant Upon Deformation of Aluminum Sheet. Takashi Ikeno, Shinkichi Yotsu and Osamu Ichii. *Light Metals*, v. 8, Nov. 1958, p. 5-10.

Effect of MoS_2 gives superior workability and tends to prevent rupture. (G4b; Al-b, NM-h, 4-53)

132-G.* (Ukrainian.) Effect of Temperature on Turning. F. Ya. Zagavura. *Dopovidi Akademii Nauk Ukrainskoi RSR*, no. 11, 1958, p. 1204-1206.

Turning of metal at -195° C.; +20° C.; and with electrical contact heating by direct current. 4 ref. (G17a, Q9, 2-61)

133-G. How Chemical Milling Benefits Canadair. *Canadian Metalworking*, v. 22, Feb. 1959, p. 16-17.

Lower costs, ease of operation and ability to mill all sides simultaneously. Chemical milling of aircraft parts of Al and Mg alloys, steel and Ti. (G24b, T24a; Al-b, Mg-b, ST, Ti-b)

134-G.* Fabrication of Refractory Metals. W.L. Bruckart. *Metal Industry*, v. 94, Jan. 30, 1959, p. 83-86.

Hydroforming, deep drawing, stretch forming, cold drawing, sawing, shearing, punching, stamping, machining, screw cutting and grinding of Mo. (To be continued.) (G-general; Mo, EG-d37)

135-G.* Steel Sheet for Deep Drawing. A. Snedden. *Australian Institute of Metals, Journal*, v. 3, Nov. 1958, p. 242-249.

Properties of the finished sheet determined mainly by grade of steel used. The five principal grades available in the "dead soft" range with a C content below about 0.10% are ingot iron (rimmed), rimmed, capped, semikilled, and aluminum-killed steels. (G4b; CN-g, Al, 4-53)

136-G.* (German.) Pilger Process in Rolling Solid Cylindrical Rods. Rolf Hinkfoth. *Neue Hutte*, v. 4, Jan. 1959, p. 40-45.

Pilger process applied to pure Al, case hardened steel and Ni. With solid rods a homogeneous deformation takes place throughout the cross section. 9 ref. (G11, 1-67; 4-55, CN-g, Al, Ni)

137-G.* Theory and Application of Electro-Discharge Machining. Robin O. Williams and Philip E. Berghausen. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 1-13.

Process is accomplished by high-frequency series of discharges between a tool and the work where a small amount of metal is removed each time. These charges are of high current density and can produce melting and vaporization. Comparision with other competitive processes. (G-24a)

138-G.* High Speed Cutting. E. K. Henriksen. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 14-18.

High cutting speeds with good tool life can be attained in conventional cutting by careful attention to correct tool geometry, good edge and surface finish on tools, correct grade of tool material, correct cutting fluid and possible supercooling of work and tool with preheating or workpiece. (G17, T6n)

139-G.* The Chemical Milling Process and Its Primary Applications. Roy L. Chandler

and Glenn E. Boehmer. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 19-23.

Applications and limitations of chemical milling applied to wrought Al alloys, Mg alloys FS-1, HK31, ZU60 and HM21, Ti and steel alloys. (G24b; Ti-b, Al-b, Mg-b, ST)

140-G.* Designing Aluminum for the Impact Process. Mark A. Ziegler. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1956, p. 24-30.

Tooling, tolerances and design features in the impact extrusion of 1100, 3003, 6061, 6151, 2014-T6 and 7075-T6 Al alloys. (G5; Al-b)

141-G.* Forming at Elevated Temperatures. Harry B. Osborn, Jr. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 31-35.

Tensile strength versus temperature is plotted for a number of steels to determine optimum forming temperatures. Warm forming is, in many cases, more satisfactory than either hot forming or cold forming. (G-general, 1-66, 2-61; ST)

142-G.* (German.) Metal Forming by Necking. R. Beck, K. H. Schenck and H. Gross. *Fertigungstechnik*, v. 8, Dec. 1958, p. 538-544.

Reduction of open ends on cylindrical shells either on presses by various types of necking tools and/or by special necking machines. Special tooling exists for measurement of stresses in material and to determine limits of compression admissible for various thicknesses of pure Al, Al-Cu-Mg and Al-Mg alloys. 7 ref. (G4; Al-b, *Cu, Mg*)

143-G. Metal Cutting. W. B. Rice. *Engineering Institute of Canada, Transactions*, v. 2, Dec. 1958, p. 149-152.

Development of a model of chip formation. 10 ref. (G17; Al-b)

144-G. Lubrication of New Metals During Heat Treatment and Forming. J. Grindrod. *Scientific Lubrication*, v. 11, Jan. 1959, p. 13-14.

Use of glass as lubricant in heat treating Ti alloys and in forming Mg and Ti alloys. (G1, J-general; Mn-b, Ti-b, NM-h, NM-f42)

145-G. (Dutch.) Flow Turning. D. A. de Fremery. *Metalen*, v. 13, Nov. 15, 1958, p. 388-390.

Manufacture of cylindrical and conical objects with thicker bottoms and thinner walls by the flow turning process. (To be continued.) (G13)

146-G.* (German.) Strain Hardening of Austenitic Steels in Deep Drawing. H. Wiegand and H. K. Kloos. *Werkstatt und Betrieb*, v. 92, Jan. 1959, p. 1-6.

Measurement of hardness and tensile strength changes to determine part played by martensite formation in strain hardening of deep drawn cups. By increasing temperature of forming the martensitic phase was almost completely suppressed. 9 ref. (G4b, N7e, 2-61; SS-e)

147-G.* Residual Stresses Produced by Up Grinding and Down Grinding. John A. Mueller. *Grinding and Finishing*, v. 4, Jan. 1959, p. 30-33.

In surface grinding the degree of stress in the ground surface produced by conventional crossfeeding is the same as that produced by crossfeeding at only one end. Performance characteristics of the wheel are changed by the method of crossfeeding. Whatever method will produce the most satisfactory end product can be used without changing the residual stress in the product. 4 ref. (G18k, Q25h)

148-G.* How to Design and Check Bends in Welded Steel Tubing. *Iron Age*, v. 183, Feb. 26, 1959. p. 85-88.

Minimum bend radii for various size and gage tubes bent with or without mandrel. Minimum bend radii for flat-sided tubing. Design considerations; diameter tolerances for end sizing. (G6, 17-51; ST, 4-60)

149-G.* Metal-Working Processes and Equipment. Pt. 4. A. G. Thompson. *Welding and Metal Fabrication*, v. 27, Feb. 1959, p. 71-73.

Relation of bend radius and thickness, length and tensile strength of plate to the design of plate bending rolls, roll diameters and power requirements in plate bending. (To be continued.) (G6, 1-52; ST, Al-b, 4-53)

150-G.* (German.) Cold Forming of High-Temperature Alloys. Rolf Krause. *Werkstatt und Betrieb*, v. 92, Feb. 1959, p. 81-83.

Formability, strain hardening, lubrication, process annealing of Ni and Co-base alloys. Die design, machine requirements for deep drawing, bending, spinning, shearing and punching. (G-general, 1-67, Q23q; SGA-h, Ni-b, Co-b)

151-G. Machinability Ratings May be Misleading, But What Other Yardstick Is Available? John A. Hedrick. *Carbide Engineering*, v. 11, Jan. 1959, p. 17.

Revision of existing machinability charts for particular applications. (G17k)

152-G.* Machining and Fabrication of Beryllium. Keith G. Wikle. *Machinery (London)*, v. 94, Feb. 25, 1959, p. 428-432.

Hot pressing, extrusion, forming and joining; properties. (G-general, H-general, K-general, Be)

153-G.* Shape, Fasten, Engrave, Test Materials With Explosives. H. P. Tardif. *Materials in Design Engineering*, v. 49, Feb. 1959, p. 82-87.

Three main approaches to explosive forming are direct forming using cartridge explosives, hydraulic fluid forming using propellant gases and a drop hammer actuated by propellant gases. Explosive bulge tests are performed at temperatures of -100 to 200° F. and are used to evaluate metal for crack initiation and crack propagation characteristics. (G-general; NM-k34)

154-G.* Fabricating Sheet Metal for Aircraft. Adolph Vlcek, Jr. *Metal Progress*, v. 75, Mar. 1959, p. 77-79.

Aircraft and missile manufacture is sparking a revolution in sheet metal fabricating. Routine forming and joining methods formerly used are being replaced with techniques designed to handle the high-strength alloys needed for supersonic aircraft. (G14, G-general, F22, J-general, K-general, T24)

155-G.* Stress-Relief of Aluminum for Aircraft. R. T. Myer, S. A. Kilpatrick and W. E. Backus. *Metal Progress*, v. 75, Mar. 1959, p. 112-115, 190.

Use of machined components instead of assemblies in aircraft has led to much research on stress-relief processes. Stretching, cold forging and skin-pass rolling are successful, in descending order, in relieving stresses in heat treated Al alloy plates. (G23, G9, Q25; Al)

156-G.* The Action of Metal Cutting Fluids at Low Speeds. Milton C. Shaw. *Wear*, v. 2, Feb. 1959, p. 217-227.

Low-speed materials function by reacting chemically with the chip to form a solid layer which prevents welding and metal transfer between the chip and the tool. Carbon tetrachloride acts both to reduce cutting forces to improve surface finish. Cutting data given for Pb and steel. 19 ref. (G17; Pb, ST, NM-h)

157-G. (Book.) Bending Aluminum. Information Bulletin no. 24. Aluminum Development Assoc., 33 Grosvenor St., London, W.1, England, Nov. 1958, 47 p. 2 s.

Bending properties of heat treatable and nonheat treatable Al alloys. Bending, forming, roll forming, roll bending, draw bending, wrap bending and ram bending operations. Data on minimum bend radii for cold bends in sheet, plates, bars, sections or tubes. 14 ref. (G6, G11; Al-b)

158-G. (Translation—BISI no. 709.) Tool Wear in Machining as Reflected in the Wear Cutting Speed Curve. Gustav Vieregge. *Stahl und Eisen*, v. 77, Sept. 5, 1957, p. 1233-1244.

See item 32-G, 1958. (G17, Q9; CN, CI-n, TS, 6-70, 6-69)

159-G. (Translation—Brutcher no. 4481.) Improvement in Fatigue Strength of Components by Shot Peening. M. Ya. Shashin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 42-47.

Effect of deformed layer, depth on increased fatigue strength, on distribution of residual compressive stresses and on distortion changes of second and third order in surface layers. 11 ref. (G23n, Q25h, Q7)

160-G. (Translation--Brutcher no. 4484.) Vibrational Working of Deformed Metal AMtsM. Yu. P. Sogrishin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 55-57.

Compared with static working of metals, vibrational working produces a more homogeneous structure and more uniform hardness distribution in the deformation region. Data for Al alloy (AMtsM). (G-general, Q29; Al-b)

161-G.* Current Practice in Chemical Milling. Neil W. Berst. *Products Finishing (London)*, v. 23, Feb. 1959, p. 31-35.

Survey of chemical milling processes; methods for cleaning, masking, etching, and for milling Al, Mg and stainless steel. (G24b; Al-b, Mg-b, Ti-b, SS)

162-G.* (Hungarian.) Magnesium Sheet Fabrication. Gyula Emod. *Kohaszati Lapok*, v. 91, Sept. 1958, p. 414-419.

Spinning, drawing and impact extrusion methods used on heated Mg strips, holding temperatures, preheating of forming tools to 150-200° C. 5 ref. (G-general; Mg-b, 4-53)

163-G.* Fabrication of the Stainless Steels. Pt. 1. Lester F. Spencer. *Metal Products Manufacturing*, v. 15, Mar. 1959, p. 29-30, 32, 60.

Workability, forming, and welding properties correlated with the various types of stainless steel. (G-general; SS)

164-G.* Cold Extrusion Process. *Automobile Engineer*, v. 49, Feb. 1959, p. 74-77.

During cold extrusion operations, the severe cold working raises the hardness and strength properties of the material. Low-carbon steels, as a result of cold working during extrusion, acquire mechanical properties approximating heat treated carbon steels or low-alloy steels. (G5; ST)

165-G.* Hard Spots in the Machined Surface. Antoni Niedzwiedzki. *Tooling & Production*, v. 24, Mar. 1959, p. 57-59.

While machining with feeds too fine, the cutting edges of milling cutters may slide over instead of cut the machined metal. These sliding cutting edges cold work the machined surface and thus form the hard spots. (G17)

166-G.* Stronger Carbon Steel Bars Produced by Elevated Temperature Drawing. E. S. Nachtman. *Materials in Design Engineering*, v. 49, Mar. 1959, p. 98-99.

Carbon and alloy steel parts produced by elevated-temperature drawing have high strength, little distortion and require no heat treatment. (G4, 1-67; CN, AY)

167-G.* Metal Forming and Cutting in the Aircraft Industry. L. G. Burnard. *Sheet Metal Industries*, v. 36, Mar. 1959, p. 179-190.

Routing, chemical machining, rubber press forming, hydroforming and stretch forming. (G-general; Al-b, 4-53)

168-G. Roll Grinding. *Iron and Steel*, v. 32, Feb. 1959, p. 71-74.

Equipment and techniques for satisfactorily grinding 0.024 in. from a 20½-in. diameter hardened forged steel roll 80 in. long in 15 min. (G18, W23k; ST)

169-G. Metal-Cutting Research. M. P. L. Siebel. *Columbia Engineering Quarterly*, v. 12, Jan. 1959, p. 20-23, 48-49.

Theoretical and experimental investigations of metal cutting. 15 ref. (G17, A9)

170-G. (Russian.) Optimum Conditions for Oxygen Cutting of Steels. V. S. Il'inskii. *Svarochnoe Proizvodstvo*, Jan. 1959, p. 22-24.

Oxygen purity has an effect on the quality of cutting. A 1% impurity in oxygen causes 19% more oxygen to be used, lowers the cutting rate by 16% and is more time-consuming. (G22g; ST)

171-G.* Hot Roll-Spinning. F. Spiegel. *Aircraft Production*, v. 21, Feb. 1959, p. 44-47.

Forming of hemispherical forms of Ti alloys with a hydraulically activated spinning roller. (G13; Ti-b)

172-G.* Producibility Barrier for Tough Alloys Hurdled in Manufacturing Revolution. Nat Wood, Editor. *Western Metalworking*, v. 17, Mar. 1959, p. 48-51.

Machining, forming and welding high-strength heat resistant metals. (G-general, K6; SGA-h)

173-G.* Fabricating Techniques for High Strength Superalloys. H. E. Haley. *Western Metalworking*, v. 17, Mar. 1959, p. 52-55.

Welding, forming, heat treating and forging heat resistant alloys. (G-general, K-general, J-general, F22; SGA-h)

174-G. Photo-Etching Molybdenum Foil. H. A. C. Hogg. *Institution of Electrical Engineers, Proceedings*, Pt. B., Supplement, May 1958, p. 614-616.

(G24b, T1c, 17-57; Mo, 4-56)

175-G. (Russian.) Ultrasonic Machining of Hard and Brittle Materials. L. D. Rosenberg and D. E. Yakhimovich. *Vestnik Mashinostroeniya*, v. 39, Feb. 1959, p. 51-55.

Process rate depends on amplitude and frequency of equipment used, hardness and size of abrasive, quantity of abrasives in the liquid, type of liquid used (water in most cases) surface area, cutting depth and kind of material to be treated. (G24c)

176-G.* Chemical Milling Process and Its Primary Applications. Roy L. Chandler and Glen E. Boehmer. *Machine Production*, v. 18, Feb. 1959, p. 13-16, 50.

Chemical milling, primary applications, design and standard practices. (G24)

177-G.* Split-Second Explosive Forming. *Ryan Reporter*, v. 20, Mar. 5, 1959, p. 4-5, 26.

Experiments with high-strength metals using dynamite, tetryl, cyclonite and PETN. (G-general; SGA-h, NM-k34)

178-G.* Advances in the Technique of Forming Metals. Frank G. Helander. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 165, American Society of Tool Engineers, Detroit, 1958, 5 p.

High-pressure rubber forming of large high-strength sheet metal parts. Roll forming or flow spinning process. (G13, G14a; SGA-h, SGB-a)

179-G.* Challenging Future of Power Spinning. John N. Heater. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 171. American Society of Tool Engineers, Detroit, 1958, 9 p.

Theoretical flow mechanisms in shear spinning. Extrusion and bending zones in the area of deformation. Thinning resulting from bending. Effect of extreme cold work or extrusion on metallurgical structure. (G13)

180-G.* Chemical Milling—Key to Space Age Design. L. B. Stearns. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 148, American Society of Tool Engineers, Detroit, 1958, 5 p.

Process development; application to Al, Mg, Ti or Ni alloys and stainless steels. (G24b; Al-b, Mg-b, Ti-b, Ni-b, SS)

181-G.* Fabrication of Refractory Metals. W. L. Bruckart. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 177. American Society of Tool Engineers, Detroit, 1958, 26 p.

Forming, spinning, cutting, machining, joining, annealing, surface treatment, mechanical properties and application of Mo, W, Ta, Cb and Re. (G-general, J23, K1d, K8; Mo-a, W-a, Ta-a, Cb-a, Re-a, SGA-h)

182-G.* Grinding Techniques for Advanced Materials. J. A. Mueller. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 138. American Society of Tool Engineers, Detroit, 1958, 11 p.

Wheel specifications and grinding procedures for Zr, Mo, Ti, dense Si carbide, dense high-purity alumina and sprayed coatings of Cr-Ni-B or alumina. (G18, W25c; Ti, Mo, Zr, 6-69, 6-70, 8-67, Cr, Ni, B)

183-G.* Hot Roll Spinning Titanium. Fred Spiegl. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 173, American Society of Tool Engineers, Detroit, 1958, 3 p.

Equipment and process requirements for hot forming thick hemispherical shapes. (G13, T26q, 1-66; Ti-b)

184-G.* Machining of Metals for Advanced Aircraft and Missiles. Norman Zlatin and Leonard J. Nowikowski. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 142, American Society of Tool Engineers, Detroit, 1958, 6 p.

Machining properties of high-strength heat resisting alloys A-286, S-816, 6A1-4V Ti, Mo, AISI 4340 steel and 420 stainless steel. (G17k; SS, Ti-b, Ni-b, Mo-b, Co-b)

185-G.* New Milling Techniques. A. O. Schmidt. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 139. American Society of Tool Engineers, Detroit, 1958, 7 p.

Increased tool wear, high temperatures and other limiting factors in machining high-strength alloys at ultra-high cutting speeds. 14 ref. (G17b; SGB-a, SGA-h)

186-G.* Non-Mechanical Machining Methods for New Metals. Lynn A. Williams. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 140. American Society of Tool Engineers, Detroit, 1958, 9 p.

Characteristics of spark-arc disintegration, chemical milling and electrolytic machining. Application of electrolytic machining to special problems. Advantages. (G24a, G24b, G24d)

187-G.* Precision Cold Extrusion Technology for High-Temperature Metals. Raymond A. Quadt. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 167, American Society of Tool Engineers, Detroit, 1958, 8 p.

Cold extrusion of sintered Al powder alloys, 4130 steel, 446 stainless steel, unalloyed Ti, Mo. Zr, Cb, Ta and U. Mechanical properties of tubular extrusions. (G5; Al-b, ST, SS, Ti, Mo, Zr, Cb, Ta, U, SGA-h)

188-G.* Theoretical Approach to the Solution of Machining Problems. Robert L. Vaughn. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 164. American Society of Tool Engineers, Detroit, 1958, 8 p.

Problems in machining new high-strength heat resistant alloys. Theoretical behavior of metals at ultra-high machining velocity. Tests with linear velocity explosively actuated metal removal apparatus. (G17; SGA-h, ST)

189-G.* Tooling for Welded Aircraft and Missile Pressure Vessels. Gerald Garfield. Paper from "ASTE Collected Papers", v. 58,

Book no. 2, Paper no. 151. American Society of Tool Engineers, Detroit, 1958, 7 p.

Tooling for deep drawing, hydroforming or spinning of hemispherical heads and for forming of cylinders in production of spherical and cylindrical pressure vessels. (G4b, G14b, G13, T26q; AY)

190-G.* Tube Bending; Plumbing-Art or Science? J. E. Hawking. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 168. American Society of Tool Engineers, Detroit, 1958, 7 p.

Relation of wall thinning with ratio of bend radius to tube diameter. Effect of wall thinning on mechanical properties of stainless steels. (G6; ST, SS, 4-60)

191-G. Metalworking and Machine Tools in the USSR. Richard E. Stockwell. *Modern Machine Shop*, v. 31, Apr. 1959, p. 122-129. (G-general, W25)

192-G. 4000 Lb. Iron Castings Salvaged by Compressed Air Arc Cutting. Martin G. Boyer. *Welding Journal*, v. 38, Mar. 1959, p. 239-240. (G22H; Fe, 5, 18-72)

193-G. (Russian.) Increasing Durability of Cogging Mill Rolls by Knurling. L. V. Andreyuk. *Stal'*, Feb. 1959, p. 141-145.

Design of a single roller for knurling cogging rolls immediately after turning. Improved surface condition resulted in a 27.5% increase in roll durability. 6 ref. (G12, W23k, 17-51)

194-G.* Some Remarks on Impact Extrusion. P. Landberg. *Microtecnic*, v. 12, Dec. 1958, p. 301-312.

Experiments to determine the mechanism of the process. (G5)

195-G.* Gray Cast Iron Machinability. W. W. Moore and J. O. Lord. *Modern Castings*, v. 35, Apr. 1959, p. 55-60.

Relationship of machinability of unalloyed cupola melted sand cast gray iron with changes in size of graphite flakes, volume of pearlite and graphite. Comparative accuracy of machinability indices when calculated from microstructure, carbon equivalent, tensile strength or hardness. 4 ref. (G17k, 3-71; CI-n)

196-G.* Explosive Welding and Forming Open Another Door for Industry. Jack Fairlie. *Welding Engineer*, v. 44, Apr. 1959, p. 61-64.

Advantages and application of explosive welding, forging and forming. Relation between plasticity by explosive forces and percentage elongation. Relative plasticity of Al, carbon steel, stainless steel, Ti and Ni. (G-general, F22, K5; Al-b, ST, SS, Ni-b, Ti-b, NM-k34)

197-G. (Pamphlet.) Technical Data: Hi-Qua-Led Steel Forgings. 37 p. Alco Product, Inc., 107 Gertrude St., Latrobe, Pa.

Effect of Pb additions on machinability, yield strength, tensile strength, ductility, hardenability, weldability of carbon and low-alloy steels. Machining characteristics of leaded steel. (G17k, 2-60, Q-general; 4-51, ST, *Pb*)

198-G. (Book—German.) Yearbook for Grinding, Polishing and Surface Treating, 1959. Bernhard Kleinschmidt. 511 p. 1959. Vulkan-Verlag Dr. W. Classen, Essen, Germany.

Grinding and polishing techniques. Data on abrasives, grinding wheels and equipment. (G18, W2)

199-G. (Translation—Digest) Surface Rolling to Increase Fatigue Strength. Digest of "Surface Rolling as a Method of Increasing the Fatigue Strength of Gears". A. A. Novik and M. S. Balter. *Vestnik Machinostroyeniya*, no. 10, 1957, p. 65-68. *Metal Progress*, v. 75, Apr. 1959, p. 174, 176, 178.

Surface rolling was selected to introduce the residual compressive stresses. The roller profile was designed to insure coverage by surface rolling of the entire transition surface between the flank of the tooth and the bottom of the tooth space (the zone of maximum bending stresses). S-N curves show a great improvement in fatigue life due to the surface rolling treatment. (G23s, T7a, Q7a)

200-G.* Fabrication of the Stainless Steels. Pt. 2. Lester F. Spencer, *Metal Products Manufacturing*, v. 16, Apr. 1959, p. 37-39, 70.

Forming and welding. (G-general, K-general; SS)

201-G.* Breakthrough in Tungsten Fabrication. Donald E. Perry. *Missiles and Rockets*, Mar. 23, 1959, p. 22-23.

Deep drawing and brazing makes tungsten available for new applications. (G4f, K8; W, 17-57)

202-G.* Controlled Explosive Blasts Hardness Into Steel. W. A. Harper. *Product Engineering (Design Edition)*, v. 30, Apr. 13, 1959, p. 62-63.

Velocity impact work-hardening Mn steel castings using sheet explosive. (G-general, NM-k34, Q23a; AY, *Mn*, 5)

203-G.* (German.) Spark Machining of Hard Metallic Materials. Pt. 1. Development and Fundamentals of Speak Machining. F. W. Neumann and J. Wetzger. *Frequenz*, v. 13, Jan. 1959, p. 15-21.

Historical development of spark machining; main types of circuits, physical process of electro-erosion; typical machine. 8 ref. (G24a)

204-G.* (German.) Materials Suited for Automatic Processes. K. Wellinger and H. Gassmann. *Werkstattstechnik*, v. 49, Mar. 1959, p. 148-152.

Machinability properties of various free cutting steels and cast irons as determined by composition and heat treatment tested by observing tool life in relation to cutting speeds applied in such operations. 25 ref. (G17k, 2-64; SGA-k, ST, CI, 17-57)

205-G.* (German.) Properties and Internal Stresses of Free Cutting Steels. Alexander Schepers and Arnold Peiter. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 337-349.

Causes of cracking in cold drawn killed and rimming-type free cutting steels, with and without Pb content. Relationship between internal stresses and longitudinal cracking was established. Influence of asymmetric machining pattern or the incidence of cracks. 53 ref. (G17, Q25; ST-c, ST-d, *Pb*, SGA-k)

206-G. (German.) Die Pressing of Flatware From Brass, Silver and Cr-Ni Steel. Ernst F. Scheven. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 106-111.

Experiments with various flatware pressing equipment, carried out to reduce die wear. (G1, T6q; Cu-n, Cu-b, SS)

207-G.* (German.) Machining Properties of High-Alloy Steels Containing Chromium, Nickel and Manganese. Georg Menges and Helmut Treppschuh. *VDI Zeitschrift*, v. 101, Mar. 1, 1959, p. 265-273.

Machining properties of ferritic Cr, heat treatable Cr, hardenable martensitic, austenitic, ferritic-austenitic and stainless free-maching steels. (G17k; SS, *Cr, Ni, Mn*)

208-G.* Hot Forming of Magnesium Moves Into High Gear. Louis R. Degen and Willard Axtell. *American Machinist*, v. 103, Apr. 20, 1959, p. 128-129.

Manufacture of suitcases from drawn sheets and extrusions of Mg. (G4; Mg)

209-G. In Electric-Discharge Machining What's the Best Electrode Shape for Removing Metal? Richard W. McDowell and Orville D. Lascoe. *American Machinist*, v. 103, Apr. 20, 1959, p. 133-135.

15 ref. (G24a)

210-G. O_2 Cutting Keeps Pace With Progress. H. Thomasson. *Canadian Metalworking*, v. 22, Apr. 1959, p. 54, 56.

New equipment and techniques. (G22g)

211-G. Stretch Former Compensates for Yield Strength Variations. *Iron Age*, v. 183, Apr. 23, 1959, p. 110-111.

New unit gives each workpiece a tensile test to determine its yield point before forming begins. (G9, 1-52)

212-G. Breakthrough in Tungsten Fabrication Promises Wider Use of Pure Metal. *Steel*, v. 144, Mar. 23, 1959, p. 102-103.

Tungsten parts produced by forging, extrusion, deep drawing or spinning. (G-general, F22; W, 17-57)

213-G. Do It Yourself: Explosive Cutting. *Steel*, v. 144, Mar. 23, 1959, p. 104-105.

Cutting steel plates with shaped explosives. (G17; ST, 4-53, NM-k34)

214-G.* (German.) Production of Screws by Plastic Forming. W. Schuster. *VDI-Berichte*, v. 39, 1959, p. 9-13.

Cold heading of steel bolts in multiple-step operations; static and dynamic load-carrying capacity of various types of cold headed bolts; plastic forming of threads by flat dies and by thread rollers. (G10; ST)

215-G.* (German.) Practicality of Substituting Cold Forming for Other Metalworking Processes. K. Sieber. *VDI-Berichte*, v. 39, 1959, p. 13-16.

Limits of application of various cold forming processes such as upsetting, form pressing, cold extrusion, drawing, trimming to the production of carbon steel and low-alloy steel components. (G-general, 1-67; CN, AY)

216-G.* (German.) Forming Metal Sheet With Elastic Media. G. Oehler. *VDI-Berichte*, v. 39, 1959, p. 17-22.

Application of rubber dies for drawing and pressing of Al parts. Relationship between Shore hardness number and specific forming pressures needed for drawing, forming, bending, blanking and combined operations on soft metal sheets. 5 ref. (G14; Al)

217-G.* (German.) Cold Pressing of Symmetrical and Asymmetrical Small Parts. O. May. *VDI-Berichte,* v. 39, 1959, p. 22-25.
Process differs from the conventional cold extrusion by reduced ram speeds, thereby allowing more time for the metal to flow. (G1, 1-67)

218-G.* (German.) Coining of Drop Forged Parts. R. Meier. *VDI-Berichte,* v. 39, 1959, p. 35-38.
Analysis of deformation forces and plastic flow. (G3n)

219-G.* (German.) Defects in Cold Pressing of Light Metals. H. Hornauer. *VDI-Berichte,* v. 39, 1959, p. 38-42.
Flaws found in cold pressed Al parts related to material properties, component design and processing. (G1, 1-67; A1)

220-G.* (German.) Extrusion of Metals in Pre-Loaded Dies. H. J. Friedewald. *VDI-Berichte,* v. 39, 1959, p. 42-49.
Accuracy of hot and cold extruded metal shapes can be increased by preloading of extrusion dies. Methods for finding optimum preloads for various extruded metal shapes to counterbalance the expected radial forces in the dies during process. (G5)

221-G.* (German.) Metal Forming and Tooling. K. Sieber. *VDI-Berichte,* v. 39, 1959, p. 49-55.
Processes of wiredrawing, reducing and cold extrusion analyzed to determine deformation pressures needed. Methods of designing tools capable of withstanding these pressures, using various metals for the forming and the armor part of the dies. (G-general, F28, W24)

222-G.* (German.) Specific Cutting Tool Loads for Cylindrical Milling Cutters. H. Philipp. *Werkstatt und Betrieb,* v. 92, Apr. 1959, p. 179-187.
Computation of forces acting in milling when the work is fed against the movement of blades. Tool loads are shown for various materials, tools and chip thicknesses. 45 ref. (G17b; ST, CI, Cu-n)

223-G.* Machining of Ultra Strength Alloys. John Maranchik, Jr., J. V. Gould and P. R. Arzt. *Society of Automotive Engineers,* Preprint no. 43 R, 1959, 40 p.
Turning, milling, drilling and tapping tests on AISI 4340 and VascoJet 1000 steels in quenched and tempered conditions. Turning and drilling tests on solution treated and aged AM-350 and A-286 stainless steels. Influence of cutting speed, feed, tool material and geometry and workpiece hardness. (G17; AY, SS-e, TS-k, SGB-a)

224-G.* Looking Ahead the Next 10 Years in Manufacturing by High Energy Rate Plastic Deformation of Materials. J. B. Ottestad. *Society of Automotive Engineers,* Preprint no. 52 T, 1959, 4 p.
Plastic deformation process; utilization of high-velocity forming; precision extrusion; forging and forming. (G-general, Q24, Q23q, NM-k34)

225-G. Facts About Explosive Metal Forming. Gilbert C. Close. *Modern Machine Shop,* v. 31, May 1959, p. 108-113.
Research work conducted by Aerojet-General Corp., Azusa, Calif. (G-general)

226-G. Explosive Forming. *Pacific Factory,* v. 91, Apr. 1959, p. 22-23.
Survey of progress. (G-general)

227-G. Explosive Forming Blasts Complex Shapes in Fraction of Time by Conventional Methods. *Western Metalworking,* v. 17, Apr. 1959, p. 52-53.
Experimental work at Ryan Aeronautical Co. (G-general)

228-G. (German.) Plastic Bending of Sheet Metal. F. Proksa. *Stahlhau,* v. 28, Feb. 1959, p. 29-36.
Theoretical treatment of bending process. 18 ref. (G6, 4-53, 10-51)

229-G.* Chip Formation in Metal Cutting. Hydrodynamic Theory. M. M. Lamm. *Engineering,* v. 137, Apr. 3, 1959, p. 444-446.
The metal appears to be squeezed plastically between the face of the tool and the main body of the metal being machined. (G17)

230-G. Cold Extrusion of High Strength Aluminum Alloys. Walter A. Backofen, Richard B. Palme and Shillings Tsang. *Massachusetts Institute of Technology,* Project no. 7263, June 1, 1958, 124 p.
Cold piercing tests on cylindrical billets of 7075 and 2024 Al alloys. Relationship of punched pressure requirements, deformation characteristics in billets and properties of resulting cup to reduction, billet geometry, punch design, scale of operation and lubrication. Calculation of deformation efficiency; deformation analysis using grids and microhardness surveys. (G5; A1-b)

231-G.* Designing Magnesium Extrusions. John J. Clemens. *Machine Design*, v. 31, May 14, 1959, p. 179-183.

Costs, characteristics, mechanical properties of Mg extrusions. (G5, Q-general, Mg-b, 4-58, 17-51)

232-G. (German.) Production of Hollow Cylinder Shapes: Impact Extrusion or Deep Drawing? Otto May. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 381-385.

Comparison of the two processes. (G5, G4b)

233-G.* Turning Alloy Steels With Ceramic and Carbide Tools. *Mechanical World and Engineering Record*, v. 139, Apr. 1959, p. 174-175.

Investigation at Production Engineering Research Assoc. shows that ceramic tools can be used successfully at high stock removal rates and that they may be superior for finish turning. (G17a; AY, SGA-j, NM-f)

234-G.* What Is Known Today About Metal Cutting. Francis W. Boulger. Paper from "An Evaluation of the Present Understanding of Metal Cutting". American Society of Tool Engineers, Detroit, 1959, p. 4-30.

Empirical relationships showing effects of changing workpiece materials, tool and cut geometry and cutting speeds on tool live. Influence of cutting speed and workpiece microstructure on surface finish. 46 ref. (G17, T6n)

235-G.* Influence of Metallurgical Properties on Metal-Cutting Operations. Francis W. Boulger. Paper from "An Evaluation of the Present Understanding of Metal Cutting". American Society of Tool Engineers, Detroit, 1959, p. 190-254.

Strength, ductility, strain-hardening characteristics and hardness are closely interrelated. Properties depend on composition and microstructure and influence machinability. Tensile data are not directly applicable to the cutting process because temperatures, strain rates, specimen sizes and stress conditions are independent. 89 ref. (G18k)

236-G.* (German.) High-Speed Cutting. M. Kronnenberg. *Werkstattstechnik*, v. 49, Apr. 1959, p. 181-184.

Comparison of highest cutting speeds of steel, steel alloys, high-speed steel, carbon steel, cast iron, Al, Cu, Cu alloys and phosphorus-bronze. The consumption of impact energy depends on the impact speed. It first increases with the increase of speed but when critical speed is reached it begins to decrease rapidly. (G17; ST, CN, Fe-b, Cu-b, Cu-s)

237-G.* (Russian.) Effect of Flux Composition on the Physical and Chemical Properties of Slag in Oxygen Flux Cutting of Stainless Steels. O. Sh. Spector. *Svarochnoe Proizvodstvo*, Apr. 1959, p. 22-25.

In slags formed during oxygen flux cutting Cr is present in the form of Cr-oxide compounds of the type $FeOCr_2O_3$. If, during cutting, the flux is fed by double injection, the total quantity of Cr-oxides, in the resulting low-temperature melting compounds, should not exceed 15% of the total slag. (G22; RM-q, SS)

238-G.* Forming of Metals by Explosives. Julius Roth. *Explosives Engineer*, v. 37, Mar-Apr. 1959, p. 52-55.

Properties of explosives which may be important in the shaping of metals. 8 ref. (G-general; NM-k34)

239-G.* Explosive Forming, Slicing and Extruding. *Plant Engineering*, v. 13, May 1959, p. 124-127.

Slicing billets, shaping without dies, direct forming, activation of pistons and extrusion. (G-general; NM-k34)

240-G.* Heat Makes It Easy to Drill Small, Deep Holes in Uranium. Edward J. Lach and Randall Lenz. *American Machinist*, v. 103, May 19, 1959, p. 117-118.

Hot machining solves the work-hardening problems. (G17e; U)

241-G.* Designing for Steel Extrusions. J. J. Barrett. *Precision Metal Molding*. v. 17, May 1959, p. 68-69.

Applications, design pointers. (G5; ST, 17-57, 17-51)

242-G.* Machining Characteristics of AISI 4340 Low Alloy Steel. P. R. Arzt, J. V. Gould and J. Maranchik, Jr. *SAE Journal*, v. 67, May 1959, p. 37-45.

Turning, milling, slotting, drilling and tapping tests. (G17; AY-n)

243-G. Report on Explosive Forming. Thomas A. Dickinson. *Light Metals*, v. 22, May 1959, p. 136-137.

(G-general, NM-k34)

244-G. The Mechanism of Chip Formation. Donald Gideon, Ralph Simon and Horace Grover. Paper from "An Evaluation of the Present Understanding of Metal Cutting".

American Society of Tool Engineers, Detroit, 1959, p. 31-57.

Chip formation at the shear plane in terms of stresses, geometry and the rela - tive motion of the tool-work combination. Dissipation of the input power at the shear plane, tool face and in stored energy in the chip and workpiece. 59 ref. (G17, G25)

245-G. Some Thermal and Physical Aspects of Cutting. Donald Gideon, Ralph Simon and Horace Grover. Paper from "An Evaluation of the Present Understanding of Metal Cutting". American Society of Tool Engineers, Detroit, 1959, p. 70-88.

Analyses of cutting temperatures; effects of temperature increments in shear zone; effects of high temperatures on the tool face; strain and strain rate in the shear zone. 22 ref. (G17, G25)

246-G. Present Knowledge of Cutting Fluids. Stanley L. Cosgrove and Roy W. Greenlee. Paper from "An Evaluation of the Present Understanding of Metal Cutting". American Society of Tool Engineers, Detroit, 1959, p. 135-189.

Cutting fluids in relation to their ability to extend tool life, permit greater depths of cut at high cutting speeds and improve surface finish. 65 ref. (G17; NM-h)

247-G. Recommendations for Further Research on Metal Cutting. D. N. Gideon, S. L. Cosgrove, R. Simon, H. J. Grover and F. W. Boulger. Paper from "An Evaluation of the Present Understanding of Metal Cutting". American Society of Tool Engineers, Detroit, 1959, p. 265-273.

Future research in relation to cutting fluids, tool life and tool wear, mechanics of the cutting operation, thermal and physical aspects of metal cutting. (G17)

248-G. (German.) Forming and Shaping of Austenitic Steels. Georg Menges. *Industrie-Anzeiger*, v. 81, Mar. 24, 1959, p. 11-14.

Directions for cold and hot deformation, heat treatment, pickling, welding, stamping and piercing, grinding, polishing and forging. 4 ref. (G-general, F22, L10b; SS-e)

249-G. (Italian.) Electrolytic Grinding. Sirio Leporatti. *Macchine*, v. 14, Apr. 1959, p. 305-317.

Electrical machining processes and equipment with special reference to electrolytic grinding. (G24)

250-G. (Japanese.) Case Hardening by Shot Peening. Syoukichi Hirose. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 98-102.

Air nozzle and centrifugal-type equipment. (G23n)

251-G. (Japanese.) Lubricants in the Drawing of Aluminum. Hisashi Ikeno. *Metals*, v. 29, Jan. 1959, p. 69-72.

Difficulties in drawing are caused by deformation resistivity, deformation hardening, roughness of the surface of tools and friction. Several lubricants are recommended. (G4; NM-h)

252-G. Belt Grinding of Titanium Sheet and Plate. Carl T. Olofson. *Defense Metals Information Center*, Memorandum no. 11, Mar. 15, 1959, 7 p.

Successful grinding of Ti with abrasive belts depends on reducing its welding action to the mineral. This can be accomplished by lowering the temperature at the grinding point through adequate cooling, and by using appropriate grinding fluids which will inhibit the chemical reaction between the mineral and the Ti. (G18, W25c; Ti, 4-53, NM-h)

253-G. The Finishing and Inspection of Uranium Fuel Slugs in the Processing Refabrication Experiment. J. Guon, J. R. Foltz and W. Cockrell. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-2798, Dec. 15, 1958, 65 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Cold short fracture, abrasive, electrical discharge and ultrasonic methods of machining cast uranium slugs. Sub-surface defects in the slugs cannot be detected by commercially available ultrasonic instruments. 29 ref. (G24, T11g, S-general; U, 4-55)

254-G.* (Hungarian.) Properties of Mild Aluminum Sheets Influenced by Macrostructure of Semicontinuously Poured Slabs. Istvan E. Boczor. *Kohaszati Lapok*, v. 92, Feb-Mar. 1959, p. 65-69.

The tendency of Al alloys to form ears and develop scalloped edges during sheet rolling and subsequent deep drawing can be counteracted in part by improved ingot casting methods, which produce a fine-grained structure, and by adequate annealing. 20 ref. (G4b, F23, C5g, 2-64; Al-b, 4-53, 9-71)

255-G.* Machining of Molybdenum and Its Alloys. W. A. Taebel and J. Gelok. Paper

from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 134-138.

Speed, feed, depth of cut, tool shape and geometry for turning, milling, drilling, shaping, reaming and grinding Mo and Mo alloys. Effect of anisotropy, microstructure and hardness. (G17, 3-71, 3-72; Mo-b)

256-G.* Press Extrusion of Molybdenum Tubing. R. A. Quadt. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 139-147.

Microstructure, mechanical properties and tolerances of tubes formed by hot, followed by cold, extrusion. Recrystallization temperatures of unalloyed Mo extrusions. (G5, F24a, Q-general, N5; Mo, 4-60)

257-G. The Chemical Contouring of Aluminum-Alloy Panels. *Machinery (London)*, v. 94, May 13 1959, p. 1093-1097.

(G24b, T24a; Al-b)

258-G. When You Machine the "Big Four" Refractories. *Metalworking*, v. 15, June 1959, p. 10-11.

Data on Mo, W, Ta and Cb. (G17; Cb, W, Mo, Ta)

259-G. How to Machine Stainless Steel With Cut-Off Tools. G. J. Stevens. *Modern Machine Shop*, v. 32, June 1959, p. 108-112.

Cut-off tool design, selection, operating techniques. (G17, T6n; SS)

260-G. Choosing the Lubricant for Carbides. John A. Boyd. *Tooling & Production*, v. 25, June 1959, p. 62.

(G17, T6n; NM-h, 6-69)

261-G. (German.) Machinability Testing Methods. Henning Siebel. *Industrie-Anzeiger*, v. 81, May 5, 1959, p. 554-558.

11 ref. (G17k, 1-54)

262-G. (Portuguese.) Sonics in Modern Industry. Pt. 2. L. X. Nepomuceno. *Engenharia, Mineracao e Metalurgia*, v. 29, Mar. 1959, p. 125-129.

Cleaning of parts; drilling operations on hard metals. (G24c, L10f)

263-G.* Practical Approach to Machining Stainless Steels. James M. Galimberti. *Metal Removing*, v. 3, Apr-May 1959, p. 14-15.

Recommended speeds and feeds for three grades of finishing various stainless steels with carbide tools. (G17; SS)

264-G.* The Effect of Selenium on the Machinability and Tensile Properties of 5% Chromium Steel. Francis W. Boulger. *American Society for Metals, Transactions*, v. 52, Preprint no. 131, 1959, 18 p.

Machinability of 5% Cr—1.2% Mo hot work die steels containing up to 0.26% S and 0.18% Se. Longitudinal and transverse tensile properties of experimental steels in the annealed conditions as heat treated to give tensile strengths of 278,000 psi. Microstructures. 5 ref. (G17k, Q27a, M27, 2-60; TS-k, *Se, Mo, Cr*)

265-G.* (Czech.) Oxy-Acetylene Cutting of Die Forgings. Jan Bezdicek and Jaromir Zabrodsky. *Zvaranie*, v. 8, Apr. 1959, p. 97-100.

Investigation of cracks found in forgings when the material is cut with an oxy-acetylene torch. Crack elimination is achieved by heat treatment, modified according to material composition and ambient temperature. 8 ref. (G22g, 2-64; CN, AY, 4-51, 9-72)

266-G.* Metallurgical Examination of Oxygen-Cut Titanium. J. C. Borland and W. G. Hull. *British Welding Journal*, v. 6, May 1959, p. 225-229.

Various zones of contamination were detected in oxygen-cut unalloyed Ti and specimens of Ti-150A and A110-At. Severe hardening, and thus contamination, was restricted to flame-cut surface. Commercially pure Ti sheet was flame cut and butt welded along line of cut. Contamination of weld metal was small and increase in hardness was only 38 D.P.N. 5 ref. (G22g, Q29n; Ti, 4-53)

267-G. Explosive-Forming Meets Space-Age Production Demands. P. F. Lambert. *Machinery*, v. 65, June 1959, p. 124-128.

Methods, advantages and limitations, current status, future possibilities. (G-general; NM-k34)

268-G.* (German.) Application of Electro-erosion and Ultrasonics in Metal Production. H. Kusserov. *Maschinenbau*, Feb. 1959, p. 42-44.

In the electro-erosion process, the removal of material is influenced by the shape of the anode, the composition of the workpiece, dielectric phenomena and heat flow. Roughness depends on the frequency of spark. In the ultrasonics process, a cutting tool is vibrated by sound waves. (G24d, G24c)

269-G.* (Italian.) Experiments With Various Cutting Fluids in Surface Finishing. Gian Federica Micheletti. *Ingegneria Meccanica*, v. 8, Feb. 1959, p. 68-74.

Distribution of heat in workpiece, tool and chip as a function of cutting speed. Passivation effect of a fluid containing amino soaps and passivation agents on cast iron, carbon steel and alloy steel at room temperature and at 40° C. (G18k; CI, CN, AY, NM-h)

270-G.* Flanging and Pressing of Dished Heads. Harry S. Beers. Digest of "The Flanging and Pressing of the Dished Head". Paper presented at Philadelphia Regional Technical Meeting of American Iron and Steel Institute, Nov. 20, 1957, 23 p. *Metal Progress*, v. 75, June 1959, p. 183-184.

Pressed heads are formed by hot or cold forming, depending on the thickness, diameter and depth of draw. Hot pressing can usually be done in flat clamping and forming dies. Cold pressing is more complex and various beaded-type dies are used, depending on the contours desired. (G6, G1)

271-G. Chemical Milling. *Design News*, v. 14, May 25, 1959, p. 18-19.

Review. (G24b)

272-G. Friction on Relief Face of Cutting Tool. Makoto Okoshi and Toshio Sata. *Institute of Physical and Chemical Research, Scientific Papers (Japan)*, v. 52, Dec. 1958, p. 216-223.

Compared with that on the rake face. (G17, Q9p, T6n)

273-G. Behavior of Chips in Steel Cutting. Keiji Okushima and Kiyoshi Minato. *Japan Society of Mechanical Engineers, Bulletin*, v. 2, no. 5, 1959, p. 58-64.

Methods for controlling shape of chip; angle of chip; ejection of chip; chip classification and effect of cutting conditions on chip shape. (G17; ST)

274-G. The Cutting Mechanism of Honing. Tokio Sasaki and Kenjiro Okamura. *Japan Society of Mechanical Engineers, Bulletin*, v. 2, no. 5, 1959, p. 80-85.

The best cutting efficiency is obtained at a cutting speed of 40 m. per min. (G19n)

275-G. Electro-Spark Machining by Alternating Current. Tokuzo Matsuyama and Takao Kayaba. *Japan Society of Mechanical Engineers, Bulletin*, v. 2, no. 5, 1959, p. 86-91.

With a-c. the machining speed is maximum, and in the widest extent of the work-current, machining is stable, using a solid brass bar electrode. (G24a)

276-G. Recent Advances in Honeycomb Fabrication. *Metalworking Production*, v. 103, May 29, 1959, p. 946-947.

Machining, brazing and inspection techniques. (G17, K8, S13m; 7-59)

277-G.* Some Electrical Phenomena in Metal Cutting. V. Solaja and H. L. Hughes. *Wear*, v. 2, May 1959, p. 311-314.

Dependence of the thermo-e.m.f. magnitude on cutting conditions in fine turning; effects of naturally generated and additional injected electrical currents. 16 ref. (G17)

278-G. Flexible Sheet-Explosive for Metal Cutting. *Welding Engineer*, v. 44, June 1959, p. 46-47.

Advantages and procedures for cutting and hardening by this new method. (G-general; NM-k34)

279-G.* (German.) Hole-Piercing in Steel by Means of the Oxy-Acetylene Blowpipe. E. Zorn. *Schweissen und Schneiden*, May 1959, p. 171-175.

Piercing perpendicular to the surface in carbon steel sheets up to 200 mm. thick and in austenitic Cr-Ni steel up to 150 mm. thick; stack-piercing of five superimposed sheets, each 10 mm. thick. (G22g; CN, SS, 4-53)

280-G. (Pamphlet.) Automatic Screw Machining of Aluminum. 31 p. 1959. Reynolds Metals Co., Richmond 18, Va.

(G17g; Al)

281-G. (Book.) Evaluation of the Present Understanding of Metal Cutting. 275 p. 1959. Battelle Memorial Institute. Research Report, no. 20, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich.

Papers abstracted separately. (G17)

282-G.* The Cold Extrusion of Metals Using Lubrication at Low Speeds. R. J. Wilcox and P. W. Whitton. *Institute of Metals, Journal*, v. 87, June 1959, p. 289-293.

Super-pure Al extruded by the direct and inverted methods using dies of semicone angle varying from 30° to 90° and of extrusion ratio varying from 2:1 to 150:1. A general equation is presented which can be used for pressure predictions over a wide range. Optimum die angle is dependent on extrusion ratio. 9 ref. (G5; Al-a)

283-G.* Tungsten-Arc Cutting of Stainless Steel Shapes in Steel Warehousing Operations. John D. Wait and Stephen H. Resh. *Welding Journal*, v. 38, June 1959, p. 576-581.

Method offers a substitute for powder cutting. The tungsten-arc product is cleaner and cut to much closer tolerances without iron powder contamination and little or no carbide precipitation. It requires a minimum of machining and the edges of the material cut can often be immediately welded without further preparation. (G22h; SS, 4-53)

284-G. The Theory and Practice of Explosive Metal Forming. Robert A. Cooley. *American Machinist*, v. 103, June 15, 1959, p. 128-130.

12 ref. (G-general; NM-k34)

285-G. Explosives Form Tubes With and Without Dies. Jacob Savitt. *American Machinist*, v. 103, June 15, 1959, p. 135-137.

(G-general; 4-60, NM-k34)

286-G. Effect of a Lead Additive on the Machinability of Alloy Steels. Norman Zlatin and John V. Gould. *Journal of Engineering for Industry*, v. 81, May 1959, p. 131-138.

The use of a Pb additive in medium-carbon alloy steels results in appreciable increases in tool life for steels having a hardness of Rockwell C-30 or less. (G17k, 2-60; AY, *Pb*)

287-G. Effects of Tool Flank Wear on Tool Chip Interface Temperature. D. R. Olberts. *Journal of Engineering for Industry*, v. 81, May 1959, p. 152-158.

Effect of land wear upon the interface temperature between a carbide tool and an AISI 1015 steel workpiece. (G17, T6n, Q9n; ST, 6-69)

288-G. Electron Beams Machine by Vaporization. *Metalworking Production*, v. 103, June 5, 1959, p. 986-987.

Concentrated beam of electrons vaporizes the workpiece material to form holes or slots of 0.0015 in. width or less. (G24a)

289-G. (French.) Technology's Newest Baby: The Plasma Torch. *Machine Moderne*, v. 53, May 1959, p. 9-12.

Description and operation; use in welding cutting, melting, forming and coating. (G13, L29)

290-G. (German.) Method of Piercing Elongated Holes Using Pressurized-Gas Blowpipe. R. Peiffer. *Schweissen und Schneiden*, v. 11, May 1959, p. 192-194.

Piercing holes through the entire cross-section of metal walls by an oxy-acetylene blowpipe in which gas is used under pressure. (G22g)

291-G. (Russian.) Powder Cutting of Stainless Steels. B. I. Smirnov. *Svarochnoe Proizvodstvo*, May 1959, p. 27-30.

Powder cutting has hardly any effect on the structure of steel near the cutting area. The dendritic structure formed did not exceed more than several tenth of a mm. in depth. (G22g; SS-e)

292-G. (Russian.) Nitrogen-Arc Cutting of Stainless Steels. I. S. Shapiro. *Svarochnoe Proizvodstvo*, May 1959, p. 30-32.

Blowing of a concentrated stream of nitrogen, containing not more than 1% oxygen, into the electric arc discharge when cutting stainless steel sheets 4-28 mm. thick. For sheets thicker than 25 mm. addition of hydrogen is recommended. 5 ref. (G22h; 4-53, SS)

293-G.* Shear Spinning. B. N. Colding. *American Society of Mechanical Engineers*, Paper no. 59-PROD-2, 1959, 12 p. $.80.

Data on spinning machines and tooling. Material flow during shear spinning; analytical expressions for shear spinning stresses and tangential force; maximum theoretical reductions; efficiency of deformations. 6 ref. (G13, G25; Al, ST, SS, Ni-b, Ti)

294-G.* Shear-Zone Size, Compressive Stress, and Shear Strain in Metal Cutting and Their Effects on Mean Shear-Flow Stress. Dimitri Kececioglu. *American Society of Mechanical Engineers*, Paper no. 59-PROD-3, 1959, 9 p. $.80.

Machining SAB 1015 seamless steel tubing under a wide range of conditions. 13 ref. (G17, G25; ST, 4-60)

295-G.* 1958 Review of Metal Processing Literature (Grinding). George Reichenbach. *American Society of Mechanical Engineers*, Paper no. 59-PROD-4, 1959, 3 p. $.80.

Chatter and vibration; grinding chip formation; residual grinding stress; abrasive wear. 8 ref. (G18, Q25h, W25c)

296-G.* 1958 Review of Metal Processing Literature (Metal Cutting Analysis). J. M. Galimberti, H. J. Siekmann, R. S. Hahn and E. G. Thomsen. *American Society of Mechanical Engineers*, Paper no. 59-PROD-6, 1959, 5 p. $.80.

Mechanics of chip formation, plasticity, cutting forces, tool life, cutting zone temperature and vibration in machining. Drill design and residual stresses. 40 ref. (G17, G25)

297-G.* Electrical Discharge Machining as Applied to Engineering for Productivity. Albert E. Holm. *American Society of Mechanical Engineers,* Paper no. 59-PROD-9, 1959, 5 p. $.80.

Use of electrical discharge machining in the fabrication of stamping dies. (G24a, W24n; TS)

298-G. Centerless Grinding Faults and How to Correct Them. Edwin R. Larson. *Grits and Grinds,* v. 50, May 1959, p. 12-15. (G18h)

299-G.* Progress in Cold Extrusion of Steel. *Sheet Metal Industries,* v. 36, May 1959, p. 353-358, 366.

Practice at the Royal Ordnance Factory, Birtley, England, together with experimental work by some industrial firms. (G5; ST)

300-G.* (Spanish.) Sheet Steel for Stamped and Deep Drawn Parts. Ernesto Diaz-Varela y Ceano Vivas. *Instituto del Hierro y del Acero,* v. 12, Jan-Mar. 1959, p. 1-27.

Mechanical and structural properties required for the deep drawing process; tests for determining properties; heat treatment and natural aging. 23 ref. (G3, G4b, Q-general; 4-53, ST)

301-G.* (German.) Cutting of Stacked Sheet by Acetylene and Propane. A. Matting and Tin Ming Wu. *Industrie-Anzeiger,* v. 81, June 9, 1959, p. 15-22.

Effect of heating gas and the type of burner on cutting efficiency. 15 ref. (G22g; ST, 4-53)

302-G.* (German.) Flame and Arc Cutting of Nonferrous Metals. W. Mantel and L. Wolf. *Industrie-Anzeiger,* v. 81, June 9, 1959, p. 22-27.

Advantages and disadvantages; quality and cost of oxygen, MIG SIGMA, argon arc and the electrocutting process using a coated electrode. 15 ref. (G22g, G22h; Al, Cu, Ni)

303-G. (German.) New Type Flame Cutting Equipment. R. Bechtle. *Werkstatt und Betrieb,* v. 92, June 1959, p. 335-344.

6 ref. (G22g, 1-52)

304-G. (Italian.) Chemical Machining and Its Applications. Sirio Leporatti. *Rivista di Ingegneria,* v. 9, May 1959, p. 577-590. (G24b)

305-G. (Swedish.) Grinding of Hard Metal. Lars Weimer. *Industriell Teknik,* v. 87, Jan. 7, 1959, p. 17-20.

Materials and methods. (G18; EG-d)

306-G. How to Design for Grinding. M. M. Patterson. *Grinding and Finishing,* v. 5, June 1959, p. 26-29.

Grinding used for stock removal more accurately and faster than single-point machining as well as for finishing. (G18k, G19)

307-G. (Translation—Brutcher No. 4529.) Cold Bending and Flame Straightening of Steels 15M and 12MKh. A. P. Simakovski. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Feb. 1959, p. 40.

Installation practices for cold bending of small-diameter pipes and flame bending and straightening of large-diameter pipes. (G6, Q5g; AY, 4-60)

308-G. (Translation—Brutcher No. 4531.) Machinability of Steel and Cast Iron by Carbide Tools. G. L. Khaet. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Feb. 1959, p. 49-53.

(G17k, T6n; CN, CI, 6-69)

309-G. Hot Forming the Answer for Tungsten. *Metalworking Production,* v. 103, June 26, 1959, p. 1098-1099.

High temperatures make possible the formation of pure tungsten products by drawing, forging, extrusion and spinning. (G-general, 1-66; W)

310-G. Spark Electrode Shape Decides Cutting Rate. *Metalworking Production,* v. 103, June 26, 1959, p. 1100-1101.

An electrode having a 90° point is the optimum shape for evacuation of particles during cutting process. (G24a, 3-73)

311-G. Auto Attachment Broaches Space Rings. Forest McDaniel. *Metalworking Production,* v. 103, June 26, 1959, p. 1103-1107.

Thickness tolerance on Al alloy spacer rings is controlled by a second-operation broaching attachment. (G17d; Al)

312-G.* (German.) Production of Casting Dies by Cold Hobbing. W. Haufe. *Giesserei,* v. 46, June 1959, p. 353-361.

Selection of die materials. Molybdenum steels compared with tungsten steels.

Compression strength and viscosity of steels for punches. Method is recommended to reduce the pressure applied in the process. (G17b, 1-67, W19n; AY)

313-G.* Belt Grinding Titanium. Carl T. Olofson. *Light Metal Age*, v. 17, June 1959, p. 6-7.

Abrasives, belt backing, contact wheels, speeds, feeds and grinding fluids. (G18p, W29c; Ti)

314-G.* (German.) Material Problems Connected With Automation. K. Wellinger and H. Gassmann. *VDI-Berichte*, v. 40, 1959, p. 28-32.

Effects of nonmetallic additions and phase composition on the machinability of free-cutting steel and gray cast iron. 25 ref. (G17k, 18-74, 2-60; CN, SGA-k, CI-n)

315-G. (German.) Belt Grinding of Titanium. R. Berger. *Metall*, v. 13, July, 1959, p. 656-657.

Grinding directions and equipment. (G18; Ti)

316-G. (Russian.) How to Rate the Deep Drawing Capacity of Steel Sheet. B. M. Ovsyanikov and L. T. Timoshuk. *Stahl'*, June 1959, p. 560-562.

Rating based on measuring the ultimate diameter of the sample, drawn without sheet rupture. 11 ref. (G4b, 17-52; 4-53, CN)

317-G.* (German.) The Hydroform Process and Hydromechanical Deep Drawing. W. Panknin. *Industrieblatt*, v. 59, June 1959, p. 245-249.

New method eliminates the matrix and uses dies of highly workable material and an oil cushion. (G14b)

318-G. Heat and Speed Form Latest Titanium Alloys. George H. DeGroat. *American Machinist*, v. 103, July 27, 1959, p. 108-111.

(G-general, 1-66; Ti-b)

319-G. M.S.E. "Fette" Thread Rolling. *Australasian Manufacturer*, v. 44, July 4, 1959, p. 44-46.

System whereby the principle of cold rolling is carried out by axially rolling threads in the direction of the grain flow of the metal; no tearing or cratering occurs. (G12)

320-G. Norair Heats Work Within Seconds for High-Temperature Forming. J. E. Hagins. *Machinery*, v. 65, July 1959, p. 118-119.

Titanium alloy blanks heated on the die by radiant heat and formed within 1 sec. of heating. (G-general, 1-66; Ti)

321-G. Missile Guidance System Tooled for Production. D. G. Gill and C. D. Spainhour. *Machinery*, v. 65, Aug. 1959, p. 94-103.

Multiple-purpose machines, unique tooling setups and template-controlled profiling for machining of many different Al and Mg castings. (G17, 5; Al, Mg)

322-G. Jet-Age Drilling at Convair. Thomas W. Driver. *Machinery*, v. 65, Aug. 1959, p. 104-107.

(G17c, W25p)

323-G.* Titanium Machining Techniques. *Titanium Engineering Bulletin*, no. 7, (n.d.), p. 6-31.

Directions for machining. Factors influencing machinability, such as poor thermal conductivity and the tendency to form alloys and chemical compounds with materials of the cutting tool. (G17, G17k; Ti)

324-G. Cookie Cutter Dies Save Money. *Canadian Metalworking*, v. 22, Aug. 1959, p. 38-40.

By shearing, stamping, piercing and punching sheet metal in a compound operation with a single die, stampings are produced in less time and at lower costs. (G3, W24n)

325-G. Ryan's Split-Second Explosive Forming. Charles O. Herb. *Machinery*, v. 65, July 1959, p. 102-108.

Sheet metal is forced into the die to which it is attached by the force of explosives carried out under water. (G-general; Ti, SS, NM-k34)

326-G. (Dutch.) Spark Machining. D. A. deFremery. *Metalen*, v. 14, July 15, 1959, p. 194-199.

Equipment and process. 9 ref. (G24a)

327-G.* Reduction of Warpage by Creep Forming and Die Quenching of Nonferrous Alloys. Joseph Soja. *Metal Progress*, v. 76, Aug. 1959, p. 77-80.

Jet planes are built with large and complex parts made from high-strength materials. Often, these parts are difficult to form by conventional means and special forming methods must be developed. Three new techniques are discussed. (G-general, T24a; Al-b, Ti-b, 9-74)

328-G. Band Sawing of Titanium and Titanium Alloys. Carl T. Olofson. *Defense Metals Information Center*, DMIC Memo. 23, July 1, 1959, 14 p.

Difficulties from galling, smearing, abrasiveness and generation of high temperatures in the cutting zone can be minimized by selecting the proper saw pitch and feeding pressure for the work thickness involved. 12 ref. (G17h; Ti)

329-G. Hacksawing of Titanium and Titanium Alloys. Carl T. Olofson. *Defense Metals Information Center*, DMIC Memo. 24, July 6, 1959, 12 p.

Appropriate selections of pitch, speeds and feeds minimize difficulties. Cutting rates are about 25 to 50% lower than those associated with quenched and tempered alloy steels of equivalent hardness. Blade life in terms of productivity is about 50% lower than that with alloy steels of equivalent hardness. 5 ref. (G17h; Ti)

330-G. Profile Milling Titanium and Its Alloys. Carl T. Olofson. *Defense Metals Information Center*, DMIC Memo. 25, July 10, 1959, 3 p.

Method in which the path of a single-spindle cutter is guided and controlled by a stylus tracing a master form or a template made to the contour, shape or pattern to be reproduced on the workpiece. (G17b; Ti)

331-G. Spindle Shaping of Titanium Sheet. Carl T. Olofson. *Defense Metals Information Center*, DMIC Memo. 26, July 15, 1959, 3 p.

Hand-fed, edge-profiling operation for sheet-metal parts produces aircraft-quality edge finish. Method is feasible for shaping sheet in gages from 0.060 to 0.187 in. using carbide cutters and carbon dioxide as a coolant. (G17b; Ti, 4-53)

332-G.* Simple Cold Forming of Aluminum Sheet and Shapes. *Modern Metals*, v. 15, July 1959, p. 28-36.

Simple and improvised methods of supporting work during bending. Techniques for cutting, folding, beating, flanging and annealing. (G2, G6, G23, 1-67; Al-b)

333-G.* What's Going on in Electromachining. *Steel*, v. 145, Aug. 24, 1959, p. 80-83.

Electrolytic machining, in which the metal is electrolytically deplated from the work, is already proving itself on new, difficult-to-work steels. (G24d; AY)

334-G.* (Czech.) Improvement of Drawing Coefficients in the Deep Drawing of Cylindrical Shapes. J. Domorazek. *Strojirenstvi*, v. 9, Apr. 1959, p. 279-282.

Use of a high drawing coefficient permits a reduction in the number of operations. Determination of the highest drawing coefficient limit. The drawing coefficient is dependent on wall thickness. Reduction of the draw force is achieved by reduction of the friction coefficient. (G4b, G4d)

335-G. Producing Blanks for Multiple-Diameter Shafts by the Cold-Forming Method. Harold C. Seifert. *Machinery (London)*, v. 95, July 22, 1959, p. 99-103.

Advantages are: less raw material required and increased tensile strength, yield strength and hardness which result from cold working the steel. (G1, 1-67, T7j; ST)

336-G. Attachment Caresses Surfaces to a Controlled Finish. *Steel*, v. 145, July 27, 1959, p. 110-112.

Precision surface finishes as fine as 0.5 micro-in. can be turned out with relative ease and economy by the microstoning process. Stones are placed against the work with light pressure (20 to 40 psi.) and vibrated (2000 to 3000 times a min.) as the workpiece rotates. (G19n)

337-G.* If Kinks, Bulges, Bends and Distortion Can't Be Pressed Out Use Low-Cost Heat Straightening. Louis J. Larson. *Welding Design & Fabrication*, v. 32, Aug. 1959, p. 34-35.

Use of heat to straighten weldments and other metal structures. (G23p, G6, K9q; 7-51)

338-G.* Material Selection in Chemical Milling Process. W. C. Rockwell. *Corrosion*, v. 17, Aug. 1959, p. 105.

Milling system for Al, Mg, Ti and steel. Tabular data list cleaner, deoxidizer and etchant solutions and tank materials for each solution. (G24b, 1-52; Al, Mg, Ti, ST)

339-G.* (German.) Cutting Temperature During Machining. W. Lehwald. *Industrie Anzeiger*, v. 81, Aug. 4, 1959, p. 27-30.

Distribution of energy during machining and temperatures on the edge of the cutting tool determined by means of colorimetry. Single and double chisel

methods, measurement of heat losses, use of thermo-color dyes and thermo-elements. 22 ref. (G17, S16b; ST)

340-G.* Carbide Grade Selection. W. E. Montgomery. *Carbide Engineering*, v. 11, July 1959, p. 15-17.

Mechanical and physical properties of carbides. Hot hardness, modulus of elasticity, density, coefficient of thermal expansion, torsional strength, compressive strength and transverse rupture properties. Effect of Co content on the hardness of carbides. (G17, P-general, Q-general, 2-60; 6-69, *Co*)

341-G.* "Hula Head" Hacks Honeycomb. Leon E. Laux and Clyde S. Hill. *SAE Journal*, v. 67, Aug. 1959, p. 68-71.

Techniques and equipment for initial fabrication of cores, for joining, hot and cold contour forming, machining, sawing and assembling stainless steel sandwiches. (G17; SS, 7-59)

342-G.* Air Force Program Evaluates the Machining Characteristics of a Stainless Steel. P. R. Arzt, J. V. Gould and J. Maranchik, Jr. *SAE Journal*, v. 67, Aug. 1959, p. 87-89.

Recommended machining conditions and characteristics for super-strength alloys SAE 4340, H11, AM-350, A-286. (G17k; SS, SGB-a)

343-G.* (German.) Treatment of Hard Metallic Materials With Spark Erosion Machining. F. W. Neumann and J. Wetzger. *Frequenz*, v. 13, July 1959, p. 197-203.

Spark machining contrasted to conventional machining methods. Energy determination per spark unit and electrical loading. (G24a)

344-G.* (German.) Effect of Crystal Structure on the Machinability of Structural Steels. Walter Knorr. *Harterei-Technische Mitteilungen*, v. 13, no. 3, 1959, p. 201-226.

Structure control of carbon steels, case hardening and heat treatable steels by modifying the austenitizing temperature and cooling conditions. 13 ref. (G17k, M26, 3-71, 2-64; CN, AY)

345-G.* The Importance of Directionality in Drawing Quality Sheet Steel. R. L. Whiteley. *American Society for Metals, Transactions*, Preprint no. 174, v. 52, 1959 10 p.

While directionality which produces earing during drawing is generally objectionable, another component of directionality representing differences in properties perpendicular and parallel to the plane of the sheet can be an asset to good drawability. This component of directionality can be measured in a simple tensile test by the ratio of transverse strains. 8 ref. (G4, Q23q; ST, 4-53, 3-72)

346-G. Lockheed Uses Oil Dies to Make Multiple-Bead Sheets. Fred C. Hoffman. *Machinery*, v. 66, Sept. 1959, p. 120-122.

Process whereby oil is forced directly on the work surface and serves as a forming or drawing medium. (G14c)

347-G. Possibilities of High Energy Rate Plastic Deformation. J. B. Ottestad. *Machinery (London)*, v. 95, Aug. 12, 1959, p. 228-230.

(G-general, F-general, NM-k34)

348-G. Difficult Milling Operations Performed With Carbide Cutters. C. Sharp and B. Main. *Machinery (London)*, v. 95, Aug. 19, 1959, p. 284-286.

Milling of high-strength materials used for aircraft landing-gear components. (G17b, T6n; 6-69, SGB-a)

349-G. Hot Forming Operations on Sheet Materials. *Machinery (London)*, v. 95, Aug. 26, 1959, p. 311, 361.

Forging, stamping and hot pressing. (G-general; 4-53)

350-G. Heliarc Offers Better Way to Cut Stainless Steels. *Steel*, v. 145, Sept. 7, 1959, p. 93.

Argon-hydrogen gas mixture protects cut edges from oxidation. Cuts performed to meet tight tolerances without distortion or discoloration. (G22h; SS)

351-G. (Book.) Dimensional Control in Precision Manufacturing. John L. Gadzala. 203 p. 1959. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $7.50.

Fundamentals and methods of dimensional control as applied in production machining. (G-general, 17-55)

352-G.* Magnesium Hot-Formed in Quantity. Louis R. Degen and Willard Axtell. *Metalworking Production*, v. 103, Aug. 14, 1959, p. 1228-1230.

Suitcase shells formed by drawing lubricated Mg alloy sheet in electrically heated dies. (G4d; Mg-b, 4-53)

353-G.* Applications of Cold-Formed Sections. R. M. Kenedi and W. Shearer Smith. *West of Scotland Iron and Steel Institute, Journal,* v. 66, 1958-1959, p. 24-50.

Behavior characteristics of cold formed struts and beams. Methods of fabrication, corrosion protection and application. Possibilities of cold formed structures and functional units. (G11, 1-67; SGB-s)

354-G.* Cold Roll Forming Practice in the United States. W. G. Kirkland. *West of Scotland Iron and Steel Institute,* v. 66, 1958-1959, p. 51-92.

Review of cold rolling, including machining, roll design, tolerances and lubrication. High production capacity is the principal advantage of cold roll forming, with uniformity in cross section and close dimensional tolerances. (G11, 1-67)

355-G.* (German.) Fatigue Strength of Weld Repaired Flame Cut Steel Samples. H. D. Steffens. *Industrie Anzeiger,* v. 81, Aug. 25, 1959, p. 46-53.

Leaping off of the flame during plate cutting often results in the formation of tiny notches on the cutting face. These defects reduce the strength, particularly under cycling stress. Repair of the cutting face by arc welding and correct choice of cutting electrodes. (G22g, K1, Q7a, 18-72; 9-71)

356-G. Spring-Back and Stretch-Forming of Sheet Metal. D. M. Woo and J. Marshall. *Engineer,* v. 208, Aug. 28, 1959, p. 135-136.

When the ratio of forming radius to metal thickness is large, the spring-back is severe and has to be reduced by applying a tensile force at each end of the metal strip. 5 ref. (G9, Q25h; 4-53)

357-G. Production Methods at Daimler-Benz. Pt. 2. Automation Applied to Axles and Blocks. David Scott. *Metalworking Production,* v. 103, Aug. 14, 1959, p. 1223-1227.

Machining of axle housings, front swivel axles and cylinder blocks. (G17, 18-74)

358-G. Hydraulic Roll Forming Bends Big Bumpers. *Metalworking Production,* v. 103, Aug. 14, 1959, p. 1235-1239.

(G11; ST)

359-G. Milling of High-Strength Steels in the Hardness Range of 330 to 560 Brinell. C. T. Olofson. *Defense Metals Information Center,* DMIC Memo. 30, Aug. 17, 1959, 21 p.

Face milling, end milling, side milling and plotting of steels such as 4130, 4340, Chromalloy and Super-Tricent. Tool and cutters grades best suited as well as cutting angles, cutting speeds and feeds help determine the compromise between best cutting conditions and longest tool life per tool required. 30 ref. (G17b; ST, SGB-a)

360-G. Drilling High-Strength Steels Heat Treated to 330 to 560 Brinell Hardness. A. F. Gerds, Carl T. Olofson and F. W. Boulger. *Defense Metals Information Center,* DMIC Memo. 31, Aug. 24, 1959, 11 p.

Drilling of hardened steels such as 4130, 4340, Chromalloy, Inco Super-Tricent steel, with most applicable drilling speeds and feeds. Optimum conditions and tools for various work-pieces. Rigid setups between work and drill, and the use of short, heavy-duty drills increase drill life and hole accuracy and frequently allow the use of less expensive high speed steel drills. (G17e; ST)

361-G.* The Effects of Atmosphere on Dry-Grinding Steel With Al_2O_3 Coated Abrasives. Ernest J. Duwell and William J. McDonald. *American Society of Mechanical Engineers,* Paper no. 59-LUB-6, 1959, 5 p. $.80.

Surface chemical reaction of abrasive with oxygen, Group VIA and VIIA gases which act as a lubricant. 5 ref. (G18; ST, EG-m44)

362-G. The Explosive Press as a Research Tool in Material Behavior and Forming. E. W. LaRocca and J. Pearson. U. S. Naval Ordnance Test Station. *U. S. Office of Technical Services,* PB 151844, May 1958, 17 p. $.50.

Expendable explosive presses were devised for research in explosive forming of powdered metals and nonmetals. Unlike most metal explosive systems, the presses permit recovery of the test specimens. Presses are single and double-action. The double-action press uses two explosive charges fired simultaneously to drive two opposed pistons together into a central steel cylinder in which the specimen material has been placed. Pressures of several million psi. can be obtained. (G-general, 1-52; NM-k34)

363-G. High Energy Rate Metal Forming. G. N. Rardin. Lockheed Aircraft Corp. *U. S. Office of Technical Services*, PB 151849, Mar. 1959, 70 p. $1.75.

Cupping tests confirmed that use of a shock focusing device is advantageous for increasing draw depth for air shots. Tests with a steel cupping die, with the air evacuated between die and workpiece, and the explosive charge suspended above the workpiece, were inconclusive because the workpieces fractured before drawing to the full depth of the air. Tests using the cupping and beading dies in assembly with the bolster and tube, and a 24-in. column of water as the transfer medium, showed satisfactory performance with considerably less explosive weight. (G-general; NM-k34)

364-G.* Forming Cones by Metal Gathering. H. P. Tardif. *Metal Progress*, v. 76, Sept. 1959, p. 84-85.

Cones formed without danger of rupture by recessing the flat workpiece in the die cavity. Metal near the base of the cone is thicker than the original blank. (G4b; NM-k34)

365-G.* Making Compacts by Explosive Forming. E. W. LaRocca. *Metal Progress*, v. 76, Sept. 1959, p. 85-86.

Acting through pistons, the explosive force compresses powders and solid materials. (G1, H14; NM-k34)

366-G.* Grinding and Polishing With Abrasive Belts. W. K. Seward. *Metal Progress*, v. 76, Sept. 1959, p. 95-100.

Understanding basic principles, production men can put abrasive belts to their best use—keeping productivity high and costs low in many finishing operations. (G18, L10b, W25c; NM-j)

367-G.* Abrasive Belt Grinding of Zirconium Sheet. H. N. Dyer and R. A. Leggett. Behr-Manning Co., Troy, N. Y. Digest of "Surfacing of Zirconium Alloy Sheet by Abrasive Belt Grinding". *Metal Progress*, v. 76, Sept. 1959, p. 154, 156.

Effects of abrasive belt speed, type of grinding fluid, and type and size of abrasive grain on bonding qualities of reactor-grade Zircalloy-2 (hot and cold rolled). Bonding was accomplished by sealing surface-ground sheets in a protective container from which air had been evacuated. (G18; Zr-b, 4-53, NM-j)

368-G.* Fabrication of Molybdenum Sheet. Alan V. Levy and Saul E. Bramer. Digest of "The Development of Refractory Sheet Metal Structures". Paper Presented Before the Society of Automotive Engineers National Aeronautical Meeting, New York, Mar. 31, 1959, *Metal Progress*, v. 76, Sept. 1959, p. 180-183.

Forming and joining of the 0.5% Ti alloy sheet. Shearing or sawing done after preheating to 700° F. Spinning, stamping, "floturning", stretch forming done on hot sheet; proper working temperatures vary with thickness, ranging from 600° F. for 0.020-in. sheet to 2200° F. for 0.320-in. (G-general, K-general, 2-62; Mo-b, *Ti*, 14-53)

369-G.* (French.) High-Frequency Electrical Heating of Brass and Copper Alloys for Stamping Operations. *Cuivre, Laitons, Alliages*, no. 50, July-Aug. 1959, p. 23-27.

High-frequency heating provides small brass stampings with greater homogeneity, very fine crystal structure, excellent surface finish and freedom from porosity and oxide inclusions. (G1, J2g; Cu-n, 4-59)

370-G. The Spark Erosion Method in Metal Working. *Australasian Manufacturer*, v. 44, Aug. 8, 1959, p. 76-78.

Application to hard materials not readily machinable, such as carbides. (G24)

371-G. Spark Erosion—Would It Pay to Do It in Your Own Plant? A. C. Parsons. *Canadian Machinery*, v. 70, Sept. 1959, p. 138, 140.

Process is useful in the correction of errors made in the manufacture of dies, salvaging of castings or dies by the removal of broken taps or drills without damaging the item to be salvaged. (G24a)

372-G. Developments in Explosive Forming. P. F. Lambert. *Machinery (London)*, v. 95, July 29, 1959, p. 131-135.

Two distinct methods of explosive forming are pressure-forming with propellant-type explosives and shock-forming with explosives of high order. (G-general; NM-k34)

373-G.* How to Machine Aluminum. C. J. Vlahos. *Mill and Factory*, Sept. 1959, p. 104-110.

Machinability rating and mechanical properties of common wrought Al alloys. Recommended speeds and feeds; appropriate tool geometry. (G17k, Q-general; Al-b)

374-G.* (German.) Design of Wire Twisting Plants. H. W. Aengeneyndt. *Draht*, v. 10, Aug. 1959, p. 339-345.

Increase of tensile strength and elastic limit of reinforcing steel for concrete construction by twisting. Description of machinery and calculation of forces, rotations and rate of twisting and process parameters. (G23, 1-67, N7e, W24k, 17-51; ST, SGB-s, 4-61)

375-G.* (German.) Optimum Values Reached With Arc Cutting. W. Herzfeld. *Industrie-Anzeiger*, v. 81, Aug. 1959, p. 1005-1009.

Test surface quality is attained only with decreased cutting speed which results in increased cutting time and gas consumption. (G22h)

376-G.* (German.) Automatic Machining of Aluminum and Aluminum Alloys. W. Scholz. *Metall*, v. 13, Sept. 1959, p. 837-842.

Turning, drilling and thread cutting operations on Al-Mg, Al-Mg-Si, Al-Mn and Al-Cu-Mg alloys with tools from carbon steel, high speed steel or hard metal. Machinability of the above alloys for the individual operations. (G17, T6n; Al-b, *Mg, Si, Mn, Cu*)

377-G. Carbide Grade Selection. Pt. 3. W. E. Montgomery. *Carbide Engineering*, v. 11, Sept. 1959, p. 18-21.

Review of machining operations, machine tool requirements and cutting tools. (G17, T6n, 6-69)

378-G. How to Spin Titanium. *Mill and Factory*, Sept. 1959, p. 127.

Use of a new hydraulically controlled lathe for hot spinning large Ti blanks with cast tools. (G13; Ti)

379-G. Cold Extruding Steel Alloys to Precision. Gilbert C. Close. *Modern Machine Shop*, v. 32, Oct. 1959, p. 126-129. (G5; ST)

380-G. Stripforming Tools. *Sheet Metal Industries*, v. 36, July 1959, p. 515-522.

Tooling arrangement for piercing, cropping, bending and forming of steel, brass, Cu or phosphor bronze strip. (To be continued.) (G-general; ST, Cu-b, Cu-n, 4-53)

381-G. Sheet-Metal Fabrication Practice in the American Aircraft Industry. Adolph Vlcek, Jr. *Sheet Metal Industries*, v. 36, July 1959, p. 523-525, 538.

Forming, heat treating and bonding. (G-general, J-general, K-general; ST, Ti, Al, 4-53)

382-G. (German.) Present Stage of Developments in the Cold Forging of Steel. D. Feldmann. *Draht*, v. 10, Aug. 1959, p. 397-398. (G5; ST)

383-G.* The Plasma Arc Torch. *Welding and Metal Fabrication*, v. 27, July 1959, p. 287-290.

Use of either wire or powder heated to temperatures up to 16,648° C. (G13, L29)

384-G.* (German.) Explosive Forming. Erwin O. Genzsch. *Industrieblatt*, v. 59, Aug. 1959, p. 383-385.

Explosive forming of Ti, stainless and high-strength steels, light metal and cast iron. Surface hardening with a propane-oxygen jet at 3000° C. and 60 m. per sec. discharge velocity, followed by quenching. (G-general, J2h; Ti, SS, AY, SGB-a, EG-a39, CI, NM-k34)

385-G.* Some Observations on the Shearing Process in Metal Cutting. S. Kobayashi and E. G. Thomsen. *Journal of Engineering for Industry (ASME Transactions, Series B)*, v. 81, Aug. 1959, p. 251-262.

Study of stresses in the work during machining. Analysis of shearing force on the shear plane, verified by correlation of shear stresses with static compression test data for low-carbon steel, Al alloy and alpha brass. The effect of strain rate on flow stress. (G17, G25, 3-68; CN-g, Al-b, Cu-n)

386-G.* Forming Metals at High Velocities. Pt. 2. T. C. DuMond. *Machine Production*, v. 18, Aug. 1959, p. 15-17.

Feasibility of explosion forming in regard to extruding, compacting, casting and forging. Special emphasis on application to precipitation hardening stainless steels such as 17-7PH and AM 350, many austenitic stainless grades and high Cr-Ni alloys, Ti, low-carbon steel, brass and Cu. (G-general, NM-k34; SS-e, Ti, CN, Cu-n, Cu)

387-G.* (Japanese.) Machinability of Metals. Hidehiko Takeyama. *Government Mechanical Laboratory, Report*, no. 31, Aug. 1959, 87 p.

Plastic deformation and machinability of Al, Cu, brass, mild steel and Ni-Cr steel are dependent on shearing, sharpness of tool and surface conditions of the

specimen. (G17k, Q24; Al, Cu, Cu-n, CN-p, CI, AY)

388-G. A Three-Dimensional Tool-Life Equation—Machining Economics. B. N. Colding. *Journal of Engineering for Industry (ASME Transactions, Series B)*, v. 81, Aug. 1959, p. 239-250.

Graphs for predicting machine tool wear from cutting speed, feed and depth of cut and thermal parameters of the metal being worked, based upon empirical data. (G17k)

389-G. Observations on the Angle Relationships in Metal Cutting. D. M. Eggleston, R. Herzog and E. G. Thomsen. *Journal of Engineering for Industry (ASME Transactions, Series B)*, v. 81, Aug. 1959, p. 263-279.

Determination of optimum tool angles for machining low-carbon steel, Al alloys and alpha brass. Two-dimensional stress analysis shows that none of present theories of tool action can explain these data. (G17, G25; CN-g, Al-b, Cu-n)

390-G. Recent Metal-Removal Developments With Compressed-Air Carbon-Arc Process. Myron D. Stepath, Homer B. Nelson and William J. Coughlin. *Welding Journal*, v. 38, Aug. 1959, p. 755-759.

Process consists of melting the metal to be gouged or cut with an electric arc and blowing away the molten metal with a high-velocity jet of compressed air parallel to the electrode. (G22h)

391-G.* (Swedish.) Deep Drawing Problems. Ake V. Larsson. *Metallen*, v. 15, no. 2, 1959, p. 43-54

Deep drawing of brass, Al and electrolytic Cu. Importance of blank diameter, radius of punch edge and grain size on quality. (G4b, 2-59, 17-51; Cu-a, Al, Cu, 4-53)

392-G.* (Swedish.) Bending of Aluminum Tubing and Profiles. W. Hegmann. *Metallen*, v. 15, no. 3, 1959, p. 83-97.

Various methods applied in bending. Tensile strength, elongation and hardness of an Al-Cu-Mg alloy as functions of the heat treating temperature. (G6, 2-64, 2-61; Al-b, *Cu, Mg*, 4-60, 4-57)

393-G. Explosive Forming by Pneumatic Machine. *Australasian Manufacturer*, v. 44, Sept. 12, 1959, p. 56, 58, 59.

Forming machine provides energy rates up to 1,500,000 ft-lb. to make extrusions and forgings to close tolerances with good surface finishes. (G-general, 1-52; NM-k34)

394-G. Machining Practices in Plastic Mold Making. E. J. Krabacher and P. A. Ropp. *Society of Plastics Engineers, 14th Annual Technical Conference*, v. 4, 1958, p. 286-303.

Machining high-strength die steels by electro-discharge and hot machining. (G19r, G24a; TS, NM-d30)

395-G. Machining Nimonic. G. A. Streets. *Machinery (London)*, v. 95, Sept. 30, 1959, p. 633-638.

Practical aspects of machining the Nimonic range of Ni alloys. (G17; Ni-b)

396-G. Metal-Cutting Research Determines Tooling and Machining Methods. K. W. Stalker. *Metalworking*, v. 15, Oct. 1959, p. 10-17.

Tool-life curves on high-strength, high-temperature alloys. (G17, T6n; SGA-h, SGB-a)

397-G. Tool and Machining Specifications for High-Strength and High-Temperature Alloys. J. F. McAuliffe and S. W. Lovejoy. *Metalworking*, v. 15, Oct. 1959, p. 18-20.

Recommended tool design, cutting rate and selection of tool materials. (G17, T6n; 17-51, SGA-h, SGB-a)

398-G. Machinability Research Aids High-Temperature-Alloy Selection and Use. Harry S. Wharen. *Metalworking*, v. 15, Oct. 1959, p. 21-22.

Importance of machinability in selecting alloys. (G17k; SGA-h)

399-G. Heat Treating Affects Tool Selection in Machining Ultra-Strength Tool Steel. Thomas A. Dickinson. *Metalworking*, v. 15, Oct. 1959, p. 23-24.

Heat treating may permit machining ultra-strength steels in the softened condition when they cannot be machined in the hardened condition. (G17, J-general; SGB-a)

400-G. Choosing Forming Methods for the New Metals. Harold R. Daniels. *Metalworking*, v. 15, Oct. 1959, p. 120-125.

Forming techniques for W, Mo, Ta, Cb, Ti, Be, ultra-strength steel and superalloys. (G-general; W, Mo, Ta, Cb, Ti, Be, SGA-h, SGB-a)

401-G.* (German.) Forming Problems in Die Pressing of Cast Iron. P. Gurner. *Maschinenmarkt*, v. 65, Aug. 1959, p. 29-33.

Grouping of burr formations in the dies, optimum temperatures, preforming of the dies and production conditions. (G1, W24n; CI)

402-G.* (German.) Quality Control in the Deep Drawing Process. C. Bohne. *Maschinenmarkt*, v. 65, Aug. 1959, p. 46, 51.

Main control techniques consist of hardness and bend testing, microscopic texture control, cupping, deep drawing and expansion tests. Imperfections and defects in texture of cold rolled and annealed sheets. (G4b, Q23, 1-54; 4-53, 9-71)

403-G.* (German.) Arc Cutting of Aluminum With the Gas Shielded Arc Process. L. Gajdos. *Periodica Polytechnica (Budapest)*, v. 3, no. 2, 1959, p. 169-187.

Al is easily arc cut with a tungsten electrode under a gaseous stream. Principal variables are density, gas volume and composition, cutting velocity, arc length and electrode diameter. (G22h; Al)

404-G.* Machining Titanium. Pt. 4 and 5. Bennet V. Whiteson. *American Machinist*, v. 103, Sept. 7, 1959, p. 149, 151.

Tool materials and geometry; machine settings for removal of scale of forging skin for rough turning, for interrupted cutting, semifinish turning and finish turning of Ti and Ti alloys. (G17a; Ti-b)

405-G.* (Dutch.) Weld Joints Prepared by Flame Cutting. C. A. Feytel. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 215-217.

Flame cut edges for I, V, Y, X and K groves. (G22g)

406-G.* Rubber Forming. J. E. Broderick. *Metal Progress*, v. 76, Oct. 1959, p. 105-108.

Application of the Guerin, impact rubber forming and the Wheelon processes. (G14a)

407-G.* Chemical Milling. J. L. Gault, C. C. Shepherd and H. H. Muller. *Metal Progress*, v. 76, Oct. 1959, p. 108-111.

Applications of chemical milling to airframe designs. The process is most advantageously used when a part has complex contours, complex milled patterns, when very tough or hard alloys are used, when thin sections are required, and when a great deal of metal is removed over a wide area to a shallow depth. (G24b, T24a)

408-G.* Metal Spinning. *Metal Progress*, v. 76, Oct. 1959, p. 118-121.

Pressure forming of metal on a rotating chuck or die. The forming is done by application of pressure by a roller or spinning tool on the metal piece while it is being rotated in a spinning lathe. Two basic types are conventional spinning and displacement spinning. (G13)

409-G.* Cold Extrusion. Elliot J. Epner. *Metal Progress*, v. 76, Oct. 1959, p. 122-125.

Steel parts which are ideal for production by cold extrusion are in the range of 2 to 15 lb.; diameter 1 to 6 in. O.D. and up to 4 in. I.D.; and length up to 20 in. In individual instances, parts both smaller and larger can be made. (G5; ST)

410-G.* Contour Rolling. *Metal Progress*, v. 76, Oct. 1959, p. 125-127.

Process combines advantages of conventional rolling and extruding to produce varied configurations over relatively large areas. Parts made by this method exhibit desirable grain flow characteristics and material distribution advantages while machining operations are minimized or eliminated. (G11)

411-G.* Carbon and Alloy Steels. *Metal Progress*, v. 76, Oct. 1959, p. 140-143.

Cold heading and cold extrusion; warm heading; developments in carbon electrical steels; finishes. (G10, G5, 1-67; CN, AY)

412-G.* Impact Extrusion. *Metal Progress*, v. 76, Oct. 1959, p. 127-128.

Impact extruders have progressed from soft alloys to hard alloys and to other metals. In Al impact extrusions, mechanical properties exceed those obtained by forging plus the added advantage gained by cold working. Since the grain flow lines of an impact follow the contour of the finished shape, impacts are stronger than drawn or cast part or parts machined from rod and bar. (G5; Al)

413-G.* Beryllium Copper. Pt. 1. Working, Machining and Joining. G. Fitzgerald-Lee. *Metal Treatment and Drop Forging*, v. 26, Sept. 1959, p. 317-322.

Melting, pouring and casting procedures; methods of hot and cold working; lubrication during cold working; machinability and joining processes. (G-general, F-general, E-general, K-general; Cu-b, *Be*)

414-G.* Tube Bending. J. E. Hawking. *Metal Progress*, v. 76, Oct. 1959, p. 102-105.

Typical current bending applications include stainless steel tubing, 8 in. in diameter, with a wall thickness of 0.020 in., bent for use in modern jet aircraft. High-pressure steam boiler tubes, 2.75 in., with thinning of the outer wall held to 5% or less. Use of hydraulic bending presses. (G6; SS, 4-60)

415-G. New Forming Process—"Intraforming"— by Cincinnati Milling. *Machine Production*, v. 18, Sept. 1959, p. 30, 32.

"Chipless machining" consists of cold forming cylindrical workpieces, such as tubes or rings, to obtain profiles on the inside diameter. (G17)

416-G.* An Electrolytic Jet Machining Technique for the Production of Thin Foils of Steel. P. M. Kelly and J. Nutting. *Iron and Steel Institute, Journal*, v. 192, July 1959, p. 246-248.

New method allows controlled reduction of the thickness of metal sheet without destruction or modification of the metal structure. Process involves use of a jet of electrolyte composed of three parts concentrated HCl and one part aqueous solution of $CuCl_2$. A small amount of mechanical cutting and grinding precedes the actual jet process. (G24d; ST, 4-56)

417-G.* Machinability of Sintered Iron. Roy S. Jamison and Ernst Geijer. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 82-93.

The tear point seems to be of more interest than the actual surface finish. Copper, phosphorus and sulphur have a beneficial hardening effect which moves the tear point to higher feed rates. Small sulphur or large copper additions improve tool life, while phosphorus additions are detrimental. (G17k, 2-60; Fe, 6-71, *S, Cu, P*)

418-G. The Principles of the Modern Arc Torch. R. Gage. *Welding Journal*, v. 38, Oct. 1959, p. 959-962.

Basic designs of modern arc-plasma jet for cutting Al properties, advantages, physical principles and voltage gradients of arc constricting nozzles. Arc temperatures and operational variables. 6 ref. (G13, G22b; Al-b)

419-G.* How to Minimize and Control Residual Machining Stresses. Robert D. Halverstadt. *American Machinist*, v. 103, Oct. 19, 1959, p. 137-144.

Proper heat treatment and machining minimize residual stresses caused by thermal transformation and mechanical effects. Such stresses affect dimensional stability and fatigue strength and can be detected by distortion of parts, mechanical relation, X-ray diffraction and stress-corrosion. (G17, Q25h, 2-64)

420-G. Applications of Cutting and Welding Processes. E. C. Alexander and J. D. Nicol. Union Carbide Nuclear Co. *U. S. Atomic Energy Commission*, Report no. KY-315, Oct. 9, 1959, 10 p. (Available from U. S. Office of Technical Services, Washington, 25, D. C.) $ .50.

Copper clad steel sheets economically cut to size by utilizing a tungsten inert-gas cutting process eliminates need of chipping Cu from cutting line prior to cutting operation. Welding time is reduced 50% by a semi-automatic short-arc process using metallic inert-gas torch in making root pass in steel pipe. (G22h, K1a; ST, *Cu*, 8-66)

421-G.* (French.) Machinability of Metals. *Trempe*, no. 36, Sept. 1959, p. 52-55.

Rating of 36 A.I.S.I. steels and 19 nonferrous metals and alloys. Standard of reference is A.I.S.I. steel B1112. AFNOR equivalents are given for A.I.S.I. designations. (G17k; ST, SS, Zn, Al-b, Cu, Cu-n, Cu-s, Ni)

422-G.* Low-Cost Chemical Milling Shapes Honeycomb Cores. *Iron Age*, v. 184, Oct. 29, 1959, p. 122-123.

Chem-Mill technique, developed by Norair Division, Northrop Corp., Hawthorne, Calif., by which Al can be held to 0.003 in. and stainless steel parts to 0.002 in. (G24b; Al, SS)

423-G.* Remedy Roll Grinding Woes. H. E. Balsiger. *Iron Age*, v. 184, Oct. 29, 1959, p. 132-134.

Recommended step-by-step procedures for the grinding of rolls with commercial, semifinish, and ultrafinish surfaces. (G18, W23k)

424-G. (Russian.) Machining of Titanium With CO_2 Refrigeration and Metallurgical Use of Titanium Shavings. M. A. Makhatadze and G. A. Aladashvili. *Tsvetnye Metally*, no. 2, 1959, p. 75-78.

6 ref. (G17, R1h, A8d; Ti)

425-G.* Experimental Investigation of Chip Formation and Resulting Theoretical

and Practical Considerations. F. Eugene. *Microtecnic*, v. 13, June 1959, p. 113-119.
Yield point of the machined material determines chip thickness. Elastic deformation energy in the cutting of steel is higher than plastic deformation energy. 4 ref. (G17, G25, Q24, Q23; ST)

426-G.* Causes of Machinability Divergences in Steels. Weill. *Microtecnic*, v. 13, June 1959, p. 133-142.
Mechanical properties due to composition and heat treatment in relation to machinability. Built-up edge of cutting tool is a significant factor. 7 ref. (G17k, 2-60, 2-64; SS, AY, CN)

427-G. Behavior of Ceramic Cutting Tools When Applied in Cutting Cast Iron. J. L. Remmersmaal. *Microtecnic*, v. 13, June 1959, p. 126-132.
(G17, Q9n, T6n; Ti, 6-69, CI)

428-G. Spark Machining—Today's Top New Process. *Plant Administration*, July 1959, p. 48-50.
Cuts through tough carbides or performs delicate die sinking with ease. (G24a)

429-G.* Cold Extrusion of Steel. F. G. Witteman. *Precision Metal Molding*, v. 17, Nov. 1959, p. 43.
Cold extrusion processes are essentially "chipless" and considerable savings can be affected in material losses. Where secondary machining operations are necessary, such as reaming, boring, tapping, threading and broaching, there is less metal removal because of much closer tolerances. Higher metal cutting rates are normally attained, especially in low carbon steels, due to the effect of cold working. (G5; ST)

430-G. A Photoelastic Analysis of Machining Stresses. E. Usui and H. Takeyama. *American Society of Mechanical Engineers*, Paper no. 59—A-37, 1959, 5 p.
Orthogonal machining tests using a tool of epoxy resin for the analysis of the distribution of strain on rake face. (G17, G25)

431-G. Machining 'R' Monel Alloy on Bar Automatics. E. L. Fowler. *Automatic Machining*, v. 20, Oct. 1959, p. 40-45.
Optimum procedures for machining Ni-Cu alloy. (G17, Ni-b, *Cu*, SGA-g)

432-G. What Shapes Can Be Extruded? *Precision Metal Molding*, v. 17, Nov. 1959, p. 46-53.
Examples of solid, hollow and impact Al extrusions; extruded brass, steel and Ni-Ag shapes. (G5; Cu-n, ST, Al)

433-G. Superalloy Machining Gets Boost From Cavity-Sinking Setup. *Iron Age*, v. 184, Nov. 12, 1959, p. 166-167.
Process for drilling into the surfaces of superalloys operates on the electrolytic metal-removal principle. Direct current flows between the workpiece and the electrode through a water-base electrolyte solution. Metal from the workpiece is removed simultaneously. (G24d; SGA-h)

434-G. Machining With Ceramic Tools at the Works of Alvis, Ltd. *Machinery (London)*, v. 95, Oct. 7, 1959, p. 692-694.
Results of investigations of ceramic tools for machining various metals. (G17, T6n; 6-70)

435-G. An Explosive Sheet Material for Hardening and Forming Metals. *Machinery (London)*, v. 95, Oct. 7, 1959, p. 697-698.
(G-general, NM-k34)

436-G. Machining a New High Tensile Steel Alloy. Bartlett West. *Modern Machine Shop*, v. 32, Nov. 1959, p. 132-134.
Effect of proper normalizing and drawing of Hy Tuf steel (AMS6418A) prior to machining operations. (G17, 2-64; TS)

437-G. Flow Turning to Increase Strength, Save Weight and Reduce Costs. John H. Peters. *American Society of Mechanical Engineers*, Paper no. 59-A-277, 1959, 8 p. $ .80.
Use of flow turning in the production of coefficient, dependable flight propulsion components. Types of flow turning; strength, weight and cost advantages. (G11)

438-G. (Russian.) Powder-Cutting of Stainless Steels With Natural Gas. I. D. Davydenko, G. F. Kulichenko and M. M. Eremenko. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 31-33.
(G22; SS)

439-G. (English.) Sliding-Block Type Cutting Test Apparatus. Keiji Okushima. Japan Society of *Mechanical Engineers Bulletin*, v. 1, no. 4, 1958, p. 338-342.
Specially designed cutting test apparatus and results for mild steel. (G17, 1-53; CN)

440-G.* (Japanese.) Study on Stretch Forming of Sheet Metal. Distribution of Circumferential Stress Over a Cross Section When the Sheet is Bent Under a Constant Tension. Hiroshi Kaga and Shiro Yaji. *Journal of Mechanical Laboratory (Japan)*, v. 13, Sept. 1959, p. 202-209.

Stress-strain diagrams and subsequent compression for mild steel and Al. Circumferential stress and strain are calculated. 5 ref. (G9, Q25, 4-53; CN-g, Al, 14-53)

441-G. (Russian.) Experience in Using Air-Arc Cutting for the Elimination of Weld Roots. V. I. Melnik and A. V. Muravev. *Svarochnoe Proizvodstvo*, June 1959, p. 33-34.

(G22h)

442-G. (Russian.) Gas Cutting Without Distortion. N. M. Varfoldmeev. *Svarochnoe Proizvodstvo*, June, 1959, p. 34-36.

Use of compressed air and water cooling in the cutting of steel strip. (G22g; 4-53, 9-74, ST)

443-G. (Russian.) Approximate Determination of Grinding Speeds for Heat Resisting Steels and Alloys. N. I. Tashlitskii. *Vestnik Mashinostroeniya*, v. 39, no. 10, 1959, p. 43-48.

(G18, 3-67; SS, SGA-h)

444-G. (Russian.) Importance of the Parameters of Individual Craters on the Surface Quality of Spark Machined Parts. B. N. Zolotykh. *Vestnik Mashinostroeniya*, v. 39, no. 10, 1959, p. 58-61.

(G24a)

445-G. Estimation of Upper Bound Loads for Extrusion and Coining Operations. W. Johnson. *Institute of Mechanical Engineers, Proceedings*, v. 173, no. 1, 1959, p. 61-72.

18 ref. (G3n, G5, F24, 3-74)

446-G. DuPont Reports on Explosive Forming. *Steel*, v. 145, no. 21, Nov. 23, 1959, p. 74-76.

Method is advantageous for single shot forming of large parts of simple shape. Welding does not interfere with formability. (G-general; CN, SS-e, NM-k34)

447-G. (German.) Forming of Oxidation and Acid Resistant Steel Sheet. Ernst Metzger. *Industrieblatt*, v. 59, Sept. 1959, p. 464-468.

8 ref. (G-general; SS, 4-53, SGA-g)

448-G. (Russian.) Kinetics of Ultrasonic Machining. A. I. Markov. *Stanki i Instrument*, no. 10, 1959, p. 15-18.

10 ref. (G24c)

449-G. Analysis of the Plastic Bending of Wide Plate and the Effect of the Stretching on Transverse Residual Stress. J. M. Alexander. *Institute of Mechanical Engineers, Proceedings*, v. 173, no. 1, 1959, p. 73-91.

8 ref. (G6, F2, Q25h; Al-b, 4-53)

450-G. The Role of Friction in Metal Cutting. S. Kobayashi and E. G. Thomsen. *American Society of Mechanical Engineers*, Paper no. 59—A-132, 1959, 9 p.

Metal-cutting studies made with free-cutting steel SAE 1112 and alloy steel SAE 4135 in the as-received condition with artificially controlled tool-chip contact areas and flank contact areas (artificial wear lands). Experimental results for SAE 1112 at a speed range of 0.083 to 1010 fpm. reveal that friction under metal-cutting conditions on the rake face can be explained satisfactorily by a junction model with possible superimposed general plastic flow above the junctions in accordance with the general rules of plastic deformation (von Mises instantaneous yield criterion). 15 ref. (G17, Q9p; ST)

451-G.* Developing a Fast Method for Drilling and Tapping Titanium. W. J. Meany and D. Morehouse. *Light Metal Age*, v. 17, Oct. 1959, p. 12-13, 18.

Use of selected tool geometries and materials, thread percentages, coolants and lubricants. (G17e, G17f)

452-G.* Method Choice Whips "Can't Be Done" Job. *Metalworking*, v. 15, Nov. 1959, p. 12-13.

Machining methods and tools developed for very soft (90 Brinell) Mirromold steel. (G17, W25; ST-f, *Mn, V*)

453-G.* Galvanized Steel Selected for Forming. *Metalworking*, v. 15, Nov. 1959, p. 80-81.

Techniques used for resistance welding, rolling, deep drawing and other severe forming operations used in appliance manufacturing. (G-general, K3; ST, *Zn*, 8-65, 4-53)

454-G.* (English.) A Comparison of Boundary Lubricants Under Light and Heavy Loads. P. R. Lancaster and G. W. Rowe. *Wear*, v. 2, Oct. 1959, p. 428-437.

Experimental study of the lubrication of steel bars during the slow drawing process. Heavy loads up to 10 tons involve dies of high entry-angle to avoid hydrodynamic contribution. Good boundary properties are required from the lubricant to be effective on grit-blasted surfaces. 4 ref. (G4, G27, Q9n, Q9p; ST, NM-h, 4-55)

455-G. (Book.) The Fabricator's Handbook. 162 p. 1959. Crucible Steel Co. of America, Oliver Bldg., Melon Sq., Pittsburgh 22, Pa.

Methods for forming, machining, joining, heat treating and finishing most grades of stainless steel. Mechanical properties, corrosion resistance and gage and weight for different shapes. (G4b, G9, G13, G17, J-general, K-general; SS)

456-G. (Book.) Practical Design of Sheet Metal Stampings. Federico Strasser. 175 p. 1959. Chilton Co., Book Div., Philadelphia 39, Pa. $10.

Details of stamping design and special problems in metal stamping. (G3, 4-59, 17-51)

457-G. (Book-Russian.) Operating Conditions for Cutting With Ceramic Tools: Turning and Milling. D. V. Mikhaylov, Editor. 49 p. 1958. Mashgiz, Moscow. (Available from Library of Congress, Washington, D. C.).

Machining data on various steels and cast iron. Tools, tool shape, speeds and feeds. (G17k, T6n; ST, CI)

458-G. (Translation—AIP.) Investigation of Ultrasonic Cutting Mechanism by Means of High-Speed Photography. L. D. Rosenberg and V. F. Kazantsev. *Machines and Tooling*, v. 30, no. 5, 1959, p. 20-22.

Physical processes by which abrasive strikes the work surface in sonic cutting investigated by stopping motion with high-frame speed photographs. (G24)

459-G. (Translation—PERA.) Investigation of Ultrasonic Cutting Mechanism by Means of High-Speed Photography. L. D. Rosenberg and V. F. Kazantsev. *Machines and Tooling*, v. 30, no. 5, 1959, p. 20-22.

Physical processes by which abrasive strikes the work surface in sonic cutting investigated by using a stopping motion with high-frame speed photographs. (G24)

SECTION H

POWDER METALLURGY

1-H.* (Russian.) Sintering of Fe-Ni-Al Base Cermets. A. B. Altman. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 456-465.

Three stages in this process: (1) reducing oxides, increasing of contact area between pressed particles; (2) mutual solution of particles, precipitation hardening of the resulting solid solution and growth of the compact; (3) homogenization and precipitation hardening of the solid solution, growth and shrinkage of the compact. There is no reason to attribute the remarkable shrinkage of the Fe-Ni-Al alloys to formation of a liquid phase during the process. 17 ref. (H15n; Al, Fe, Ni, 6-70)

2-H. Alumina-Base Cermets. Pt. 5. J. G. Stradley and T. S. Shevlin. Ohio State University Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151143, Feb. 1958, 15 p. $.75.

Noncombustible helium-hydrogen atmosphere produced compact, nonporous cermet specimens with fired properties equal to or better than the metal alone. Solid solutions of Al_2O_3-Cr_2O_3 and Al_2O_3-NiO spinels were combined with iron and their physical properties studied. Secondary oxides Cr_2O_3 and NiO were reduced and alloyed with the original metal. (H-general; Al, Fe, 6-70)

3-H. Sintering Method for Semiconductor Material. Gerhart K. Gaule, James T. Breslin and John R. Pastore. *Review of Scientific Instruments*, v. 29, July 1958, p. 565-567.

Sintering process which makes it possible to utilize semiconductor material which comes in the form of small grains of small dendrite-like pieces. When pressure, alternating current, and an r-f. field are applied, this loose material is sintered into rods without using a binder. These rods are used as "feed" for a floating zone apparatus. (H15; Si, EG-j)

4-H.* Pressing and Sintering Characteristics of Certain Copper and Tin Powder Mixes. G. R. Bell, F. B. Webb and R. Woolfall. *Metallurgia*, v. 58, Nov. 1958, p. 233-241.

Manufacture of Cu powders by atomizing, having apparent densities as low as 2.1 g. per ml. Pressing and sintering properties of this type of powder in comparison with two electrolytic Cu powders when mixed with 10% tin powder. Atomized powder is an entirely satisfactory substitute for electrolytic powder. (H10f, H14, H15; Cu, 6-68)

5-H.* (Rumanian.) Experimental Studies on Methods of Obtaining Porous Iron for Bearings. G. Dan. *Studii si Cercetari de Metalurgie*, v. 1, July-Dec. 1956, p. 325-337.

Fine electrolytic iron powder containing about 8% iron oxides is used. Powder was reduced in a current of hydrogen, mixed with 1% glycerine (as a binder) and pressed into cylindrical molds (with a diameter equal to, or greater than, the height) with a pressure of 4 tons per sq. cm. 7 ref. (H-general, T7d; Fe)

6-H. Who Uses Sinterings. *Precision Metal Molding*, v. 16, Nov. 1958, p. 24-27.

Properties and applications. Some advantages exist over castings. (H-general; 6-72, 17-57)

7-H. Hafnium Metal Powder by the Hydride-Dehydride Process. R. N. Honeyman and C. T. Waldo. Knolls Atomic Power Laboratory. U.S. Atomic Energy Commission, KAPL-1929, May 6, 1958, 13 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.75.

Upon completion of the hydriding process, the furnace is cooled from 700° C. to room temperature and the system purged with He. The hafnium hydride (HfH_2) is removed from the furnace under He atmosphere. The powder hydride is placed in a Mo or stainless steel boat and removed from the dry-box to the dehydriding furnace. Approximately 8 lb. of Hf powder are dehydrided at one time. 5 ref. (H10c; Hf)

8-H. International Powder Metallurgy. Glossary. *Metal Powder Report*, v. 13, no. 2, Oct. 1958, 3 p.

Definitions are founded on those drawn up by the American Society for Testing Materials and incorporate modifications suggested by various other authorities. (H-general, 11-67)

9-H. (German.) Powder Metal Bearing and Friction Materials. Friedrich Eisenkolb. *Abhandlungen der Deutschen Akademic der Wissenschaften zu Berlin*, no. 3, 1958, p. 5-24.

Manufacture of sintered Fe and Cu parts. Use of sintered metals for bearings and piston rings. Bearing materials on a metal-graphite base. Brake and clutch linings. 15 ref. (H-general; Fe, Cu, SGA-c)

10-H. (Translation-Brutcher, 4393.) Dilatometric Study of Physico-Chemical Phenomena of Sulphurizing Process. T. P. Gilman. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 33-36.

Iron-ceramic samples with varying sulphur content aimed at finding what effect different S quantities have on baking temperature, on volumetric changes and finding the critical points of phase and structural changes during sintering. Baking powdered Fe with S produces FeS, which is shown by changes in dilatometric curves. To obtain a sulphide film on parts, sulphurizing of hardened work piece can be carried out at 180-200° C., thus combining sulphurizing with tempering. (H15, L15; Fe, S, 6-70)

11-H.* A Review of the Development of Cermets. G. C. Deutsch, A. J. Meyer, Jr., and G. M. Ault. *North Atlantic Treaty Organization Advisory Group for Aeronautical Research and Development*, Report no. 185, Mar-Apr. 1958, 23 p.

Elevated-temperature strength, thermal shock resistance, ductility and impact strength of representative cermets in relation to jet engine and turbine blade applications. 25 ref. (H-general, Q-general, T24b; SGA-h, 6-70, 17-57)

12-H. Fundamentals of Sintering. Pt. 3. A. L. Pranatis, L. S. Castelman and L. Seigle. Sylvania Electric Products. *U. S. Atomic Energy Commission*, SEP-250, June 30, 1958, 30 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Influence of presence of grain boundaries on rates of sintering of Ni, Cu and Fe wire-wound compacts. In Fe compacts sintered in the alpha range, surface diffusion appears predominant and no grain boundary effect is evident. Sintering of Cu and Ni compacts at temperatures close to their respective melting points apparently occurs by volume diffusion but with varying grain-boundary effects. 17 ref. (H15, N1; Ni, Cu, Fe)

13-H.* Furnace Sintering of Metals and Ceramics. Pt. 2. R. L. Harper. *Industrial Heating*, v. 25, Dec. 1958, p. 2446, 2448, 2450, 2452, 2454.

Sintering stainless steel powders, Mo and Ta carbides, Ti and Zr powders, powder rolled products. (To be continued.) (H15, W26e; SS, Ti, Zr, Mo, Ta)

14-H. Design Parameters for Cermets. John C. Redmond. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, D. C., p. 70-87.

Tests for determining properties of TiC compositions including density, hardness, tensile and stress-to-rupture data. Test methods are applicable to temperatures in excess of 1800° F. (H11, Q-general; Ti, C, 6-70, 17-51)

15-H.* Factors Affecting Sintering. L. L. Seigel and A. L. Pranatis. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 10-30.

At least four material-transport processes operate during the sintering of a powder compact — evaporation and condensation, surface diffusion, volume

diffusion and bulk flow. As particle size is decreased and the ratio of surface area-to-volume increased, surface diffusion becomes relatively more important as a material-transport process. Volume-diffusion is the rate-controlling process in all but the initial stages of sintering of normally sized particles of nonvolatile metals and oxides. 42 ref. (H15, N1)

16-H.* Preparation of Metal Powders for Reactors. P. Chiotti and H. A. Wilhelm. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 31-50.

Preparation of U powder by reduction of uranium oxides with Ca, Mg or calcium hydride; reduction of uranium halides with K, Na, Mg or Ca; or electrodeposition from fused salts. Similar processes for the preparation of Th powders. 39 ref. (H10c, T11; U, Th, *Ca, Mg, K, Na*)

17-H. Powder Metallurgy of Zirconium and Beryllium. Harold H. Hirsch. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 51-72.

Full-density bodies are prepared from Be powder by a variety of processes including hot pressing, warm pressing, cold pressing followed by sintering and pressing and by warm or hot working. Powder preparation, consolidation techniques and properties for Zr. 23 ref. (H-general; Zr, Be)

18-H.* Powder Metallurgy of Uranium. Henry H. Hausner and John L. Zambrow. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, 73-81.

Powder production, compacting and sintering techniques. U prepared by hot pressing is high in hardness and tensile strength and low in ductility. The hardness corresponds approximately to that of hot rolled beta-annealed specimens. Special heat treatments of the sintered product are necessary to increase ductility and to lower hardness. 4 ref. (H-general; 2-64)

19-H. Powder Metallurgy of Thorium. W. W. Beaver and K. G. Wikle. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 82-119.

Direct reduction of ThO_2, ThF_4, and $ThCl_4$ by a reactive alkaline metal such as Ca, Na, or K and reduction of $ThCl_4$ or ThF_4 electrolytically in a molten salt bath. Th powders can be compacted at room temperature to a high degree of densification, especially under high pressure. The pressure required for densification is dependent on the type of powder, particle size, purity, die lubrication and the size and shape of the compact. 32 ref. (H10c, H11, H14; Th)

20-H.* Alloying by Powder Metallurgy. H. A. Saller and F. A. Rough. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 120-140.

Alloying has been practiced in the reactor field in the metallurgy of Zr and U alloys and of various metal-compound composites or cermets. The preparation of bimetallic reactor components, such as U-containing fuel elements, is limited by the alloying behavior of U. 37 ref. (H12n, Zr-b, U-b, 2-60)

21-H.* Uranium Alloys by Powder Metallurgy. Herbert S. Kalish. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 141-148.

Mo is one of the most beneficial addition elements from the standpoint of enhancing the densification of U during sintering and also for controlling grain size. Cb gives good densification and even finer as-sintered grain size. Si is not as good as Mo or Cb, but due to its low cross section is an attractive addition element. The 1.0% Cr and 2 to 5% Zr alloys are promising. (H-general, 2-60; U; *Mo, Cb, Si, Cr, Zr*, 2-60)

22-H.* New Methods of Powder Metallurgy. W. D. Manly and J. H. Coobs. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 165-179.

Techniques used in the fabrication of components for nuclear reactors include powder rolling, electrophoresis, extrusion, cold pressing and sintering combined with cladding by hot working, hot pressing, infiltration and hot coining. 7 ref. (H-general, T11g)

23-H.* Uranium Dioxide as a Nuclear Fuel Material. Henry H. Hausner and R. G. Mills. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 207-223.

Fabrication of UO_2 powders into finished shapes can be accomplished by any conventional ceramic technique. UO_2 can be cold compacted either in a steel die or

hydrostatically, slip cast, extruded or hot pressed. These methods are normally followed by sintering to obtain desired density, strength and other properties. 15 ref. (H14, T11g; U, O)

24-H.* Mechanical Filter Transducer Wire and Resonator Disks by Powder Metallurgy. W. E. Whittington. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 9-18.

Mechanical bandpass filters are devices used in electronic circuitry. A 45% Ni, Fe-Ni alloy compact is sintered 100 hr. at 2200° F. Following prolonged purification-homogenization sintering, compacts are rolled and drawn into required diameters of wire by standard methods. (H15, T1c; Fe, Ni)

25-H.* Effect of Sintering Atmospheres on the Properties of Sintered Iron Compacts. E. P. Kawasaki. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 23-31.

Four compositions are investigated: Fe, Fe with 7% Cu, Fe with 3% Cu with 1% C, Fe with C. Highest tensile strengths are obtained by sintering in a carburizing atmosphere with endo or scrubbed and dried exo gas. Carburizing atmospheres reduce the elongation characteristics of compacts. (H15q; Fe, Cu, C)

26-H.* Application of the Endothermic Atmosphere Generator to the Sintering of Powder Metallurgy Parts. Norbert K. Koebel. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 42-46.

The atmosphere produced by the generator is ideally suited for sintering Fe powder compacts since not only does the atmosphere contain 60% of reducing constituents, but also the carbon monoxide content makes it possible to produce an atmosphere with a controlled carbon potential. (H15q; Fe)

27-H.* Frontiers of Powder Metallurgy in the U.S.S.R. Claus G. Goetzel. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 47-54.

Basic research programs; processing and testing techniques; powder metallurgy of Be and Ti; refractory metallurgy; cermets, intermetallics and dispersion alloys. (H-general; Be, Ti)

28-H.* Slip Casting of Metal Powders. Henry H. Hausner. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 79-90.

Preparation, pouring and molding of slip mixture. Properties of the slip before and after sintering depend on the liquid-to-metal ratio and type and amount of the deflocculant. Particle size distribution of the deflocculant. Particle size distribution and apparent density for Type-316 stainless steel powder. (H14; H11; 6-70)

29-H.* (French.) Application of Equilibrium Halogenated Reducing Atmospheres in Powder Metallurgy. Ph. Galmiche and A. Hivert. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 907-917.

Surface protection of dies used in powder metallurgy and extruding with an atmosphere of chromium fluoride. Cr coating of iron particles by addition of Cr powder. Treatment of Cr powder in a halogenated atmosphere to increase plasticity. 9 ref. (H-general; Fe, Fe-b, Cr, F, Cl, Br)

30-H. Hydrogen and Dissociated Ammonia for Sintering. M. Robert Ogle. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 32-36.

Application of highly reducing furnace atmosphere gases. (H15q)

31-H. Exothermic and Purified Exothermic Atmospheres for Sintering. H. M. Webber. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 37-41.

Rich exothermic gas is used for sintering various materials such as bronze, Ag and Fe, although CO_2 and moisture content are such that it is still considered unsuitable for some powdered metal parts. (H15q; Ag, Fe, Cu-s)

32-H.* General Metallurgical Problems in the Design of Nuclear Power Reactors. Vincent P. Calkins. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 1-9.

Problems are centered on physical and mechanical property requirements, nuclear property requirements, corrosion limitations and radiation damage phenomena. Powder-metallurgy structures of fuel elements, moderators and controls can be wholly stable over useful temperature ranges, even though in some cases they might be thermodynamically unstable and

completely lose all their desirable properties if heated to temperatures approaching those required for melting and casting consolidation. 7 ref. (H-general, T11, 17-57, 2-67)

33-H.* Metal-Powder Rolling. Samuel Storchheim. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 180-192.

Process has many advantages — unique properties can be obtained with very fine grains; rolled sheets have no crystallographic orientation; purer sheet can be obtained than by conventional techniques; metal strip can be clad on one or both sides by using it as a carrier of the chosen powder through the rolls; a larger percentage of any scrap material reclaimed in powder form can be made into strip, rod and wire more cheaply than by conventional techniques. (H14j)

34-H.* Fundamentals of Powder Metallurgy Lecture. A New Viewpoint of Sintering. Frederick N. Rhines. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 91-101.

The driving force of the geometric changes that constitute sintering originates in the surface tension. Geometric changes that result in reduced surface area are densification of the powder mass, rounding and smoothing of the surface contours, isolation of the connected porosity into individual pores and segregation of the unfilled space into fewer though larger pores. (H15)

35-H. (Book.) Powder Metallurgy in Nuclear Engineering. 275 p. 1958. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio, $8.50.

Proceedings of Conference on Powder Metallurgy in Atomic Energy, Oct. 20, 1955, in Philadelphia under joint sponsorship by U.S. Atomic Energy Commission and American Society for Metals. Papers abstracted separately. (H-general, T11)

36-H. (Book.) Proceedings of the 14th Annual Meeting of the Metal Powder Association. 125 p. 1958. Metal Powder Assoc., 130 W 42nd St., New York 36, N. Y.

Meeting held Apr. 21-23 at Philadelphia. Papers abstracted separately. (H-general)

37-H. (Translation—Brutcher no. 4415.) Sintering of Columbium Powder. O. P. Kolchin and N. P. Chuveleva. *Tsvetnye Metally*, v. 13, no. 12, 1957, p. 65-70.

Variation with sintering temperature of electrical resistivity, hardness, density, weight and percentage of foreign elements in Cb powder compacts. (H15, H11; 6-72; Cb)

38-H. Ultrafine Al Bids for Markets. *Chemical and Engineering News*, v. 37, Jan. 19, 1959, p. 53-54.

Al powder, average particle size 0.03 micron, is possible fuel for rockets. (H-general; Al, RM-j)

39-H.* Slip Casting. Chalmers Dale. *Ordnance*, v. 43, Jan-Feb. 1959, p. 678-680.

Process variables include density of the liquid slip, type and amounts of deflocculant, ratio of liquid to solid, viscosity and pH value of the slip, reaction of the metal powder with the deflocculant and liquid, slip temperature, moisture content and porosity of the mold and rate of drying after separation. (H-general)

40-H.* New Powder Metallurgy Applications in the Metal Cutting Field. Horace Frommelt. Paper from "Proceedings of the 14th Annual Meetings". Metal Powder Assoc., New York, 1958, p. 5-8.

Dampening of vibrations induced in cutting tools, both single and multi-edged, by the use of powder metal bodies for single point and milling cutters. Application of carbide inserts. (H-general, T6n; 17-57, 6)

41-H.* Production of Nuts and Washers From Brass Powder. Philip V. Tarr. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 107-111.

Sintered brass nut is produced to reasonable tolerances, and maintains "as-sintered" an average ultimate tensile strength of 30,000 psi. Tests are outlined for ductility, malleability and ultimate axial sustaining load strength. (H-general; T7f; Cu-n, 6-72)

42-H.* Hot Forming Techniques for Consolidating Metal Powders. Harold H. Hirsch. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 112-125.

The best mechanical and physical properties attainable from metal powders are achieved through hot compaction methods. Advantages of hot forming include high density; possibility of producing large and often complicated shapes; beneficial effects on microstructure; brittle, nonductile

materials can be made to flow plastically at high temperatures to produce dense structures, not otherwise attainable. (H14h)

43-H.* Powder Metallurgy of Nuclear Materials. Henry H. Hausner. Digest from "Powder Metallurgy at the Atoms-for-Peace Conference", A.I.M.E. Powder Metallurgy Committee. *Metal Progress*, v. 75, Jan. 1959, p. 144, 146, 148-150.

Powder metallurgy production of U for fuel rods, Th powder metallurgy, co-reduction of oxides, uranium carbides, plutonium cermets. (H-general; U, Th, Pu, *C, Si, Be*)

44-H. Metal Parts for Operating at Higher and Higher Temperatures. D. A. Robins. *Metal Progress*, v. 75, Jan. 1959, p. 84-86.

Several hundred experts in the field of powder metallurgy gathered at Reutte, Austria, in June to discuss "High-Melting Metals, Their Manufacture, Properties and Applications". Columbium, molybdenum, tungsten, tantalum appear to hold most promise for the future. (H-general; EG-d37, Cb, Mo, W, Ta)

45-H. (German.) Powder Metallurgy of Boron Carbide. K. Adlassnig. *Plansee-berichte fur Pulvermetallurgie*, v. 6, Dec. 1958, p. 92-103.

Survey on methods of pressure and pressureless sintering; properties of compacts; methods for improving properties; applications. 30 ref. (H15n; B, C, NM-a35)

46-H. (Czech.) Production of Iron Powder. Jaroslav Kubelik. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1129-1131.

Comparison of different powder production methods—grinding of wire shot, spraying of liquid steel or cast iron and reduction of iron oxides. 6 ref. (H10; Fe, ST)

47-H.* (Czech.) Production of Lead Bronze Bearings by Powder Metallurgy. Zdenek Ministr. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1132-1137.

Mixtures of powdered Cu and Pb with different composition ratios were pressed at 1 to 4 tons per sq. cm. pressures and sintered at 800 to 900° C. in a hydrogen atmosphere to determine the best conditions for the manufacture of bearings. 26 ref. (H-general, T7d; Cu-b, *Pb*, 17-57)

48-H.* (Russian.) Sintering of Metallic Powders at Constant Heating Rate. Ya. E. Geguzin. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 650-656.

Dilatometric experiments with Cu powders. 10 ref. (H15, 2-62, Cu-b)

49-H* (Russian.) Preparation of Boride Cermets. K. I. Portnoi and E. B. Samonov. *Izvestiya Akademii Nauk, SSSR*, July 1958, p. 140-141.

Preparation of boride cermets with Cr, Fe, Mo, Ti and Zr. Increased resistance to oxidation can be obtained by adding silica and silicides. Relation of heat resistance to brittleness; relation of properties to composition. (H-general; Cr, Fe, Mo, Ti, Zr, 6-70)

50-H. Preliminary Study of the System Titanium-Aluminum Oxide Extruded Alloys. P. Turillon and N. J. Grant. Massachusetts Institute of Technology. (Wright Air Development Center.) *U.S. Office of Technical Services*, PB 151207, Mar. 1958, 15 p. $.50.

Extrusions of Ti powder mixed mechanically with Al oxide and rare earth oxides produced relatively sound bodies, but were too brittle. Both the Al oxide and the rare earth oxide are not stable enough in the presence of Ti during a hot extrusion process to avoid reaction. (H-general; Ti, Al, EG-g, NM-a34)

51-H. (Translation—BISI, no. 1092.) Particle Size and Grating Distortion of Tungsten Powders and Tungsten Carbide Powders. H. Hendus. *Zeitschrift fur Metallkunde*, v. 48, Dec. 1957, p. 615-624.

See item 59-H, 1958. (H11j, M21e, M21f; W, 6-69)

52-H. (Translation—Brutcher, no. 4444.) Powders in Iron-Nickel-Aluminum System. A. B. Al'tman. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 17-20.

Physical properties and microstructure of alloy Fe-Ni-Al-Co Type, "Alnico". Alloy was prepared both at high and ordinary sintering temperatures. Heating to temperature exceeding that at which the alloy begins to melt considerably accelerated sintering; however, the sintered alloy has a decreased density, resulting in lowering of the residual induction and magnetic saturation. (H15, P16; Fe-b, Ni, Al, Co)

53-H.* Growth of Sintered Metal Compacts. J. E. Elliot. *Metallurgia*, v. 59, Jan. 1959, p. 17-27.

Growth during sintering of Fe-Cu and Cu-Sn mixtures; effect of powder characteristics, additions to mixture, green compact density and sintering conditions. (H15; Fe, *Cu, Sn*)

54-H. The Production of a Stable Beryllium Powder From Electrolytic Flake, Its Fabrication and Properties. J. Williams, W. Munro and J. W. S. Jones. *United Kingdom Atomic Energy Authority*, AERE-M/R-1679, Sept. 8, 1958, 27 p.

New treatment involves leaching dry-milled flake powder with 10% aqueous oxalic acid, which reduces the chloride content to 200 ppm., and yields a powder stable in air. Its fabrication behavior and mechanical properties when fabricated are very similar to O.M.V. powder. Mechanical properties are given for extruded rod. (H10b, Q-general; 4-55, Be, 6-72)

55-H.* (Russian.) Properties of Solid Alloys With a Nonuniform Distribution of Cementite Phase. K. A. Bystrova and V. F. Funke. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 35-41.

Preparation of tungsten carbide-cobalt bodies with a nonuniform distribution of cementite phase and investigation of physical, mechanical and cutting properties. Material contained 94% WC and 6% Co. (H-general; W, Co, C, 6-69)

56-H. A Proposed Mechanism for the Strengthening of Sap-Type Alloys. G.S. Ansell. Naval Research Laboratory. *U.S. Office of Technical Services*, PB 151047, Oct. 1958, 4 p. $.50

Extrusion process causes motion of the grain boundaries, sweeping dislocation sources into the vicinity of the second phase where they are pinned in place and no longer active. If the manufacturing process of the alloys were adjusted so that only some of the dislocation sources were pinned, alloys with high-temperature tensile properties superior to those of the normal dispersion hardened alloys could be obtained without extreme loss of ductility. (H14k; Al-b)

57-H.* Custom Atomized Metal Powders. Gordon J. LeBrasse and Robert L. Probst. *Precision Metal Molding*, v. 17, Feb. 1959, p. 40-41, 55.

Metal powders manufactured by atomization include high-temperature alloy compositions such as Co-Cr (80-20), Udimet 500, Ni-Cr (80-20) alloy. (H10f; Co-b, Ni-b, *Cr*)

58-H. The Preparation of Tungsten Carbide-Uranium Compacts of High Density and High Hardness. P. A. Kulin and N. S. Dallas. Watertown Arsenal Laboratory. *U. S. Office of Technical Services*, PB 131751, Dec. 1953, 36 p. $1.25.

Combinations of 27% W carbide, 72% U, and 1% of either Co, Fe, Ni or Cr possess densities greater than 16 g. per cc. and hardness values between Rockwell A-80 and 85. (H11k, H15, H14, 2-60; U, *W, C*, Co, Fe, Ni, Cr, 6-69)

59-H. Structural Evaluation of Beryllium Produced by Several Processes. B. B. Muvdi. Martin Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151263, June 1958, 66 p. $2.

Evaluation of five powder metallurgy methods for fabrication of Be showed cold compacting followed by upsetting to produce plate or sheet with optimum properties. (H-general; Be, 4-53)

60-H.* (Polish.) Pressing of Brittle Powders. Wladyslaw Rutkowski. *Hutnik*, v. 25, Oct. 1958, p. 397-402.

Comparison between pressing brittle and ductile powders (Fe_2O_3, Al_2O_3, Si_2O_3, Cr, Cu, Mn). Results obtained by adding ceramic mixtures to metallic powders. 13 ref. (H12, H14, 2-60; *Fe, O, Al, Si*, Cr, Cu, Mn, 6-70)

61-H. Slip Casting Offers Greater Design Flexibility for Cermets. L. M. Schifferli, Jr. *Ceramic Age*, v. 73, Jan. 1959, p. 28-30.

Technique, limitations, advantages. (H14; 6-70)

62-H.* (German.) Non-Scaling Materials of Ni-Al Base. Friedrich Bisenkolb and Hein-Eberhard Rollig. *Neue Hutte*, v. 3, Dec. 1958, p. 721-731.

Mechanical properties, scaling behavior and phase composition of Ni-Al alloys produced by melting or sintering. 8 ref. (H14, H15, Q-general, R2q, 2-60; Ni-b, *Al*)

63-H.* (French.) Preparation and Sintering Under Load of Uranium. J. Dubuisson, A. Houyvet, E. Le Boulbin, R. Lucas and C. Moranville. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 55-60.

U powder is prepared by calcium reduction of UO_2. Calcium oxide is eliminated by acetic acid. U powder is pyrophoric; special treatment in aqueous solution of Cl_2Zn eliminates this condition and makes it possible to handle powder in air. Powder is sintered in double-acting

graphite container in vacuum furnace. Characteristics of sinter product are comparable to those of smelted U. (H10, H14h, H15; U)

64-H.* (French.) Sintering of Beryllium Oxide Mixtures Containing 3 and 5% Boron. R. Pointud, Ch. Rispal and M. Le Garec. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 68-74.

Bricks for fabrication of protective shields in nuclear installations were made by sintering mixtures of BeO and boron carbide at 1500° under pressure of 150 kg. per sq.cm. Densities of brick were between 2.85 and 2.90. Also, results of tests with BeO alone, and BeO and B mixtures of other proportions under various sintering conditions. 6 ref. (H15, T11; Be, B, RM-h)

65-H. (Book.) Hoeganaes Iron Powder Handbook. 2 v. 148 p. (v. 1) 254 p. (v. 2), 1959. Hoeganaes Sponge Iron Corp., Riverton, N. J. $36.

Iron powder: history, production, properties, applications; testing, designing, heat treatment, finishing and machining powder metal parts. (H-general; Fe)

66-H. (Translation—BISI no. 1076.) Improved Methods for Manufacture of Hard Alloy Tube Drawing Dies. G. S. Maksimovich. *Stal'*, v. 18, July 1958, p. 629-633.

See item 127-H, 1958. (H14h, F26r, 1-52)

67-H.* (Rumanian.) Sintered Electrical Interruption Contacts. A. Domsa, G. Muller, T. Bereczky, S. Kovacs and H. Colan. *Studii si Cercetari de Metalurgie*, v. 3, no. 4, 1958, p. 491-503.

Contacts produced by sintering tungsten powder and impregnation with Ag or Cu. Contacts of pure W, manufactured in two sintering processes, the second of which employs high frequency to heat the part to approximately 2000 to 2500° C. 7 ref. (H15, H16d; 6-72, W, *Ag, Cu*, SGA-r)

68-H.* Powder Metallurgy Growing. *Chemical and Engineering News*, v. 37, Mar. 16, 1959, p. 46, 48-49.

Production of large ingots of Mo, Cb, Ta and W. Applications of refractory metals. (H14; Cb, Mo, Ta, W, EG-d, 17-57)

69-H.* (Italian.) Preparation of a Chromium Powder Suitable for the Manufacture of Cermets. G. Venturello and V. Coen. *Metallurgia Italiana*, v. 50, p. 538-540.

Metallic Cr in form of very fine powder is obtained by reaction between CR_2O and metallic Mg in presence of MgO heated in vacuum at 700° C. for 20 min. Powder is 96% Cr and highly compressible. Effect of time, temperature and MgO addition to starting mixture on efficiency of reaction. (H10, 2-60, 2-61, 3-67; Cr, 6-70)

70-H.* (German.) Elastic Deformation of Metal Powder During Pressing. W. Rutkowski. *Neue Hutte*, v. 4, Feb. 1959, p. 110-113.

The elongation of the compact after release of pressure is determined for Fe, Cu, Cr, Pb and Ag. Influence of pressure, particle size and hardness, lubrication. 21 ref. (H11n, H14g, Q21; Fe, Cu, Cr, Pb)

71-H.* Dispersion Strengthened Alloys: The Possibilities for Light Metals. Pt. 2. Claus G. Goetzel. *Journal of Metals*, v. 11, Mar. 1959, p. 189-194.

Fundamentals of dispersion strengthening process; theory of dispersion hardening; role of interparticle spacing; storage of strain energy during extrusion; mechanical properties of Al and of Mg alloys. (To be concluded.) 43 ref. (H14, H15, Q-general, N7a; Al-b, Mg-b)

72-H. Dispersion Hardening of Sintered Titanium Alloys by Refractory Metal Powder Additions. Armour Research Foundation, Illinois Institute of Technology. *U. S. Office of Technical Services*, PB 131937, Mar. 1958, 47 p. $1.25.

Powder metallurgical techniques used to improve Ti-base alloys for service at temperatures to 1200° F. Dispersion hardening of Ti by mechanically blending fine particles of W with Ti powder, and by internally oxidizing Ti-Th alloys to disperse the thoria. (H12, H15, N7; Ti-b, *Th, W*)

73-H.* Problem of Manufacturing Hard Alloys in India. E. I. Mozjukhin and H. N. Sinha. *Indian & Eastern Engineer*, v. 123, Dec. 1958, p. 435-438.

Characteristics, methods of preparation and production. (H-general; 6-69)

74-H.* Some Preliminary Experiments on the Continuous Compaction of Titanium, Molybdenum and Tungsten. P. Evans and G. C. Smith. *Metallurgia*, v. 59, Mar. 1959, p. 117-120.

Technique consisted of rolling to strip followed by sintering. Argon atmosphere was used for Ti and although strip of reasonable strength was produced, the ductility was low. Mo and W strip was sintered

in vacuo but the green strength was low. 11 ref. (H14j; Mo, Ti, W)

75-H.* How to Do More With Prealloyed Powders. W. L. Batten. *Metal Progress*, v. 75, Apr. 1959, p. 105-112.

Pre-alloyed powders are produced from molten alloys, and compacts have properties of the composition within limitations of the density achieved. Parts made from alloy steel powders, such as gears and cams, can be heat treated to high strength. A variety of stainless steel and special powders are useful in corrosion resisting, high-temperature and electrical applications. (H-general, H12n; AY, SS, TS)

76-H.* Extruding Metal Powders. Eric Gregory. *Metal Progress*, v. 75, Apr. 1959, p. 113-116, 150-152, 154, 156, 158.

By modifying conventional extrusion methods, powders can be extruded in long bars with cross sections of varying complexity. In many instances, density is close to 100%. Still largely in the experimental stage, powder extrusion methods are used to produce materials with good elevated-temperature properties. Certain atomic reactor fuel elements could also perhaps be fabricated by these methods. (H14k)

77-H.* Cermets From Thermite Reactions. J. D. Walton, Jr., and N. E. Poulos. *American Ceramic Society, Journal*, v. 42, Jan. 1, 1959, p. 40-49.

Oxide of the cermet (Al_2O_3) is produced from the oxidation of powdered Al and the metallic phase is produced from the resulting reduction of its oxide. Formation of metallic silicides and borides as the metallic phase of a cermet from the appropriate silicates and borates, or metallic oxides with silica or boric acid. (H15; Al, Zr, 6-70)

78-H.* Fourth Dimension: Controllable Density. *Powder Metallurgy Quarterly*, Spring 1959, p. 3-7.

Various degrees of porosity for filters, bearings, gears and various components. (H11k, 6-72, 9-68, 17-57)

79-H.* Furnace Sintering of Metals and Ceramics. Pt. 3. R. L. Harper. *Industrial Heating*, v. 26, Mar. 1959, p. 498, 500, 502, 504.

Necessary atmospheres, heating cycles and equipment for sintering ferrites and uranium oxide. The sintering operation is similar to that used for other powdered materials. (H15; Fe, NM-a34, U)

80-H.* Process Compacts Metal Powders Into Continuous Bars. F. Emley and C. Deibel. *Iron Age*, v. 183, Apr. 23 1959, p. 122-113.

Powder in a trough-like container is compressed by a sloping punch. Some of the powder is completely compacted, but that part under the sloping portion of the punch is compacted a variable amount—from full compaction to zero. By reciprocating the sloping punch while advancing the powder, the bar is formed. (H14; 4-55)

81-H.* Designing for Metal Powder Structural Parts. John L. Everhart. *Materials in Design Engineering*, v. 49, Apr. 1959, p. 113-124.

Manual covering powder properties, pressing, sintering, heat treatment, design and properties of parts. 9 ref. (H-general, 17-51)

82-H.* (Japanese.) Sintering of TiC-Base Cermet. Pt. 2. Shrinkage of TiC-Ni Compact by Heating in Vacuum. Etsuro Kato and Shigeharu Naka. *Nagoya Government Industrial Research Institute*, Reports, v. 8, Mar. 1959, p. 228-234.

Shrinkage varies with ratio of TiC and Ni content. 6 ref. (H15, P10c, 2-60; Ti, C, Ni, 6-69)

83-H.* Sizing and Coining of Metal-Powder Parts. John Haller. *Machinery*, v. 65, Apr. 1959, p. 135-138.

Improving density and dimension by sizing with punch presses. (H16a)

84-H.* Dispersion Strengthened Alloys: Properties and Applications of Light Metals. Claus G. Goetzel. *Journal of Metals*, v. 11, Apr. 1959, p. 276-280.

Al, Be and Mg cermets. 16 ref. (H-general, N7; Al, Be, Mg, 6-70)

85-H.* High Quality Strip From Powder Metal. *Canadian Metalworking*, v. 22, Apr. 1959, p. 20-21.

Recent tests show superior mechanical properties and lower oxygen content in Cu strip. (H14, Q27a; Cu, O, 4-53)

86-H. Metal and Self-Bonded Silicon Carbide. R. E. Wilson, L. B. Coffin and J. R. Tinklepaugh. Alfred University. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151115, Jan. 1955, 46 p. $1.25.

Method was devised for the formation of dense self-bonded silicon carbide by hot pressing. Al in small quantities was found essential to the formation of uniformly dense specimens. In a metal-bonding study, molybdenum and silicon carbide were hot pressed to form dense specimens having good oxidation resistance. (H14h, R1h; Si, C, 6-69, 6-70)

87-H.* Fiber Metals. Robert H. Read. *Frontier*, v. 32, Spring 1959, p. 1-5.

Preparation, properties and applications. (H17)

88-H.* Application of the Endothermic Atmosphere Generator to the Sintering of Powder Metal Parts. N. K. Koebel. *Industrial Heating*, v. 26, Apr. 1959, p. 692-702.

Principle of endothermic atmosphere generators. Sintering iron or nonferrous powder metal compacts. (H15q, W28q; Fe, Cu)

89-H.* (German.) Effects of Adsorbed Gases and Impurities on Sintering of Tin. Wolfgang Friemel, Ottmar Knacke and Iwan N. Stranski. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1958, p. 404-408.

In a testing apparatus, a tin ball was pressed against a Sn plate, after surface treatment, and under modified atmospheric and temperature conditions, to study the sintering process. Mechanically polished Sn could not be sintered, while pickled Sn sintered at 140° C.; vacuum remelted Sn sintered above 20° C. Sintering is retarded by any hydrogen and CO_2 present. 9 ref. (H15, 1-54; Sn, *H, C, O*)

90-H.* (German.) Sinter Bronze of High Strength and High Elongation. Horst Schreiner. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1958, p. 409-415.

To avoid porosity, bulging and formation of cracks in sintered parts caused by a surface layer impermeable to gases, an organic substance ("Sterotex") is added to the powder. The substance decomposes, forming carbon-containing layers which permit gases to escape. 15 ref. (H15; Cu-s)

91-H.* Production of Electrolytic Copper Powder. Frank Wills and E. J. Clugston. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 362-366.

Operation, equipment and quality control used in commercial production. 4 ref. (H10b; Cu)

92-H.* Pressureless Sintered Beryllium. Pt. 2. Evaluation of a New Process. T. R. Barrett. *Engineering*, v. 137, Apr. 3, 1959, p. 437-439.

By this method, loose Be powder of 45 to 50% bulk density is consolidated to near theoretical density by vacuum sintering in an uncoated graphite mold at 1200° C. without the application of pressure. (H15, Q-general; Be, 4-53)

93-H.* (German.) Metals With High Melting Points. Pt. 1. R. Kieffer and F. Benesovsky. *Metall*, v. 13, May 1959, p. 379-385.

Preparation of Mo by sintering, refining, tungsten arc melting and electron bombardment. Effect of alloying elements on cold and hot deformability, recrystallization temperature, creep, high-temperature strength. Sintering of tungsten by direct passage of current. 42 ref. (H15, C5h, 2-60; Mo, W)

94-H.* (German.) Powder Metallurgy in the Construction of Nuclear Reactors. R. Palme. *Metall*, v. 13, May 1959, p. 386-389.

Sintered U and Th fuel elements and their fabrication. Construction parts of Mg, Al, sintered Zr and Be. Screening materials obtained by sintering tungsten powder with 5-15% Cu and Ni or by sintering tungsten powder and impregnating with Pb. 33 ref. (H-general, T11; U, Th, Mg, Al, Zr, Be, W, *Cu, Ni*, Pb, 17-57)

95-H.* (German.) Production of Strip From Zinc and Zinc-Lead Alloy Powders. H. Weik, G. Ogiermann and R. Ergang. *Metall*, v. 13, May 1959, p. 398-404.

Strip with satisfactory mechanical properties can be produced by pressing mixtures of powdered Zn and Pb (up to 10%) followed by repeated rolling. Corrosion resistance and mechanical properties vary in proportion to the Pb content. 22 ref. (H14j, 2-60, Q-general, R-general; Zn, Pb, 4-53)

96-H. (Japanese.) Slip Casting. Atsumi Ohno. *Metals*, v. 29, Jan. 1959, p. 47-49.

Advantages, disadvantages, applications. (H14)

97-H.* (German.) Preparation and Properties of Sintered Nickel Aluminides. Erich Fitzer and Peter Gerasimoff. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 187-196.

Preparation of nickel aluminide powder by heating Ni-amalgam together with Al-amalgam in a sealed vessel up to 500° C. Resistance to scaling and strength of sin-

tered parts vary with the Ni content (80-84% optimum). Strength behavior in influenced by an oxidizing heat treatment. Effect of testing temperature on strength. 10 ref. (H10c, H15, R1h, 2-64, Q-general; Ni-b, *Al*)

98-H.* (Portuguese.) Influence of Manufacturing Conditions on Porosity, Volumetric Changes and Density of Porous Bronze Bushings. Vincente Mazzarella. *Instituto de Pesquisas Tecnologicas*, Publication no. 590, 1959, p. 162-170.

Influence of mesh size of Cu, percentage of Sn, molding pressure and sintering temperature. (H11, H14, H15; Cu-s)

99-H. Powder Metallurgy. A. Kapilov. *Indian Ceramics*, v. 5, Feb. 1959, p. 267-269.

Production techniques at "Udarnik" plant in Minsk (Byelorussian SSR). (H-general)

100-H. Basic Concepts and Techniques of Modern Ceramics. L. S. Williams. *Australasian Engineer*, v. 51, Apr. 7, 1959, p. 50-56.

Fabrication of special ceramics and cermets. 21 ref. (H14, H15; 6-70)

101-H. (Japanese.) Powder Metallurgy in the United States. Hisashi Kimura. *Metals*, v. 29, Apr. 1959, p. 275-279.

Review of powder rolling methods, slip casting, infiltration and canning. Analysis of sintering mechanism. (H-general)

102-H.* New Uses for Powder Metallurgy. *Metal Progress*, v. 75, June 1959, p. 97-99.

Report on meeting of the Metal Powder Industries Federation. A method for continuous compaction opens up new possibilities for using powders to produce bar and sheet products and to fabricate bimetal combinations. Metal powders are mixed with other materials to give compositions for special uses in nuclear and other applications. (H-general)

103-H. Report on the Third International Plansee Seminar. *Powder Metallurgy Bulletin*, v. 8, Mar. 1959, p. 75-115.

Abstracts of papers presented at the Seminar held in Reutte, Austria, June 22-26, 1958. (H-general)

104-H. (German.) Factors Influencing the Behavior of Tungsten in Sintering. J. Vacek. *Planseeberichte fur Pulvermetallurgie*, v. 7, Apr. 1959, p. 6-17.

Examination of the influence of metal additions on the sintering behavior of tungsten powder shows that Ni and Co, more than Fe, increase the reactivity during sintering. Other metals so not show any marked influence. (H15, 2-60; W, *Ni, Co, Fe*)

105-H.* (English.) Rare Earth Hardmetals. J. Binder and R. Steinitz. *Planseeberichte fur Pulvermetallurgie*, v. 7, Apr. 1959, p. 18-21.

Hot pressed samples of gadolinium hexaboride (GdB_6) and dysprosium disilicide ($DySi_2$) investigation as to structure, physical and scaling properties. Because of their high thermal-neutron capture cross section, possible applications include use as materials for control rods in nuclear reactors. 10 ref. (H-general, P18j; Gd, Dy, EG-g)

106-H. Powder Metallurgy of Beryllium. *Precision Metal Molding*, v. 17, June 1959, p. 36-37.

(H-general; Be)

107-H.* Powder Metallurgical Products. Henry H. Hausner. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 370-391.

Effect of vacuum sintering and vacuum infiltration on density and properties of Be, Cu and Zr powder compacts. 16 ref. (H15, H16e, 1-73; Be, Cu, Zr)

108-H. (Slovakian.) Manufacture of Metal Powders Used in Electrode Coatings. Frantisek Zahoransky. *Zvaranie*, v. 8, May 1959, p. 149-152.

Various methods for the manufacture of metal powders. (H10, W29h)

109-H.* (Rumanian.) Manufacture of Iron Powder by Reduction With Methane. A. Domsa and A. Palfalvi. *Studii si Cercetari de Metalurgie*, v. 4, no. 1, 1959, p. 59-72.

Method allowing the direct reduction of finely ground rolling mill scale in an atmosphere of natural methane or in methane after partial combustion. Sintering in a mixture of methane and air permits the control of carbon content by varying the ratio of methane to air. 5 ref. (H10c, H15; Fe, *O*)

110-H.* (Polish.) Elastic Deformation During Powder Pressing. Wladyslaw Rutkowski and J. Bryniarski. *Hutnik*, v. 26, Apr. 1959, p. 154-158.

Hametag Fe, electrolytic Fe, electrolytic Cu, mechanical Cr, sprayed Pb and chemical Ag powders were pressed, with and without a lubricant composed of camphor solution in ethyl alcohol, at pressures

between 1 and 15 tons per sq.cm. Dependence of elastic deformation on the hardness of starting material, the initial powder weight, oxidation, particle shape and pressure. 21 ref. (H14g, H11n, Q24; Fe, Cu, Cr, Pb, Ag)

111-H.* (Ukrainian.) Effect of Compressive Stresses on Shrinkage in the Sintering of Porous Bodies. I. M. Fedorchenko and Andrievskii. *Dopovidi Akademii Nauk Ukrainskoi R.S.R.*, no. 3, 1959, p. 281-284.

Dependence of shrinkage on the compressive stress in Ag, Cu and Ni powders proved to be nonlinear in the case of annealed powders. This is due to plastic deformation arising from the application of the load to the sintered body. 10 ref. (H15, P10d, 3-66; Ag, Cu, Ni)

112-H.* (Czech.) Manufacture of Metal Fiber. Ludek Kratky. *Hutnicke Listy*, v. 15, June 1959, p. 499-500.

Molten Al is pressed through orifices 0.06-0.08 mm. in diameter. The fiber produced is used in a similar manner to metal powders in sintering. 4 ref. (H17; Al)

113-H.* (German.) Surface Activity of Tungsten Trioxide Powders. Will Kleber and Dieter Radloff. *Neue Hutte*, v. 4, June 1959, p. 323-328.

Comparison of the surface activity of various tungsten trioxide powders with the structure of sintered bars produced using the powders as starting materials. 4 ref. (H10c, H11j; W)

114-H.* The Development of SAP-Type Structures in Titanium for Elevated Temperature Service by Powder Metallurgical Techniques. R. W. Jech, A. D. Schwope and E. P. Weber. Paper from "High Temperatures Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 332-341.

Dispersion-strengthening effect of Al_2O_3, ThO_2 and TiC in TiH. Bonding of dispersed phase to matrix must be achieved for improvement of dispersion strengthened systems. 5 ref. (H-general, N7, 2-62; Ti-b, *Al, Th*, 6-69, SGA-h)

115-H.* Recent Developments in Powder Metallurgy. Ivor Jenkins. *Powder Metallurgy*, no. 1-2, 1958, p. 3-12.

Materials and processes; recent work on sintering; grain boundaries; hard metals and dispersed hard particles; research trends. (H-general)

116-H.* Atomization of Metal and Alloy Powders. J. F. Watkinson. *Powder Metallurgy*, no. 1-2, 1958, p. 13-23.

Atomization of stainless steels, high-speed steels and Ni-base or Co-base alloys with gas or water jets. Powder properties; process limitations. (H10f, H11; Ni-b, Co-b, SS, TS)

117-H.* Electrolytic Production of Straight and Alloyed Metal Powders. I. Ljungberg. *Powder Metallurgy*, no. 1-2, 1958, p. 24-32.

Electrolytic preparation of Fe, ferroalloys and Ni powder from aqueous solutions, fused salt baths or amalgam dispersions. 13 ref. (H10b; Fe, Ni, SS)

118-H.* Electrolytic Copper Powder. E. Mehl. *Powder Metallurgy*, no. 1-2, 1958, p. 33-39.

Conditions and mechanisms of electrodeposition of metal sponge. Commercial production of Cu powder. 9 ref. (H10b; Cu, 6-74)

119-H.* Manufacture and Properties of Metal Powders Produced by the Gaseous Reduction of Aqueous Solutions. *Powder Metallurgy*, no. 1-2, 1958, p. 40-52.

Ni, Co, Ni-Co and Cu powders. 26 ref. (H10c, H11; Ni, Co, Cu)

120-H.* Production of the Powders of Some of the Reactive Metals. G. L. Miller. *Powder Metallurgy*, no. 1-2, 1958, p. 53-64.

Preparation of Be, Zr, Ti, Ta and Cb powders using electrolysis, reduction or hydrogenation. (H10b, H10c; Be, Zr, Ti, Ta, Cb)

121-H.* Mechanical Methods of Powder Production as Used in the Carbide Industry. E. M. Trent. *Powder Metallurgy*, no. 1-2, 1958, p. 65-72.

Ball milling of carbides with bonding metals in the preparation of powder for manufacture of cemented carbides. 11 ref. (H10h; 6-69)

122-H.* Compacting of Powders Using Molds Made From Reversible Gels. T. W. Penrice. *Powder Metallurgy*, no. 1-2, 1958, p. 79-84.

Pressing powder metal compacts in high plasticized and gelled polyvinyl chloride mold. (H14g, W26f)

123-H.* The Continuous Production of Strip by the Direct-Rolling Process. D. K. Worn. *Powder Metallurgy*, no. 1-2, 1958, p. 85-93.

Rolling metal powders into strip; sintering and cold rolling; capabilities and limitations of the process. 17 ref. (H14j, H15, 1-61; Ni, Cu, Fe, ST)

124-H.* The Consolidation of Metal Powders by Hot Working Within Sheaths. J. Williams. *Powder Metallurgy*, no. 1-2, 1958, p. 94-103.

Upsetting, forging, extrusion, rolling, swaging and hydrostatic pressing of metal powders sealed in metal sheaths. Choice of sheath material. (H14, F21g; Be, Zr, U, 6-68)

125-H.* Conditions for Effective Vacuum Sintering and Their Realization in Practice. Otto Winkler. *Powder Metallurgy*, no. 1-2, 1958, p. 114-121.

Physical and chemical absorption in metal powders. The desorption process; evaporation; vacuum sintering practice. 5 ref. (H15n, H15q, 1-73)

126-H.* The Pressureless Sintering of Loose Beryllium Powder. T. R. Barrett, G. C. Ellis and R. A. Knight. *Powder Metallurgy*, no. 1-2, 1958, p. 122-132.

Ingot casting, swarf turning and milling in production of powder. Vacuum sintering of loose Be powder held in a graphite mold at 1200° C. (H15, H10, 1-73; Be)

127-H.* Zone Sintering. J. Antill and M. Gardner. *Powder Metallurgy*, no. 1-2, 1958, p. 133-142.

Th and U powdered compacts sintered into dense tubes and rods by slowly passing furnace over the length of green compacts. Changes in dimensions and density. (H15n; Th, U)

128-H.* Fabrication and Properties of Chromium-Alumina and Molybdenum-Chromium-Alumina Cermets. J. B. Huffadine, L. Longland and N. C. Moore. *Powder Metallurgy*, no. 1-2, 1958, p. 235-252.

Powder preparation, sintering and hot pressing in production of cermets. Modulus of rupture; resistance to creep, oxidation, thermal shock and impact. 32 ref. (H12q, H14h, Q-general; Cr, Mo, 6-70)

129-H.* Fabrication and Properties of Uranium Oxide-Iron Cermets. W. J. Wright, R. B. Gibbon and J. Williams. *Powder Metallurgy*, no. 1-2, 1958, p. 253-272.

Hot rolling and hot extrusion of uranium dioxide dispersed in Fe and clad in mild steel. Density, structure, dimensions, defects and mechanical properties of cores. 11 ref. (H14j, H14k, Q-general; Fe, U, 6-70)

130-H. Metal-Ceramic Laminates. R. K. Francis, R. Brown, E. P. McNamara and J. R. Tinklepaugh. Alfred University. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151664, Nov. 1958, 78 p. $2.

Techniques for brazing or hot pressing metal-ceramic laminates. Fabrication of Fosterite-stainless steel 430, Mo-alumina, Kovar-alumina and Mo-alumina-mullite laminates. Thermal expansion and conductivity of metal-ceramic compacts. Apparatus for measurement of thermal conductivity. (H14h, K8, K11b, P11h, SS, Mo, Co, 6-70, 7-58)

131-H. Metal Fiber Reinforced Ceramics. R. S. Truesdale, J. J. Swica and J. R. Tinklepaugh. Alfred University. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151610, Dec. 1958, 45 p. $1.25.

Sintering and hot pressing of alumina and aluminas containing up to 20% Mo fibers. Strength, resistance to impact and thermal shock. (H14h, H15, H17, Q-general; Al, *Mo*, 6-70)

132-H.* The Compaction of Metal Powders by Rolling. Pt. 1. The Properties of Strip Rolled From Copper Powders. P. E. Evans and G. C. Smith. *Powder Metallurgy*, no. 3, 1959, p. 1-25.

Crystallographic orientation in green strip and following sintering and cold rolling. Variation of tensile properties with rolling direction, powder properties, density, porosity and grain size of sintered strip. Relation of electrical conductivity to density, sintering time and rolling direction. 21 ref. (H14j, H15n, H11j, Q27a, P15g; Cu, 4-53)

133-H.* Compaction of Metal Powders by Rolling. Pt. 2. An Examination of the Compaction Process. P. E. Evans and G. C. Smith. *Powder Metallurgy*, no. 3, 1959, p. 26-44.

Deformation of particles in pressing and rolling. Determination of average roll pressure; variation in gripping angle and strip thickness with shape of powder and with roll-powder friction. Relation of powder flow properties with their behavior in compaction. Compaction mechanisms. 12 ref. (H14j, H11j, H11m; Cu-a, 4-53)

134-H.* Production of Pure Nickel Strip by the Direct-Rolling Process. D. K. Worn

and R. P. Perks. *Powder Metallurgy*, no. 3, 1959, p. 45-71.

Effect of powder properties, rolling speed, powder head and roll gap on density, thickness, breaking strength and rate of production of grain strip. Use of hydrogen in powder feed; sintering conditions; comparison of properties of strip produced from carbonyl Ni powder with conventional strip. 8 ref. (H14j, H15n, Q-general; Ni-a, 4-53)

135-H.* The Removal of Internal Porosity in Copper. B. Clapson and D. A. Robins. *Powder Metallurgy*, no. 3, 1959, p. 72-79.

Importance of grain boundaries in the sintering process. Grain boundaries act as strong vacancy sinks in contrast to twin boundaries and dislocations, which apparently do not absorb a large number of vacancies. The mechanism of sintering involves the diffusion of vacancies to the grain boundaries, where they are destroyed by the progressive removal of planes of atoms adjacent to the boundaries. 7 ref. (H15, P10m, M26s, 2-64, 3-71; Cu)

136-H.* Processes Involved in Sintering. Rene G. Bernard. *Powder Metallurgy*, no. 3, 1959, p. 86-103.

Adhesion, densification and void disappearance stages during sintering of a pure single-phase metal interpreted on the basis of volume self-diffusion and grain boundary diffusion. Sintering mechanisms in mixtures capable of forming solid solutions or of undergoing chemical reactions; sintering processes in presence of liquid phase. 33 ref. (H15n, N1d, N1h)

137-H.* Recent British Developments in the Theory of Sintering. G. A. Geach. *Powder Metallurgy*, no. 3, 1959, p. 104-114.

Definition, sintering mechanisms, effect of particle size, compact density, composition, temperature, atmosphere and grain boundaries on sintering. Adhesion between metal surfaces. 28 ref. (H15n, H15q)

138-H.* Current Progress in Theories of Sintering in the U. S. A. John T. Norton. *Powder Metallurgy*, no. 3, 1959, p. 115-124.

Theoretical transport mechanisms involved in sintering of single-component solid phases in solids in the presence of liquid phase. 20 ref. (H15n, N1, N3m)

139-H.* Recent Work on the Theory of Sintering in the German Democratic Republic. F. Thummler. *Powder Metallurgy*, no. 3, 1959, p. 125-145.

Elementary mechanisms involved in sintering. Factors affecting sintering processes including crystal orientation, diffusion coefficient, total contact surface, crystal structure, surface activity, lattice activity, foreign constituents and liquid phases. 36 ref. (H15n, N1)

140-H.* Mechanism of Sintering in Single-Component Systems. I. M. Fedorchenko and R. A. Andrievsky. *Powder Metallurgy*, no. 3, 1959, p. 147-171.

Flow and diffusion processes responsible for densification and changes in physical and mechanical properties during sintering. Influence of external stresses on shrinkage during sintering of Cu, Ni and Ag compacts. Effects of surface conditions of powder particles. Magnetic properties of Fe compacts resulting from activated sintering. 73 ref. (H15n, N1, 3-66; Cu, Ni, Ag, Fe)

141-H.* Powder Metallurgy. Robert L. Pettibone. *Engineering Forum*, v. 20, June 1959, 5 p.

Powder blending, molding, sintering and secondary operations; capabilities and recommendations for fabrication of parts. (H-general)

142-H.* Recent Advances in Infiltrated Titanium Carbides. H. W. Lavendel and C. G. Goetzel. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 15, 1959, p. 140-154.

Modified microstructures providing greater strength and ductility for gas-turbine components have been obtained by employing finer carbide powders. Increased stress-rupture strength at 1800 and 2000° F. made possible by changing from Ni-base to Co-base superalloys as infiltrants. (H16e, Q-general; Ni-b, Co-b, 6-69, SGA-h)

143-H. Fiber Metallurgy: New Opportunities for Metal Working? *Steel*, v. 145, Aug. 10, 1959, p. 126-128.

Processes, properties and applications. (H17)

144-H.* (English.) Sintered Intermetallic Compound NiAl as a High-Temperature Material. Pt. 1. Yunoshin Imai and Masuji Kumazawa. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 210-219.

Microstructure, density, porosity, volume change and hardness of intermetallic compound prepared by pulverizing Ni-Al alloy, compacting the powder at pressures of 1-10 tons per sq. cm. and sintering in a vacuum at 1100-1600° C. (H10e, H14g, H15n, 1-73, P10, Q29n; Ni-b, *Al*, 14-68)

145-H.* (German.) Effect of Storage on the Properties of Metal Powders. Martin Clasing. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 424-428.

Ag powder is obtained by different processes. The rippling angle, bulk density, tap density, pressed density and sinter density are determined immediately following powder preparation and 60 to 3200 hr. afterwards to study the effect of storage. 10 ref. (H10b, H11, 3-67; Ag)

146-H.* (Czech.) Progress in Powder Metallurgy. Z. Ministr. *Strojirenstvi*, v. 9, July 1959, p. 525-527.

Manufacture of steel parts impregnated with Cu. Strength properties of steel powder parts with phosphorus and Mn additions. Al fibers used as starting material for rolling porous sheets. (H16d, F23, 2-60; ST, Al, 4-53, 4-62, *P, Cu, Mn*)

147-H.* Perfected and Practical Methods of Processing Powder Into Commercial Strip. Richard A. Smucker. *Iron and Steel Engineer*, v. 36, July 1959, p. 118-124.

Equipment requirements; mechanical properties of Cu and Ni strip produced from powder. (H14j, 1-61, Q27a; Cu, Ni, 4-53)

148-H.* Observations on the Structure and Sintering Mechanism of Cemented Carbides. J. Gurland. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 601-608.

Investigation of the structure of sintered WC-Co and TiC-Co alloys by means of dilatometric and metallographic methods. The sintering of cemented carbides takes place by transport of particles through the liquid binder, followed by grain growth and coalescence of carbide grains. The structure changes during sintering by the formation of contacts between carbide grains. 26 ref. (H15; W, Co, Ti, 6-69)

149-H. New Methods Spur Metal Powder Use. Charles Burley, Jr. *American Machinist*, v. 103, July 13, 1959, p. 108-109.

Improved materials; application of extruding, rolling and forging techniques. (H-general)

150-H.* (Polish.) Nitriding of Metallic Manganese. H. Zak and Z. Kulinski. *Prace Instytutow Hutniczych*, v. 11, no. 2, 1959, p. 83-91.

Effect of temperature, time and grain size of Mn powder on the quantity of combined nitrogen. Three grain sizes were used: 0-0.06 mm., 0.06-0.35 mm. and 0.35-0.5 mm. Gaseous nitrogen was applied as nitriding agent at pressures about 1.5 atm. and temperatures of 650-900° C. (H12, 2-61, 2-59, 3-67; Mn)

151-H.* (German.) Columbium Powder Metallurgy. Jiri Vacek. *Neue Hutte*, v. 4, Aug. 1959, p. 493-501.

Pressing and sintering of Cb powder. Effects of applied compression force and sintering temperature on density, hardness, bend strength, electrical resistivity. Influence of sintering temperature on shrinkage, tensile strength and structure. 7 ref. (H15, P10a, P10c, P15g, Q29n, Q5g, Q27a, M26, 3-68, 2-61; Cb, 6-72)

152-H.* (German.) Volume Changes Occurring During the Sintering of Fe-Cu and Fe-Cu-C Powders. G. Bockstiegel. *Stahl und Eisen*, v. 79, Aug. 20, 1959, p. 1187-1201.

Volume changes of Fe-Cu, Fe-Cu-C powders are explained by the diffusion activity of Cu into the Fe lattice during the sintering process. The powder increases its volume in proportion to the volume of the diffused Cu. The dissolution of Fe is caused by the Cu melt and shrinks the lattice of the sintered material. The shrinkage increases in proportion to decreases in grain size of the Fe powder, and with increased Cu additions. (H15, P10c, N1; Fe, Cu, C)

153-H.* Pressureless Sintered Beryllium Powder. T. R. Barrett, G. C. Ellis and R. A. Knight. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 319-327.

Technique for the consolidation of loose Be powder to high densities in solid and hollow shapes without the application of pressure. (H15, Q-general, 3-74; Be)

154-H.* Composite Neutron-Absorbing Materials for Control-Rod and Screening

Applications. E. J. Bradbury, C. R. Sutton and D. K. Worn. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 328-333.

Direct rolling of pre-mixed powders for the production of sheet and strip, and a tube-drawing technique for producing tubular control-rod elements. Production of a stainless-steel-clad Cu-base material containing boron carbide. 6 ref. (H14j, F26r, T11j; Cu-b, *B*, SS, 8-66, 4-53)

155-H.* (Rumanian.) Sintering of Ferrous Powders in an Atmosphere Obtained by Incomplete Combustion of Methane. G. Dan, A. Protopescu and O. Stefan. *Studii si Cercetari de Metalurgie*, v. 4, no. 2, 1959, p. 189-199.

Effect of mixing ratio of gases on sintering process of electrolytic Fe powder investigated by measuring hardness, weight and volume changes and by microscopic tests. 8 ref. (H15q, Q29n, P10d; Fe-a, 6)

156-H. Sizing and Coining Metal-Powder Parts. John Haller. *Machinery (London)*, v. 95, Sept. 30, 1959, p. 648-650. (H16a; 6-72)

157-H.* (English.) Study of Sintering of Carbonyl Iron by Electrochemical Potential. B. Bovarnick. *Planseeberichte fur Pulvermetallurgia*, v. 7, Aug. 1959, p. 34-49.

Influences of sintering temperature and time on the electrochemical potential, tensile strength and density. 22 ref. (H15, P15, Q27a, P10a, M27, 2-61, 3-67; Fe-a, 6-72)

158-H.* (English.) Infiltration of Iron Powder With Tin-Lead Alloy. Takashi Kimura. *Planseeberichte fur Pulvermetallurgie*, v. 7, Aug. 1959, p. 50-66.

Close-packed iron powder is infiltrated with a liquid solder composed of Pb and Sn. Effect of gases adsorbed or occluded on the powder surface on the infiltration process and promotion of the process by chemical pretreatment. Effect of powder size on tensile strength. 12 ref. (H16e, 2-66, 3-73; Fe, 6, Sn-b, *Pb*)

159-H.* (German.) Processes Occurring in the Pressing of Complicated Powder Compacts. H. Silbereisen. *Planseeberichte fur Pulvermetallurgie*, v. 7, Aug. 1959, p. 67-78.

Flow or powder particles during pressing and density distribution in the pressed compact. Reasons for cracking and strata formation. 7 ref. (H14, P10a, 9-72; 6-72)

160-H.* (French.) Heavy Alloys. R. Bernard. *Machine Moderne*, v. 53, Aug. 1959, p. 81-85.

Recent progress in the powder metallurgy of W-Ni-Cu and W-Ni-Fe alloys. (H-general; W-b, *Ni, Cu, Fe*)

161-H.* Slip Casting. L. M. Schifferli, Jr. *Metal Progress*, v. 76, Oct. 1959, p. 99-102.

Process consists of preparing concentrated, stable suspensions of finely ground materials in a liquid, pouring these suspensions into absorbent molds, removing the partially dried and solidified shapes from the molds, drying completely and sintering to increase density and strength. Materials to be slip cast must, however, have definite characteristics. (H14)

162-H.* A New Method for Compacting Metal or Ceramic Powders Into Continuous Sections. Frank Emley and Charles Deibel. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 5-13.

Pressing technique capable of producing bars of unlimited length and relatively large cross-sectional area uses continuous compaction. In addition to straight metal powders, a variety of alloys can be pressed from elemental powder mixes. (H14g, 1-61)

163-H.* The Effects of Lithium Stearate Additions and Various Atmospheres on Sintered Brass Compacts. Frank I. Zaleski and Robert A. Powell. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting Metal Powder Industries Federation, New York 17, 1959, p. 28-40.

Substantially higher properties were obtained with sintered 70-30 brass compacts when Li stearate, rather than the conventional Zn stearate,was used as the lubricant. Improvements were apparent whether the sintering atmosphere was reducing, inert or oxidizing. (H15; Cu-n, NM-h)

164-H.* Detergency During Infiltration in Powder Metallurgy. T. Kimura, J. C. Kosco and A. J. Shaler. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 56-66.

Elements and compounds which belong to the atmosphere and which modify powder metallurgy processes are called "detergents" since they act primarily by altering the surface and interface energies of the primary constituents. 13 ref. (H16e)

165-H.* Current Status of Aluminum Powder Metallurgy. John D. Sahaw and Walter V. Knopp. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 67-71.

Manufacture and application of Al powders; die lubrication; SAP and APM powders; rolling of Al powders as strip. 7 ref. (H-general; Al)

166-H. Stainless Steel Clad Dispersion of Boron in Iron for Pressurized Water Reactors. C. F. Leitten, Jr., R. J. Beyer and A. E. Richt. *Journal of Nuclear Materials*, v. 1, July 1959, p. 136-143.

Cold pressing and sintering of boron-iron powder mixture to form high density core and roll cladding with austenitic stainless steel to produce boron-bearing neutron absorber section of reactor control rod. Mechanical properties of fabricated dispersion of 3% B in Fe at 25 to 980° C. Performance under irradiation. (H14g, H15n, L22, Q27a, P10d, 2-67; Fe-b, *B*, *SS*, 8-66)

167-H. The Preparation of a Large Plutonium-Beryllium Neutron Source. K. L. Wauchope and J. Baird. *Journal of Nuclear Materials*, v. 1, July 1959, p. 191-195.

Reduction of plutonium dioxide with Be followed by vacuum sintering at 1450° C. to form a mechanically strong nonfriable alloy compact. 5 ref. (H12q, H15n, C26; Be, *Pu*)

168-H. Some New Applications of Lead Powders. R. L. Ziegfeld. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 22-23.

Pb powder can be mixed with polyethylene to produce molded mechanical parts. Pb powder has been bonded to steel sheet experimentally. Compressed Pb powder is used to make superconducting connections between thin films of vapor-deposited metals and external circuits in computers. (H-general; Pb)

169-H. Automatic Control of Endothermic Sintering Atmospheres. George F. Sommer. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 41-48.

Carbon content is controlled by proper regulation of the dew point of the furnace atmosphere during sintering. 5 ref. (H15)

170-H. Direct Measurement of Fine Metal Powders Evaluation of Micromesh Sieves From 10 to 45 Microns. John Haertlein. Paper from "General Session on Powder Metallurgy". Metal Powder Industries Federation, New York 17, 1959, p. 49-55.

Simple method for extension of particle size distribution measurement from the 325 mesh screen (44 microns) to 20 microns. (H11g)

171-H. A New Basis for an Inspection Method for Sintered Metal Components. Bennett Bovarnick. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting. Metal Powder Industries Federation, New York 17, 1959, p. 72-81.

Test method for measuring changes in the surface energy in sintering. 14 ref. (H15, 1-54)

172-H. Fundamentals of Sintering. Pt. 4. J. Brett, L. S. Castleman and L. Seigle. Sylvania Electric Products, Inc. *U. S. Atomic Energy Commission*, SEP-254, June 30, 1959, 33 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

The disappearance of porosity during sintering in the absence of grain boundaries and free surfaces is studied in Cu. After sintering, metallographic observations of the intragranular porosity at regions remote from grain boundaries and free surfaces reveal no significant densification, even though considerable decrease in the numbers and increase in the size of voids has occurred. Intragranular sinks such as dislocations are not effective in eliminating vacancies during sintering. (H15, M26; Cu, 9-68)

173-H. (Russian.) Sintering of Molybdenum at Relatively Low Temperatures. A. V. Savin and Yu. A. Eiduk. *Tsvetnye Metally*, no. 5, 1959, p. 81-84.

8 ref. (H15; Mo)

174-H.* Iron Carbon System in Powder Metallurgy. Pt. 1. Quality of Iron Powder and Graphite. P. Ulf Gummeson. *Precision Metal Molding*, v. 17, Nov. 1959, p. 56, 58-59.

For best results when using iron carbon close attention should be paid to quality of the Fe powder (reactivity, hydrogen loss), quality of the graphite and atmosphere composition. (H11; Fe, C)

175-H. (Russian.) Pressing of Beryllium, Zirconium, Uranium and Thorium. I. L. Perlin, V. A. Fedorchenko and N. M. Bogorad. *Tsvetnye Metally*, no. 2, 1958, p. 68-76.

16 ref. (H14h; Be, Zr, U, Th)

176-H. (Russian.) Production of Zinc Powder From Vapors in an Electric Furnace. P. A. Sokolovskii and Yu. I. Belov. *Tsvetnye Metally*, no. 11, 1958, p. 20-25.

(H10, C22, G21d; Zn)

177-H.* Role of Grain Boundaries in Sintering. L. Seigle. Paper from "Kinetics of High-Temperature Processes". John Wiley & Sons, Inc., New York 16, 1959, p. 172-178.

In porous compacts of Cu, Ni and Al_2O_3, grain boundaries play an important role in densification. They are of negligible importance in sintering which involves only interparticle bonding. 17 ref. (H15, M24f; Co, Ni)

178-H.* The Relationship Between Free Energy and Kinetics in Sintering Processes. H. J. Oel. Paper from "Kinetics of High-Temperature Processes". John Wiley & Sons, Inc., New York 16, 1959, p. 179-186.

Both the free energy of the substance and the kinetics of the sintering process depend upon the number of defects. Experiments show the different behavior of amorphous and regular powders. 13 ref. (H15)

179-H.* Sintering in the Presence of a Liquid Phase. W. D. Kingery. Paper from "Kinetics of High-Temperature Processes". John Wiley & Sons, Inc., New York 16, 1959, p. 187-194.

During sintering in the presence of a liquid phase, the fractional shrinkage during both the initial and secondary rearrangements is related to definite powers of time. 22 ref. (H15)

180-H.* Electrolytic Iron Powder From a Caustic Soda Solution. J. Adrien M. LeDuc and Richard E. Loftfield. *Electrochemical Society, Journal*, v. 106, Aug. 1959, p. 659-667.

Conditions of deposition are influenced mainly by temperature (90° C.), caustic soda concentration (600-800 g. per liter) and low current densities. A ductile, dendritic deposit is obtained which can be easily ground up. 5 ref. (H10b, Q-general; Fe, 6-68)

181-H.* Powder Metallurgy. N. Chowdhuri. *Science and Engineering*, v. 12, May-June 1959, p. 70-72.

Applications, production mixing, pressing, hard carbides, sintering, Cu alloy infiltrated Fe, porous metals and non-alloying metals. 4 ref. (H-general)

182-H. (Book.) General Session on Powder Metallurgy. 15th Annual Meeting. 105 p. 1959. Metal Powder Industries Federation, 60 E. 42nd St., New York 17, N. Y.

Proceedings of meeting held at Sheraton-Cadillac Hotel, Detroit, Apr. 20-22, 1959. Papers abstracted separately. (H-general)

183-H. (Translation—ConBur.) Metallic Thorium. G. A. Meerson and A. F. Islankina. *Soviet Journal of Atomic Energy*, v. 5, Aug. 1958, p. 993-1005.

Compacting of Th from electrolytically and Ca-reduced Th. Theoretical analysis of sintering; strength and ductility in terms of sinter temperature and time. Cold pressing and annealing. Physical and mechanical properties of Th produced by various processes. (H14g, H15n, 2-61; Th)

SECTION J

HEAT TREATMENT

1-J.* Softening Characteristics of Al-$MgZn_2$ Alloys. Rihei Kawachi. *Light Metals*, no. 31, July 1958, p. 22-34.

Samples of Al alloy sheets which contained approximately 8% $MgZn_2$ were heated to 470° C. and quenched to various temperatures. They were held for varying periods at quenching temperature and then water quenched and aged immediately following initial heating, then reheated and briefly maintained at tempering temperatures, followed by water quenching and aging. Effects of alloy composition, of heat treatment and step quenching on hardness. Mn and Cr accelerated the softening. Quenching stress had an effect similar to Mn or Cr. The split-aging effect as shown by greater hardness of samples tempered after natural aging compared to those tempered immediately after quenching varied according to quantity of Mg or Zn. 21 ref. (J27, Q29n, 2-60; Al-b, Mg, Zn, *Cr, Mn*)

2-J.* Heat-Treated Powder-Iron Parts for Improved Strength and Hardness. Navin Kothari. *Machine Design*, v. 30, Oct. 30, 1958, p. 93-96.

Properties of ferrous parts produced by the powder-metal process can be improved by the same conventional heat treatment techniques used on carbon and low-alloy steels. Carburizing, carbonitriding and carbo-austenizing discussed in relation to density, tensile strength, yield strength, elongation and Rockwell hardness. (J28; 6-72, Fe)

3-J.* Developments in Surface Hardening. E. Mitchell. *Metal Treatment*, v. 25, Oct. 1958, p. 425-430, 433.

Methods by which chemical composition of the outer layer of the steel is altered; methods in which the surface is hardened by rapid localized heating followed by quenching. Optimum methods of gas carburizing. 6 ref. (To be continued.) (J28; ST)

4-J.* Annealing of Malleable Iron: Effect of Repeated Annealing on Rate of Second Stage Graphitization. J. E. Rehder and J. E. Wilson. *Modern Castings*, v. 34, Aug. 1958, p. 49-52.

Annealing of malleable iron is affected by the thermal history of the material. If re-annealing is necessary because of retention of primary carbide due to furnace trouble or insufficient time at specified temperature, the cooling rate through the critical temperature range can be increased for the re-anneal by about 85% with a proportionate saving in time. Annealing is independent of soaking time at high temperatures. Hardness of material decreases as annealing is repeated. 6 ref. (J23, 2-64; CI-s)

5-J.* New Thermo-Chemical Techniques. Pt. 1. Bright Annealing. P. Galmiche. *Metal Treatment*, v. 25, Oct. 1958, p. 405-408.

The ONERA process of bright annealing consists of the use, for annealing, of reducing atmospheres halogenized 'at equilibrium' similar to those which are produced in the ONERA process of bright chromizing. (J23a; SS)

6-J. (Translation —Brutcher no. 4095.) Improved Heat Treating Processes for Large Forgings. N. V. Fiksen. *Metallovedenie i Obrabotka Metallov*, no. 11, Nov. 1957, p. 77-80.

Previously abstracted from original. See item no. 71-J, 1958. (J-general, W27, 4-51, ST)

7-J. Tempering Type-410 Stainless Steel. Charles F. Lewis. *Metal Progress*, v. 74, Nov. 1958, p. 88-89.

Method of determining tempering time to get desired hardness in steels, the hardness of which falls rapidly in a short temperature range. (J29; SS)

8-J. (German.) Fatigue Strength Increased by Bath Nitriding. Bruno Finnern. *Draht*, v. 9, Oct. 1958, p. 414-415.

Crankshafts and axle journals were nitrided in salt bath at 550-570° C. in 90 to 120 min. Fatigue strength of parts subject to bending and torsional cyclic stresses is greatly increased. (J28k, Q7a, T7j; ST)

9-J.* Electrical Resistance Heating. S. Nordin. *ASEA Journal*, v. 31, no. 4-5, 1958, p. 47-53.

Theory, several types of machines; advantages and disadvantages of method. (J2, 1-68; 10-51)

10-J.* Application of Progressive Induction Heating to Forged Roll Hardening Operations. John Dugan. *Iron and Steel Engineer*, v. 35, Nov. 1958, p. 65-76.

Gives better control of hardening operation; internal stresses reduced, grain structure improved. (J2g, W18a; 4-51)

11-J.* (French.) Deformation Occurring During Quench Hardening of High-Chromium Steels. Pt. 1. C. Rovirosa. *Metallurgie et la Construction Mecanique*, v. 90, June 1958, p. 473-481.

Equilibrium diagram plotted for steels containing 2% C, 12% Cr, 0.4% Mn, 0.3% Si and 0.3% V was used to establish heat treatment techniques for hardening of dies used to cut sheet for magnetic circuits. Influence of thermo-mechanical history of steel. Heating and cooling phenomena, including structural changes, which occur during hardening treatments. (J26, M24d; TS, *Cr*)

12-J.* (French.) Deformation Occurring During Quench Hardening of High Chromium Steels. Pt. 2. C. Rovirosa. *Metallurgie et la Construction Mecanique*, v. 90, July 1958, p. 541-551.

Laboratory study of die steel provides data for establishing heat treating techniques. Structure of steel should be as homogeneous as possible before hardening; a preliminary stabilizing heat treatment is advised. Use of oil or water quench depends on size of part. In designing die parts, it must be borne in mind that areas most subject to deformation are located in planes parallel to plane of hot rolling. Dimensional changes in laboratory specimens and Rockwell hardness readings. (J26, P10d; TS, 17-51)

13-J.* Temperature Distribution Throughout a Stack of Electrical Sheet Steel During Annealing. R. J. Wakelin. *British Journal of Applied Physics*, v. 9, Sept. 1958, p. 353-358.

During the final annealing process in the manufacture of 4% Si-Fe electrical sheet, the temperature at any one time varies horizontally across the plane of the sheets and vertically up the stack. By combining results of a number of experiments, the temperature distribution throughout a stack of sheets was obtained at all times during the three-day annealing cycle. (J23; SGA-n, *Si*, Fe, 4-53)

14-J.* (German.) Use of Protective Gas in Cold Rolling Mills. Werner Feige and Paul Middelhaufe. *Stahl und Eisen*, v. 78, Oct. 16, 1958, p. 1441-1448.

Water gas constant is important when a bright surface is to be preserved in low-carbon steel strip, while the carbon equation determines the preservation of carbon in high-carbon steels. Production, composition and uses of protective gases. 17 ref. (J2k, B25; CN, 4-53)

15-J.* (Japanese.) Electrolytic Heating. Pt. 11. Diffusion of Hydrogen Into Cathode. Hisao Mii, Toshikazu Sato and Susumu Minowa. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Sept. 1958, p. 13-15.

Specimens of a carbon steel were electrolytically heated to 850° C under various conditions and quenched in electrolytic bath. Specimens of the same material and size were heated to the same temperature in a salt bath and quenched into water. Hydrogen was analyzed in

these as well as nontreated specimens to determine whether or not electrolytic heating causes a hydrogen embrittlement problem. 5 ref. (J2, R26s; CN, *H*)

16-J. Annealing Titanium Sheet. *Metal Industry*, v. 93, Nov. 14, 1958, p. 412.

(J23; Ti-b, 4-53)

17-J.* (German.) Distribution of Temperature in Induction Heated Hollow Cylinders. H. Geisel. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 541-543.

Equations for calculating level of temperature in relation to location and heating time for hollow cylinders heated both internally and externally by induction. 8 ref. (J2g; ST, 4-60)

18-J.* Controlled Atmospheres. Pt. 7. P. F. Hancock. *Metal Treatment and Drop Forging*, v. 25, Aug. 1958, p. 323-330.

Composition, properties, methods of generation and applications of both protective and chemically active controlled atmospheres used in heat treatment of steels. 3 ref. (J2k; ST, 1-55, RM-g)

19-J.* (Japanese.) Theoretical Basis of Nitriding in the Salt Bath—Rapid Nitriding. Kiyokazu Ogawa. *Metal Finishing Society of Japan, Journal*, v. 9, Aug. 1958, p. 302-305.

Development of suitable baths and treatment conditions. Specimens of 13% Cu steel, 18-8 stainless steel, case hardening Cr-Mo steel and standard nitriding steel treated for up to 6 hr. at 510° C. in a salt bath containing sodium cyanide, sodium chloride and sodium carbonate. High hardness observed in nitrided layer after 2-hr. treatment. Salt bath showed good stability. 5 ref. (J28k, AY, SS-e)

20-J. Practical Pointers for Profitable Heat Treating. A. S. Eves. *Modern Machine Shop*, v. 31, Dec. 1958, p. 72-77.

How to case harden steel economically. (J28g; ST)

21-J.* (French.) Bright Annealing of Steel and Refractory Alloys in a Fluorided Reducing Atmosphere. P. Galmiche. *Revue de Metallurgie*, v. 55, Sept. 1958, p. 840-846.

Principles and operating conditions. Examples of technique and surface alterations effected; application to skin annealing of gas turbine blades in modified 80/20 Ni-Cr alloy. 4 ref. (J23a, W11m, 2-66; Ni-b, *Cr*, ST)

22-J. (Translation-Brutcher, 4396.) Heating Capacities of Nitrate Baths. P. Ya. Yakovlev. *Metallovedenie i Obrabotka metallov*, Oct. 1958, p. 47-50.

(J2j, W27m)

23-J. (Translation-Brutcher, 4399.) Interreaction Between Some Sulphurizing Salts and Cast Iron and Steel. A. V. Kriulin. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 58-62.

Wear resistance and better machinability are obtained by sulphurizing and creating a surface fortified with S and N. Interreactions with iron and steel and the following salts $Na_2S \cdot 9H_2O$; Na_2S_3; $Na_2S_2O_3$; Na_2SO_3; NaCNS and KAL $(SO_4)_2$. (J28, Q9n, G17k; ST, CI, *S*, *N*)

24-J. (Translation-Brutcher, 4398.) Bright Quenching of Steel. A. K. Beskrovnyi. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 56-57.

Electrolytic polishing using the workpiece as anode in an electrolytic bath consisting of 88% orthophosphoric acid and 12% anhydrous chrome. Hardening and bright quenching are obtained in one operation. (J26, L13p; ST)

25-J. (Translation—SLA, ASLIB-GB80.) Heat Treatment of Alloys of the Al-Zn-Mg-Cu Type. M. Tournaire and G. M. Renourd. *Metaux Corrosion Industries*, no. 379, Mar. 1957, p. 95-101.

See item 104-J, 1957. (J-general, Q21b, Q23; Al, *Zn*, *Mn*, *Cu*)

26-J. (Translation—SLA, R-4734.) Process of Carbide Formation During Tempering of Carbon Steel. B. A. Apaev. *Metallovedenie i Obrabotka Metallov*, no. 1, 1957, p. 2-15.

(J29, N8a; CN)

27-J.* (German.) Influence of Protective Gas Circulation and Holding Time in Pot Annealing Furnaces on Properties of Cold Rolled Steel Strip. Jacques Gerhard Brockhaus, Roland Horst and August Luth. *Stahl und Eisen*, v. 78, Oct. 16, 1958, p. 1449-1456.

Experiments with commercial open-hearth and C75 steel strip 0.2 to 2.5 mm.

thick. When the protective atmosphere was circulated by a ventilator the consumption of fuel gas was 17% lower with 3-ton charges of strip. With small charges of about 1.5 tons circulating the protective gas did not decrease fuel gas consumption. Good mechanical properties with this method. For openhearth deep drawing steel with 0.06% C, 0.31% Mn, 0.018% P and 0.03 S a holding time of 6 hr. at 650° C. was optimal; 2 hr. satisfactory. (J23a; ST, 4-53)

28-J.* (Rumanian.) Cementation of Alloy Steels Using Two New Mixtures Based on Calcium Carbonate and Dolomite. Toma Farcas, Tiberiu Golgotiu, Gh. Ailincai, C. Ciochina and Emil Andrei. *Buletinul Institutului Politehnic Din Iasi. Serie Noua*, v. 2, no. 3-4, 1956, p. 335-349.

By comparison of the results obtained with the values found by cementation with "Feridon" (barium base) the cheaper mixtures of calcium carbonate and dolomite give almost the same results. (J28g; AY)

29-J. Selective Case Hardening. *Automatic Machining*, v. 20, Dec. 1958, p. 31-33.

Methods and apparatus for rapid hardening of surfaces during production. (J2n; ST)

30-J.* Heat Treatment of Aluminum. H. M. Short. *Industrial Heating*, v. 25, Dec. 1958, p. 2432, 2434, 2436, 2438, 2440, 2442-2443, 2549.

Effect of heating method and furnace atmosphere and equipment used for solution heat treating wrought alloys. (J27a, W27; Al-b)

31-J.* How Nickel Affects High-Speed Tool Steels. R. F. Hehemann and A. R. Troiano. *Iron Age*, v. 182, Dec. 25, 1958, p. 52-56.

Ni improves hardening of steel. Austenitizing temperatures versus as-quenched hardness, austenitizing temperatures versus percentage of structural constituents, austenitizing temperatures versus grain size; tempering conditions versus hardness, tempering conditions versus amount of retained austenite, and cyclic tempering versus hardness. (J22, J29, Q29n, 2-60; TS-m, Ni)

32-J.* Heat Treating. Pt. 3. A. S. Eves. *Modern Machine Shop*, v. 31, Jan. 1959, p. 122, 124, 126, 128, 130.

Tempering temperatures and time; brittleness; discoloration. (J29; ST)

33-J.* (Russian.) Increasing Durability of Hardened Steel Rolls by Low-Temperature Annealing. N. S. Vasil'chenko. *Stal'*, v. 18, Oct. 1958, p. 917-920.

Rolls were forged for cold rolling; weight 210-390 kg., diameter 210-250 mm., length 450-650 mm. Durability of these hardened rolls was greatly improved by additional tempering at 165-180° C. for 6 hr. to remove internal stresses. Additional annealing, although it completely eliminates internal stresses, has insignificant effect on hardness of rolls. (J23, 1-67, W23k; ST)

34-J.* (Russian.) High-Quality Cold Rolled Transformer Steel. A. A. Rastorguev, A. A. Nefedov and P. I. Borzov. *Stal'*, v. 18, Nov. 1958, p. 1023-1029.

Low-alloy Si steel (about 1.5% Si) is subjected to high-temperature recrystallizing anneal at 1000°. Low-alloy two-phase Si steel with a relatively low anisotropy can be obtained by comparatively low anneal of 850°, which is not accompanied by significant grain growth. 4 ref. (J23, F23, 2-62; AY, *Si*)

35-J. Automatic Heat Treating in Roller Bearing Manufacturing. Leo H. Everitt and O. E. Cullen. *Industrial Gas*, v. 37, Dec. 1958, p. 9-12.

Includes four double revolving-retort gas carburizing furnaces, one revolving-retort atmosphere hardening furnace, four pusher-type atmosphere hardening furnaces, four quench presses, one single revolving-drum recirculating draw furnace and three double revolving-drum recirculating draw furnaces. (J-general, T7d, W27g, 18-74; CN-g)

36-J.* (Russian.) Effect of Diffusion Annealing on the Stability of Cooled Austenite in Chromium-Nickel-Molybdenum Steel. I. E. Brainin, A. I. Kondrashnov and V. A. Kharchenko. *Kzvestiya Akademicheskikh Nauk SSSR*, May 1958, p. 55-58.

Diffusion annealing of forged Cr-Ni-Mo steel at 1200-1255° C. considerably reduces the general time interval necessary for the separation of austenite in the upper and lower subcritical regions. (J23, N8; St, *Cr*, *Ni*)

37-J.* Production Methods for Heat Treatment of Steel Components in Salt Baths. *Current Engineering Practice*, v. 1, Oct. 1958, p. 20-25.

Applications, preparation and maintenance of bath, superficial case hardening, deep carburizing, heat treatment in

neutral baths, martempering, austempering and isothermal annealing of steels. (To be continued.) (J2j; CN, AY)

38-J. Automatic Heat Treating in Roller Bearing Manufacturing. Leo H. Everitt and O. E. Cullen. *Industrial Gas*, v. 37, Dec. 1958, p. 9-15.

Facilities and processes at Timken Roller Bearing Co., Bucyrus, Ohio. (J-general, 1-52, 18-74, T7d)

39-J. (Russian.) Influence of Aluminum Nitride on Grain Size in Steel. Kh.Sh. Levinzon. *Stal'*, v. 18, Nov. 1958, p. 1036-1037.

Study of relation between Al content in steel and growth of austenitic grain during high-temperature anneal. (J23, M27c, 2-60, 2-62; ST, *Al*)

40-J.* Modern Quenching Oils and Techniques for Foundry Heat Treating. N. F. Squire. *Modern Castings*, v. 34, Jan. 1959, p. 76-80.

Variables affecting the quenching phase. Conventional quench, marquench and modified marquench. (J26; ST, 5)

41-J.* (Polish.) Recrystallization and Spheroidization of the Cementite in Mark-35 Steel After Rolling. S. Orzechowski. *Prace Instytutow Ministerstwa Hutnictwa* v. 9, no. 5, 1957, p. 191-202.

Determination of conditions of annealing, which give good mechanical properties and a spheroidal cementite in cold rolled sheet. Relationship between various annealing conditions, particularly between rate and temperature of annealing and spheroidization of cementite. (J23, N5, N8q, 3-68; ST, 4-53)

42-J. Induction Surface Hardening. W. G. Cass. *Iron and Steel*, v. 31, Dec. 1958, p. 583-584.

Equipment and processes at the Gorki Automobile Works, U.S.S.R. (J2g)

43-J.* (German.) Homogeneity of Austenite and Hardenability. Alois Legat. *Haerterei-Technische Mitteilungen*, v. 12, May 1958, p. 9-18.

Composition of alloy steels is not the only factor to determine proper heat treating procedure and temperatures. Nuclei as partly recognizable in their effects on grain dimensions have a determining effect on behavior hardenability of alloy steels and degree of hardness obtained in the heat treating process. 7 ref. (J5, N8n, Q29n, 2-60, 3-71; AY)

44-J.* (German.) Factors Influencing the Heat Treatment of High Speed Steels. Karl Wagner. *Haerterei-Technische Mitteilungen*, v. 12, May 1958, p. 18-35.

Relationship between hardness (depending on quenching temperature and tempering procedure) and impact strength. Comparative chart on hardness losses sustained by various compositions of high-speed steels when subjected to temperature of 600 and 650° C. following heat treatment. (J-general, Q6n, Q29n, 2-60; TS-m)

45-J.* (German.) Material and Heat Treatment of Stamping Dies. M. Strauber. *Werkstattstechnik und Maschinenbau*, v. 48, Nov. 1958, p. 593-596.

Dimensional changes due to heat treatment were analyzed to determine best methods for various materials and causing a minimum of warpage. Slow heating and slow quenching were found the most important factors. (J-general, P10d, W24n)

46-J. (Translation—Brutcher, 4427.) Structure, Properties and Heat Treating of New High Speed Steels. Yu. A. Geller and V. S. Kachanov. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 6-19.

High-V steels in contrast with Co and standard high-speed steels possess a more stable residual austenite. High-V steels with 5% Co are equal in thermal stability to 18% W steel and 10% Co and exceed them in machinability. Recommended hardening temperatures. Soaking rate and tempering temperatures. 10 ref. (J-general, N8, 2-60; TS, *Co, V, W*)

47-J. (Translation—Brutcher, 4431.) Heat Treatment of High Speed Toolsteels in Water Vapor Atmosphere. A. P. Gulyaev, Z. S. Luneva, G. G. Korolev and V. V. Samoilov. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 39-44.

Water vapor treatment produced an oxidizing surface of F_2O_3 (ferric oxide) which prevents the formation of a magnetic iron oxide. Water vapor treatment is recommended as a supplementary treatment. To increase tool corrosion stability and increase cutting qualities, the magnetic oxide film formed has a thickness of 1-4 microns. 4 ref. (J2k; TS)

48-J. (Translation—Brutcher, 4435.) Thermomagnetic Treatment of Magnetically Soft Alloys With a Rectangular Hysteresis Loop in Vacuum Furnaces. O. N. Alt'gausen, Sh.

I. Zusman and A. N. Stepanova. *Metallovedenie i Obrabotka Metallov,* Nov. 1958, p. 60-62.

Recommended procedure is high-temperature annealing at 1000-1100° in vacuum, cooling at a definite rate followed with a thermomagnetic treatment at 600-700° in hydrogen in presence of a magnetic field. Magnetic properties depend upon the magnitude of the superimposed magnetic field. To obtain best magnetic properties, it is sufficient to maintain a voltage range of 10-15 ergs. Increasing the range does not improve the alloy properties. (J23, P16a; Fe-b, Ni)

49-J.* What Controls Are Needed for Accelerated Carburizing? P. M. Unterweiser. *Iron Age,* v. 183, Jan. 15, 1959, p. 86-88.

Application of high temperatures, cooling, grain refining and annealing. (J28g, 1-66)

50-J.* (French.) Hardness and "Sulphinuzing". Y. de Villemeur. *Metaux-Corrosion-Industries,* v. 33, July-Aug. 1958, p. 324-334.

Although increase in microhardness is not principal object of "Sulphinuzation", it has interesting effects on properties of steels so treated. Effects on microhardness of nitriding and nitrided steels. Influence of surface hardness in sulphinuzed materials increased fatigue resistance, disadvantages due to hardness. 6 ref. (J28, Q29q, Q7a; ST)

51-J. Production Methods for Heat-Treatment of Steel Components in Salt Baths. *Current Engineering Practice,* v. 1, Nov. 1958, p. 14-18.

(J2j, J28k, K8n; ST)

52-J.* (German.) Heat Treatment of 13% Cr Steel Castings. Hans Zeuner and Ulrich Heubner. *Giesserei,* v. 45, Dec. 4, 1958, p. 747-753.

Influence of chemical composition on structure; various methods of heat treatment, including hardening and tempering. Dependence of ultimate hardness on the chemical composition of delta ferrite and on the method of heat treatment. Low C content 13% Cr alloy with slight addition of Ni produces best impact strength. 11 ref. (J-general, M28, Q6, Q29, 2-60; ST, *Cr, Ni,* 5)

53-J.* (German.) Case Hardening of Free-Machining Steels. Alexander Schepers and Werner Bartolome. *Stahl und Eisen,* v. 78, Nov. 27, 1958, p. 1745-1749.

In basic bessemer steel, increased Mn caused a lower C content in the carburization zone; Pb seems to act in a similar way. Decreased effect of Pb on C was observed in openhearth steel. Keeping steels for a minimum time at the high temperatures or heat treating in an inert salt recommended to avoid decarburization and reduction of hardness. (J28, J4a; ST, *Pb, Mn*)

54-J.* (Russian.) Heat Treatment of Cold Rolled Transformer Steel in Coils. M. I. Kolov and A. I. Terekhova. *Stal',* v. 18, Nov. 1958, p. 1029-1035.

Rejection of cold rolled transformer steel caused by deterioration of magnetic properties and dimensional deviations during bright annealing was eliminated by straightening the strips and subsequent second annealing of coil. Straightening and compressing of metal with deformation at 3.5% and secondary annealing at 750° improved the magnetic qualities due to grain growth resulting from recrystallization and coagulation of cementite. 11 ref. (J23a, F29r, P16; ST, SGA-n)

55-J.* (German.) Age Hardening of Al-Mg-Zn Alloy With or Without Chromium. W. Koster. *Aluminium,* v. 34, Dec. 1958, p. 694-699.

Changes of properties (tensile strength, longation, electric conductivity and thermal power) in relation to aging temperatures between 20 and 225° C. and time (up to 70 days) were tested, using specimens of two Al alloys, one of them containing 0.2% Cr, in 2-mm. wire which had been homogenized at 480° C. and then quenched in water. Isothermes and isochrones show decrease and increase in property values parallel to structural changes. Addition of Cr, which accelerates precipitation in different phases, increases resistance to stress corrosion. 17 ref. (J27d, Q-general, 2-60; Al-b, *Mg, Zn, Cr*)

56-J. Modified Martempering Permits Close Tolerance in Aircraft Pumps. Edgar C. Wallace and Howard E. Crouse. *Industrial Gas,* v. 37, Jan. 1959, p. 10-11, 20.

(J26p, T24d, W13d)

57-J. Controlled Atmospheres in Australia. F. P. Heard. *Metal Progress,* v. 75, Jan. 1959, p. 98-100.

Limited gas sources make the production of adequate controlled atmospheres

very difficult, but byproduct propane from newly built oil refineries appears to have solved the problem. An immense pool of natural gas under the Sydney area has also been considered as a potential source for controlled atmospheres. (J2k, B25)

58-J.* Heat Treatment of Drop Forgings. F. C. Bird. *Metal Treatment and Drop Forging*, v. 25, Dec. 1958, p. 518-520, 525.

Mechanism of grain growth, effect of increasing temperature and hot working and influence on physical properties; role of C in steel; various structures produced by heat treatment. (J-general, M27; 4-51, ST)

59-J.* Flame Buckled This Steel and Flame Straightened It! *Welding Engineer*, v. 44, Feb. 1959, p. 40-43.

Techniques for straightening steel members of aircraft carrier frame buckled by fire; heating with oxy-acetylene torches. (To be continued.) (J2h; ST)

60-J.* Bright Annealing. A. E. Pickles. *Metal Treatment and Drop Forging*, v. 26, Jan. 1959, p. 7-14.

Requirements for bright or clean annealing of variety of ferrous and nonferrous metals. Furnace types and atmospheres for various classes of work. (J23a, 1-55; ST, Cu-b, Ni-b)

61-J.* (German.) Structure, Heat Treatment, Age Hardenability and Soft Annealing of Sand Cast Remelted Aluminum Alloys. Hans Reininger. *Giesserei-Praxis*, Nov. 10, 1958, p. 423-428.

High content of heavy metals causes hardening by metallides, as does magnesium silicide. The result is lower plasticity and higher hardness and tensile strength. In casting, a strong and fine-grained structure can be obtained by the use of chills. 30 ref. (J-general, Q-general, E22r, 2-60; Al-a, 5-60)

62-J.* (German.) Nitriding of Steel by Glow Discharges. Helmut Knuppel, Karl Brotzmann and Friedrich Eberhard. *Stahl und Eisen*, v. 78, Dec. 25, 1958, p. 1871-1880.

Chromium steel nitrided by glow discharge in an ammonia or a nitrogen-hydrogen atmosphere at pressures between 1 and 10 mm. of mercury. Description of apparatus. 8 ref. (J28k, 1-68; AY)

63-J.* (German.) Structure of Nitrided Steels. T. M. Noren and L. Kindbom. *Stahl und Eisen*, v. 78, Dec. 25, 1958, p. 1881-1891.

Effects of glow discharge nitriding (in ammonia, alternating with a nitrogen-hydrogen atmosphere of 3 mm. of mercury) and gas nitriding on structure and properties. Ti alloyed nitrided steels found to be heat resistant. 7 ref. (J28k, 1-68, M27; AY)

64-J.* (Dutch.) Salt Bath Heat Treatment. H. Koops. *Metalen*, v. 13, Dec. 31, 1958, p. 436-440.

Carburizing baths, hardening, tempering, nitriding and carbonitriding baths and their application. Hardening and isothermal annealing in saltpeter baths, hardening in baths of NaOH or $CaCl_2$ and bath bright annealing. (J2j, J28)

65-J.* (French.) Double Quenching Prevents Deformation. *Machine Moderne*, v. 52, Oct. 1958, p. 46-48.

Quenching in heated oil to introduce martensite formation, retaining piece until quenching effect penetrates to core, then transferring part to air for finishing formation of martensite on the surface. (J26p; ST)

66-J.* (French.) Grain Refinement of Uranium. J. Lehmann and H. Aubert. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1188-1194.

Experiments to obtain fine-grained U by quenching from beta or gamma phases. Stabilizing of beta phase necessary to obtain uniform refinement. 7 ref. (J26, M27c; U-b)

67-J. (Translation—AIP.) Recrystallization Diagram of Rhenium. E. M. Savitskii, M. A. Tylkina and K. B. Povarova. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 398-402.

Results obtained on recrystallization and variation in hardness show that annealing temperature of Re, 10% of more deformed, is 1750-2400° C. 7 ref. (J23c, N5, 3-68; Re)

68-J. (Translation—BISI, no. 1031.) Influence of Annealing on the Precipitation of Aluminum Nitride and the Mechanical Propties of Non-Alloyed Steels. Paul Werthebach and Hubert Hoff. *Stahl und Eisen*, v. 78, May 29, 1958, p. 736-743.

See item 281-J, 1958. (J23, J24, Q-general; CN, Al, N)

69-J. (Translation—Brutcher, no. 4446.) Quenching in Water-Air Mixtures. M.E. Blanter, N.A. Kulakov, I.M. Sergeichev, T.A.

Mikhin and S.D. Fainborn. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 29-34.

Cooling capabilities of water-air mixtures for quenching to obtain qualitative characteristics. Cooling (quenching) in oil is equivalent to quenching in mildly humid air. 5 ref. (J26n, W28p)

70-J.* Heat Treatment in the Foundry. A. B. Everest. Paper from "Modern Foundry Practice". 3rd Ed. Philosophical Library, Inc., New York, 1959, p. 62-83.

Annealing, quenching, tempering, flame hardening, normalizing, stress-relieving of cast iron or steel castings. Mechanical properties following heat treatment. Heat treatment of nonferrous alloys. (J-general; CI, ST, Al-b, Cu-b)

71-J.* H-12 Hot Work Tool Steel. R. F. Harvey. *Precision Metal Molding*, v. 17, Jan. 1959, p. 48-49, 70.

Recommended heat treatment for H-12 is preheat at 1200° F., harden at 1825 to 1850°, air cool, double temper at 1080° F., giving a Rockwell hardness of C-48 to 50. (J-general; TS)

72-J.* Some Considerations Involved in the Heat Treatment of Steel Strip. J. McMullen. *Sheet Metal Industries*, v. 36, Jan. 1959, p. 5-25.

Influence of the prior anneal; furnace atmospheres, quenching techniques and furnace equipment. (J-general; ST, 4-53)

73-J.* How to Carbonitride Low Carbon Steel. *Steel*, v. 144, Feb. 23, 1959, p. 86-88.

Optimum temperature, dew point, gas volumes and furnace times for case hardening production parts of 0.20% C steel in an automatic, shaker-hearth carbonitriding furnace. (J28m; CN-g)

74-J.* (Japanese.) Residual Stresses of Solid Rolled-Wheels Due to Various Kinds of Heat Treatment. Naoteru Oda and Kunio Nishioka. *Sumitomo Metals*, v. 10, July 1958, p. 137-143.

Treatments are normalization, forced air cooling, tempering, rim-quenching, slack-quenching, and combinations of two of these. No significant difference is observed in the residual compressive stress. (J-general, Q25h, T23p; ST)

75-J. Heating and Cooling of Flat Strip. Pt. 3. A. H. Vaughan. *Industrial Heating*, v. 26, Jan. 1959, p. 33-34, 36, 38-40, 42, 44.

Data for determining natural convection coefficients when utilizing air, combustion products or prepared atmosphere with low combustibles. (J2; ST, 4-53)

76-J. Foundry Heat Treatment Department. Pt. 1. Function of the Department. W.H. Everard. *Edgar Allen News*, v. 38, Jan. 1959, p. 1-3.

Heat treatment of castings, annealing, quenching, cooling, stress-relieving. (J-general; 5)

77-J. (Russian.) New Method of Surface-Profile Hardening of Gears With a Medium Module. K.Z. Shepelyakovskii and R.I. Entin. *Vestnik Mashinostroeniya*, Dec. 1958, p. 53-58.

Surface heating and surface hardening of teeth by induction heating. 10 ref. (J2g, J5, T7a)

78-J.* Post-Weld Annealing of Stainless Steel. M.W. Wilson. *Corrosion Prevention & Control*, v. 6, Jan. 1959, p. 62.

Difficulties in annealing long length of welded stainless steel tubing. Effect of annealing on corrosion resistances. (J23n; SS, 4-60)

79-J.* (German.) Heat Treatment of Small Parts. *Draht*, v. 10, Jan. 1959, p. 14-16.

Atmosphere control in furnaces used in the automatic heat treatment of springs and fasteners; quenching baths and equipment for air circulation in annealing furnaces. (J2k, J26, J23, T7c, T7f; ST)

80-J.* (Russian.) Heat Treatment of Low-Carbon Structural Steel. O.L. Petrov. *Stal'*, Jan. 1959, p. 81-85.

Application of simple heat treatment to machine parts made of low-carbon steel improves mechanical properties, reduces weight and gives significant savings by replacing low-alloy steels. 6 ref. (J23n; CN-g)

81-J.* (Russian.) Annealing Effect on Modified Ingot Molds. A.P. Rogach, A.P. Ryzhikova and D.V. Sklyarenko. *Stal'*, Jan. 1959, p. 92-93.

Cast iron molds, modified with 45% ferrosilicon, annealed at 500-850° C., which is repeated after 100-110 pours, increased durability by 2-2.5 times. (J23n, W19c; CI, *Si*, AD-n31)

82-J.* (Dutch.) Aging of Al-Mg Alloys. L. J. G. van Ewijk. *Metalen*, v. 13, Nov. 15, 1958, p. 376-382.

Microstructures of cross-sections of tensile samples. Aging is influenced by percentage of Mg, purity of alloy and deformation after heat treatment. 7 ref. (J27d, M27; 2-60, 3-68, Al-b, *Mg*)

83-J.* (English.) Stress Relief of Alloy Steels. W. Soete and G. E. Tummers. *Lastechniek*, v. 24, Nov. 1958, p. 236-240.

Cr-Mo-Ni alloy subjected to torsion and tensile tests at 475-800°C. for heating periods of 30-100 min. Relaxation behavior is analyzed for each heating period. (J1; AY, *Cr, Mo, Ni*)

84-J.* (German.) Induction Heating and Its Applications in Industry. G. Hoffmann. *Fertigungstechnik*, v. 8, Dec. 1958, p. 552-559.

Depth of heat penetration related to conductivity and permeability of material and its temperature in various steels. Application of induction heating to warm forming, brazing, sintering, normalizing, hardening, welding and melting. (J2g)

85-J.* (German.) Annealing With High-Frequency Current. G. Benkowsky. *Fertigungstechnik*, v. 8, Dec. 1958, p. 559-565.

Selection of frequency, efficiency of induction coils, specific resistance and magnetic conductivity of various metals as dependent on temperature. Applications of induction annealing. (J23, J2g, 2-61)

86-J.* (Russian.) Investigation of Decarburization Rate of Steel Pipe in Hydrogen Medium. V. V. Ipatiev, O. P. Merkulova and V. P. Teodorovich. *Zhurnal Prikladnoi Khimii*, v. 31, no. 12, 1958, p. 1891-1894.

Rate of decarburization in pipe made from 30 KHMA steel in H media at 400-600°C. and 100-700 atm. pressure. Mathematical equation relating depth to decarburization to time exposure and an equation relating decarburization rate to pressure and temperature. (J4a, 2-61, 3-74; ST, *H*)

87-J.* (Russian.) Decarburization of Carbon Steels With Hydrogen at High Temperatures and Pressures. S. L. Skop, V. P. Teodorovich and V. V. Ipats'ev. *Zhurnal Prikladnoi Khimii*, v. 31, no. 12, 1958, p. 1894-1897.

Effect of temperature, pressure and time on carburization depth of steel #35. Mathematical equation of relation of incubation period to pressure and temperature. (J4a, 2-61, 3-74; ST, *H*)

88-J. (Russian.) New Austenitic Steel for Nitriding. M. F. Aleksfenko and A. G. Anoreeva. *Stal'*, Jan. 1959, p. 78-81.

The steel has the following advantages: Quick nitriding to a depth of 0.18 mm. in 40 hr., stronger center, more gradual hardness transition from upper layer toward center, greater spread of the region of corrosion stability, absence of peeling of nitrided layer. (J28k; SS-e)

89-J.* (German.) Influence of Surface Condition on Carburization Properties of Steel. Rudi Jonck. *Industrieblatt*, v. 59, Jan. 25, 1959, p. HT1-HT3.

Rough surfaces carburized better; cold working preceding heat treatment has no measurable influence; presence of graphite on the surface has detrimental effects, amounting to 60% reduction in depth of penetration. (J28g, 3-70; ST)

90-J.* (German.) Development of Induction Hardening in Japan. Seiichi Ishida. *Industrieblatt*, v. 59, Jan. 25, 1959, p. HT4-HT6.

Composition and application of quenching media; distortions encountered and influence on fatigue strength. (J2g)

91-J.* (German.) Nitriding of Iron and Steel. Theo Kootz. *Stahl und Eisen*, v. 79, Feb. 5, 1959, p. 135-137.

Application of N, air, nitrogenized air (35% O) and pure N. Effect of O content in the metal on the velocity of nitriding. 12 ref. (J28k, 2-60; ST, *N, O*)

92-J.* Reducing Scuffing and Wear of Ferrous Metals. F. D. Waterfall. *Engineering*, v. 137, Jan. 23, 1959, p. 116-120.

The "Sulfinuz" process is used to impregnate the surface of steel, or cast iron, with S and N, with a view to improving the resistance of the treated surfaces to scuffing and wear. The treatment is carried out in a molten salt bath, containing cyanide and S compounds maintained at a temperature of 500 to 600°C.; more usually at 570°C. (J28, Q9, Q7, 2-60; ST, SS, CI)

93-J.* (Italian.) Heat Treatment of Meehanite Cast Iron. Alfredo Secciani. *Fonderia*, Nov. 1958, p. 501-519.

Time-temperature conditions for various annealing, hardening and isothermal heat treatments; structural changes; hardenability. (J-general, Q29n; CI)

94-J.* Automatic Heat Treating in Continuous Roller Bearing Manufacturing. Leo H. Everitt and O. E. Cullen. *Industrial Heating*, v. 26, Feb. 1959, p. 250-258, 424.

Automatic line achieves uniform carburizing and good size control. (J28g, T7d, 18-74; CN-g)

95-J.* Induction Hardening of Tractor Axles. P. W. Carbaugh and A. H. Pittaway. *Industrial Heating*, v. 26, Feb. 1959, p. 286-290, 292-294, 296, 298, 400.

Selection of optimum alloy composition and heat treatment cycle. (J2g, T7j, 2-60; AY)

96-J.* Quench and Temper Process for the Manufacture of High Strength Tubular Products. H. B. Emerick. *Industrial Heating*, v. 26, Feb. 1959, p. 303-304, 306, 308, 310, 312, 312, 316, 318, 320.

Pipe with high strength and a reasonable amount of ductility produced by heat treating carbon steel tubular products in modernized continuous quench and temper lines. 5 ref. (J26, J29, T28p; CN, 4-60)

97-J.* Continuous Annealing 60 Tons Per Hour of Tin Plate. Quentin M. Bloom. *Iron and Steel Engineer*, v. 36, Feb. 1959, p. 115-125.

Multi-line annealing facilities for continuous annealing of steel strip with single-pass direct-fired furnace and controlled cooling sections. Advantages of multi-line moderate speed installations. (J23a, W27n, 1-61; ST)

98-J.* (German.) Influence of Furnace Atmosphere on Fire Loss and Skin Decarburization in a Small Pusher-Type Furnace. G. Baukrowitz. *Werkstattstechnik*, v. 49, Feb. 1959, p. 113-116.

Heating with coke oven gas, oil, or both; influence of atmosphere, time and temperature; maximum fire loss at 20% oil, 80% gas. Equal decarburization at top and bottom of ingot. (J4a, J2k, W27g, W27h; ST, 5-59)

99-J.* Welding and Heat Treating Rocket Cases. C. N. Scott. *Metal Progress*, v. 75, Mar. 1959, p. 99-102.

Rocket engine cases are fabricated from precisc weldments of alloy steels which are heat treated to give high strength. Cases are quenched from austenitizing temperature into salt at 350° F. to minimize distortion. (J22, J2j, K1, T2p, AY)

100-J.* Cold Treatment for Better Properties. Rolland S. Jamison. *Metal Progress*, v. 75, Mar. 1959, p. 128-130.

Chilling of heat treated steel parts to -120° F. transforms retained austenite to martensite. Commercial refrigerating units are doing this today on a wide variety of parts. (J26q, W10g; ST)

101-J.* High Temperature Carburizing. H. N. Ipsen. *Metal Treating*, v. 10, Jan-Feb. 1959, p. 4-8, 42.

AISI 1117, 4615, 8620 and 9315 steels carburized in enriched endothermic atmosphere at 1700 to 2000° F. for 1 to 3 hr. Effect of temperature and time at temperature on case depth, percentage carbon in case and grain structure. (J28g, 2-62, 3-67; ST)

102-J. (Translation—BISI no. 859.) Use of Protective Coatings for Decreasing Steel Decarburization. S. Z. Yudovitch. *Stal'*, Jan. 1957, p. 69-71.

See item 23-J, 1958. (J4a; AY, *Cr*)

103-J. (Translation—Brutcher no. 4478.) Effect of Contact Electric Heating Upon Properties of Cold Rolled Stainless Steels. L. V. Mironov, V. G. Sazonov, V. V. Levitin and N. M. Rodigin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 26-30.

Effect on mechanical properties, recrystallization and resistance to intercrystalline corrosion. Recrystallization proceeds at a greater rate but at much higher temperatures in comparison with the usual heating procedures. 6 ref. (J2, N5; SS)

104-J. (Translation—Brutcher no. 4480.) Annealing of Low-Coercivity Iron. N. V. Vyaznikov and G. I. Ivanyuk. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 39-41.

High ductility and low magnetic coercivity of technically pure iron are attained by slow cooling within the annealing furnace at 350-400° C. followed by accelerated air cooling. (J23, P16, 2-64; Fe)

105-J. (Translation—Brutcher no. 4483.) Aging of Alloy TsAM-4-1. F. S. Adel'skaya and P. L. Chernova. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 52-54.

Effect of natural and artificial aging and of cold treating on dimensional changes of TsAM 4-1 alloy (3.5-4.5% Al; 0.5-1.5% Cu, balance Zn). Artificial and natural aging produce the same shrinkage effect while cold treatment retards shrinkage. (J27d, P10d; Zn-b)

106-J.* (German.) Bright Annealing of Copper Alloys and Noble Metal Copper Alloys. Habil F. Erdmann-Jesnitzer, G. Wunsche and H. Schlegel. *Metall*, v. 13, Feb. 1959, p. 87-92.

Brittleness testing; effect of hydrogen and carbon monoxide content upon the alloys. 25 ref. (J23a; Cu-b, *EG-c*)

107-J.* (German.) Influence of Annealing Time on Structure and Transformation Behavior of Plain Carbon Steels. Heinz Borchers and Gunter Saur. *Stahl und Eisen*, v. 79, Feb. 19, 1959, p. 210-215.

Ferrite grain size, proportion of pearlite and location of Ar_3 and Ar_1 points in hypo-eutectoid plain carbon steel as dependent on annealing time. 11 ref. (J23, N8, 2-64; CN)

108-J.* Quench Aging, Strain Aging, Yield and Flow Phenomena in Low Carbon Steel. Eric R. Morgan. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 19-28.

Quench and strain aging, and their relation to supersaturated solutions of carbon and nitrogen in iron; effects on magnetic and mechanical properties which may result in stretcher strains, buckling and tearing in deep drawn sheets. Yield and flow phenomena explained in terms of dislocation theories of plasticity. 10 ref. (J26d, N7e, Q23; CN-g)

109-J.* Annealing Cycles for Commercial and Drawing Quality Rimmed Steels. Howard E. Miller. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 53-56.

Grain structure and corresponding hardness for various cycles. Temperature employed is between 1150-1340° F., while soaking time is determined by desired grain size and hardness. (J23, M27; ST-d)

110-J.* Short-Time Annealing of Cold Worked Low Carbon Steel. Georg Niebch. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 63-74.

Deformation, annealing time and temperature required to produce full softening by recrystallization in short time, or retention of permanent part of strengthening on long-time annealing. Strip steel, cold rolled between 10 and 60% and annealed between 650 and 900° C. for 1 to 3 min. resulted in full softening either for normalizing at 900° C. or for annealing at lower temperatures. 7 ref. (J23, J24, N5; CN-g)

111-J.* Effect of Variation in Annealing Cycle and Composition on Mechanical Properties of Continuously Annealed Tin Plate. P. W. Marshall and J. A. Bauscher. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 75-83.

Effect of increasing annealing temperature and decreasing cooling rate and amount of temper mill extension on hardness and tensile strength. Influence of carbon, Mn and nitrogen levels on mechanical properties. 8 ref. (J23, 1-61, 2-60, Q-general; 4-53, CN-g, *Sn, C, Mn, N*)

112-J.* The Economics of Annealing in the United States. Lyle F. Gulley. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 85-93.

Procurement and cost of fuel, availability and cost of labor, metallurgical limitations and customers' requirements in production of low-carbon sheet steel. (J23, 17-53; CN-g, 4-53)

113-J.* Annealing of Cold Reduced Sheet and Coil in Europe. Harry H. Ascough. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 95-124.

Annealing cycles, control of microstructure and ductility; surface quality and defects produced during annealing. 7 ref. (J23; CN, 4-53)

114-J.* (Italian.) Heat Treatment of Steel Springs. O. Dorigo. *Trattamenti Termici*, v. 1, Sept-Oct. 1958, p. 6-9, 24-26.

Methods to increase strength of material before shaping of spring. Patenting, hardening and tempering; stabilization after plastic working. (To be continued.) (J-general, T7c; ST)

115-J.* Present-Day Annealing and How It Is Affected by Cold Work. Fred L. Otto. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 51-52.

Factors affecting grain size of batch-annealed low-carbon steel (AISI 1008 and 1010) include hot-mill temperatures, rate of heating, amount of cold work. (J23, N5, M27c; CN-g)

116-J.* Generation and Use of Prepared Atmospheres in the Annealing of Low Carbon Steel Strip. George J. Campbell. Paper from

"Annealing of Low Carbon Steels, Proceedings". Lee Wilson Engineering, Co., Inc., Cleveland, Oct. 1957, p. 57-62.

Prepared atmospheres in batch annealing of tin plate and cold rolled steel coils. Factors to consider in producing an acceptable gas and their effect on strip surface when gases vary beyond certain fixed chemical compositions and not in equilibrium. (J23, J2k; CN-g, 4-53)

117-J. (Italian.) Controlled Atmospheres. *Trattamenti Termici*, v. 1, Nov-Dec. 1958, p. 19-21.

Use of hydrogen and nitrogen atmospheres. (To be continued.) (J2k)

118-J.* (Slovakian.) Use of Producer Gas as Protective Atmosphere in the Heating of Thin Steel Sheet. Jan Mucka and Josef Teindl. *Hutnicke Listy*, v. 14, Feb. 1959, p. 104-110.

Formation of gray edges is explained by the action of sulphur present in the protective atmosphere. After removal of sulphur and moisture from producer gas, this can be used as a protective atmosphere. (J2k; CN, 4-53)

119-J. (Italian.) Controlled Atmospheres. *Trattamenti Termici*, v. 1, Sept-Oct. 1958, p. 15-18.

Use of ammonia gas and its derivatives. (To be continued.) (J2k)

120-J.* (Italian.) Sulphurizing Case Hardening of Steels. Alfredo Secciani. *Macchine*, v. 14, Jan. 1959, p. 25-34.

Patented sulphurizing processes (sulfinuz and sulfide). Morphology, microhardness, anti-wear and mechanical properties of sulphur-hardened layers. Influence of duration of treatment. 14 ref. (J28, Q-general; ST, *S, N*)

121-J. Precipitation Hardening Aluminum-Base Alloys. W. A. Anderson. Paper from "Precipitation From Solid Solution" American Society for Metals, Cleveland, 1959, p. 150-207.

Properties of alloy systems, wrought structural alloys, alloys for castings, rivets, electrical conductor and heat resistant alloys. 49 ref. (J27, Q-general; Al-b, *Cu, Mg, Si, Zn, Ni*, SGA-h, SGA-q)

122-J. Magnesium Alloys. R. S. Busk. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, 1959, p. 391-416.

Precipitation reactions in those Mg alloy systems that are used commercially. 28 ref. (J27, N7, Q-general; Mg-b)

123-J. Precipitation in Cobalt-Base Alloys G. A. Fritzlen, W. H. Faulkner, B. R. Barrett and R. W. Fountain. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, 1959, p. 449-494.

Properties of Co and some of its alloy systems discussed to evaluate their precipitation hardening behavior. 52 ref. (J27, N7, Q-general; Co-b)

124-J.* (Russian.) Production of Protective Atmospheres for Bright Annealing. F. B. Zenchenko and Ya. A. Peker. *Stal'*, Feb. 1959, p. 151-155.

Cold rolled strip steel can be bright annealed in bell-type furnaces by burning coke oven and blast furnace gas mixture of various compositions. Dew point must be below -30° C. (J23a, J2k; ST, 4-53)

125-J.* (German.) Precipitation Hardening of Quenched Beta-Brass Occurring Between 200 and 300° C. Erhard Hornbogen. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 70-74.

New phases develop at the grain boundaries and transformation from a bcc. to a face-centered lattice takes place. Precipitation is influenced by external stress. 6 ref. (J27d; Cu-n)

126-J. Precipitation Reactions in Iron-Base Alloys. Adolph J. Lena. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, 1959, p. 244-327.

High-alloy steels of the precipitation hardenable types. Heat treatment and properties of commercial alloys. 94 ref. (J27, Q-general, 2-62; SS)

127-J. Precipitation Hardening of Copper Alloys. W. D. Robertson and Robert S. Bray. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, 1959, p. 328-390.

Review of age hardening Cu alloys, mechanism of precipitation and accompanying changes in properties. 138 ref. (J27, N7, Q-general; Cu-b)

128-J. Some Age Hardening Characteristics of Nickel-Chromium Alloys (Nickel-Rich) Containing Aluminum and Titanium. C. G. Bieber and R. J. Raudebaugh. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, p. 417-448.

Outstanding attributes are oxidation resistance, high-temperature strength and

creep resistance associated with a relatively good insensitivity to overaging. 21 ref. (J27, N7a, Q-general; Ni-b, *Cr, Al, Ti*)

129-J.* Making of Aircraft Structures From Inconel X. Robert R. Ferguson. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 178, American Society of Tool Engineers, Detroit, 1958, 9 p.

Effect of solution treatment, aging, stress relief and annealing conditions on hardness and tensile properties of Inconel X. Heat treatment, Warpage and oxidation; fusion and resistance welding, machining, chemical milling, flame cutting, forming and cleaning. (J-general, G-general, K1d, K3n, Q27a, Q29n, T24a; Ni-b)

130-J.* (English.) Sub-Zero Treatment of Quenched Steel. Pt. 1. Stabilization of Retained Austenite. Yunoshin Imai and Masao Izumiyama. *Tohoku University Science Reports of the Research Institutes*, v. 10A, no. 6, 1958, p. 414-425.

Effects of quenching temperature, room-temperature aging and tempering on the stabilization of retained austenite. 15 ref. (J26q, N8n; ST, 2-61, 2-64)

131-J. Automatic Flame-Hardening Techniques Heat-Treat Giant Excavator Components. *Metalworking Production*, v. 103, Mar. 20, 1959, p. 491-493.

(J2h, T4a)

132-J. (Italian.) Reducing Manufacturing Costs by Improved Heat Treatment. Wilson T. Groves. *Trattamenti Termici*, v. 2, Jan-Feb. 1959, p. 3-6, 29.

(J-general; ST)

133-J.* Prediction of Carburizing Cycles. E. N. Case. *Metal Treating*, v. 10, Mar-Apr. 1959, p. 2-7, 39.

Tables and formulas for case depth and carburizing rate. 6 ref. (J28g)

134-J.* Metallurgical Research Develops Improved Products Through Heat Treating. Helen Hoover. *Metal Treating*, v. 10, Mar-Apr. 1959, p. 8-13, 40, 42-44.

Determination of the cause of failure of harrow disks. Elimination of faults by austempering. (J26p, Q27; ST)

135-J.* Heat Treatment of Ductile Iron. W. D. McMillan. *Modern Castings*, v. 35, Apr. 1959, p. 77-78.

Treatment conditions and resulting mechanical properties of castings subjected to a full ferritizing anneal, a sub-critical anneal or to a two-temperature normalizing cycle. (J23, J24; CI-r)

136-J.* (German.) Observations When Hardening Tools. Pt. 2. *Industrieblatt*, v. 59, Mar. 1959, p. HT17-HT19.

Data on increase in volume and hardness in the inductive surface hardening of several carbon steels. Cracking of high speed toolsteels due to internal stress. Volume increase from nitriding. (J2g, Q26, J28m; CN, TS-m)

137-J.* (Japanese.) Sintered Iron-Base Alloys for Machine Parts. Gas Carburization of Sintered Iron-Base Compacts. Yasuji Fujii, Etsuo Hayashi, Teruhisa Watanabe and Masabumi Yasuda. *Nagoya Government Industrial Research Institute, Reports*, v. 7, June 1958, p. 412-420.

Sintered iron compacts expand during carburizing and quenching and the expansion increases with an increase in carburizing time and decreases with an increase in compacting pressure. 4 ref. (J28g; Fe-b, *Cu*, 6-72)

138-J.* New Thermo-Chemical Techniques. Pt. 1. Bright Annealing. P. Galmiche. *Metal Finishing Journal*, v. 5, Mar. 1959, p. 113-116.

Bright annealing, chromizing and brazing in fluoride-reducing atmospheres. (J23a, L15, K8)

139-J.* Heat Treatment of Sintered Iron. Ivan Ljungberg and P. Ulf Gummeson. *Precision Metal Molding*, v. 17, Apr. 1959, p. 30-31.

Relationship of hardness and depth of carburization to density, treatment time and carburizing medium. Effect of Cu on strength and hardness of carburized parts (J28g, J28j, Q29n, 2-60; Fe, *Cu*, 6-72)

140-J.* The How and Why of Quenching. Clarence A. Siebert. Paper from "Quenching of Steels". American Society for Metals, Cleveland, 1958, p. 1-9.

Cooling curves of water-quenched steels; variation of coefficient of heat transfer; diffusivity of various structures, thermal conductivity with temperature. Effect of temperature and size on severity of quench for oil or water-quenched steels. 9 ref. (J26n; ST, SS)

141-J.* Quenching: A Thermal Process. V. Paschkis. Paper from "Quenching of

Steels". American Society for Metals, Cleveland, 1958, p. 11-27.

Heat balance at surface of quenched object and quenching medium. Quenching of fully heated solids. Influence of size and shape on internal resistance to heat transfer in steel specimens. Apparatus for measuring boundary conductance. Variation in boundary conductance with temperature; quenching of surface heated objects. (J26n, P11k, 2-61, 3-73; ST)

142-J.* Evaluation of Quenching Media. George H. Robinson and Harry J. Gilliland. Paper from "Quenching of Steels". American Society for Metals, Cleveland, 1958, p. 29-43.

Hardening power and cooling power tests to determine effectiveness of special oil and additives for quenching carbon and alloy steels. Correlation of hardening power with results of magnetic quench, hot wire and 5-sec. tests. Effects of surface condition and quenching oil agitation and temperature. (J26n, W28p; ST)

143-J.* Hot Oil Quenching. William C. Hiatt. Paper from "Quenching of Steels". American Society for Metals, Cleveland, 1959, p. 45-49.

Marquenching of carburized gears in oil at 400° F. Oil selection; improving oil life. (J26p, W28p, T7a; ST)

144-J.* (German.) Increase of Fatigue Strength by Bath Nitriding. J. Mueller. *Draht*, v. 10, Mar. 1959, p. 94.

After nitriding and quenching in salt water, carbon steel with Mn shows increase in fatigue strength, especially under bending and torsion. (J28k, Q7; AY, CN, *Mn*)

145-J.* (German.) Influence of Flame Hardening on Internal Stress and Fatigue Strength. H. W. Groenegress. *Draht*, v. 10, Mar. 1959, p. 95.

Influence of feed rate, part size, and preheating on internal stress. Fatigue strength is increased by surface hardening. (J2h, Q25, 2-65, Q7a; ST)

146-J.* (German.) Interdependence of Heat Treatment, Internal Stress and Fatigue Strength in Flame and Induction Hardening. K. Falkenmayer. *Draht*, v. 10, Mar. 1959, p. 95-96.

Internal stress distribution depends on temperature fields resulting from the conditions of surface hardening and quenching and on size and shape of the parts. (J2g, J2h, 2-64, 3-73, Q25; ST)

147-J.* (German.) Transformation Times of the Case and the Core During Carburizing of Steel. O. Schaaber. *Draht*, v. 10, Mar. 1959, p. 96.

Inductive measurements show that case transforms after the core. (J28g, Q25m; ST)

148-J.* (German.) Stress-Relief Heat Treatment in Alloyed and Unalloyed Steels. M. Kroneis. *Draht*, v. 10, Mar. 1959, p. 96.

Annealing temperature depends on Mn, Ni, Cr, Mo and austenite content. (J1a, 2-60; ST, AY, *Mn, Ni, Cr, Mo*)

149-J. (German.) Heat Treatment of Steel. *Atompraxis*, v. 4, no. 12, 1958, p. 11-12.

(J-general; ST)

150-J. (German.) Continuous Cooling Curves of Surface Hardened Gears in Relation to Resulting Internal Stress. H. B. Knowlton. *Draht*, v. 10, Mar. 1959, p. 96.

By controlling the variables an optimum internal stress may be achieved which can improve the fatigue properties and reduce warping. (J28, T7a, Q7, Q25; ST)

151-J. (Russian.) Treatment of Welded Structures With Oxy-Acetylene Flame Heating. L. B. Tsal'man. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 29-31.

(J2h, T26)

152-J.* Pearlitic and Malleable Iron Heat Treated Automatically. Lawrence E. Emery. *Foundry*, v. 87, May 1959, p. 82-87.

Automatic combination annealing and heat treating plant with atmosphere control produces both high-strength pearlitic and ferritic malleable irons. (J-general, W27; CI-s)

153-J.* (Italian.) Heat Treatment of Nimonic Alloys for Special Applications. W. Betteridge. *Metallurgia Italiana*, v. 51, Feb. 1959, p. 49-56.

Treatment of Nimonic alloys for industrial gas turbine applications involves super-aging at temperatures slightly below beginning of precipitation hardening and provides higher over-all creep elongation before rupture without impairing rupture life. Treatment of material for service at temperatures up to 600° C. involves

combination of cold working and precipitation hardening and provides wide range of tensile and creep properties.. 4 ref. (J27d, Q27a, Q3, 2-64, T7h; Ni-b)

154-J.* Precipitation in a Beta-Brass-Fe Alloy. A. E. Berkowitz and P. J. Flanders. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 111S-112S.

Single crystal samples of beta-brass containing 0.1% iron were annealed at 300 and 400° C. to develop the Fe precipitate particles. At intervals during the anneals, magnetic data were obtained and analyzed in terms of the size, shape, orientation and general magnetic behavior of the precipitate particles. 4 ref. (J27, P16; Cu-n, *Fe*)

155-J.* (French.) Quenching and Annealing of Uranium-Chromium Alloys With Small Chromium Contents. Jean Delaplace and Roland Bigot. *Comptes Rendus*, v. 248, Apr. 1, 1959, p. 2000-2002.

Effect of cooling speed and Cr content on beta phase transformation in annealing of U-Cr alloys quenched from beta or gamma ranges. Alloys containing 0.05, 0.37 and 0.50% Cr were quenched in gaseous argon, aqueous $CH_3CO_2NH_4$ solution, concentrated and aqueous KCl solution, water, diluted KCl solution and a mixture of NaCl with ice. (J23, J26, N7c, 2-60; U-b, *Cr*)

156-J.* Making and Treating Alloy Steel Plates, Pt. 2. R. Russell Fayles. *Industrial Heating*, v. 26, Apr. 1959, p. 742, 744, 746.

Normalizing, annealing, quenching, flattening, grinding and cutting of alloy steel plates. (J23n, J24, J26n, G18, G22g; AY, 4-53)

157-J.* (Russian.) Effect of Gaseous Atmospheres on Strengthening of Metals by Means of Electric Sparks. B. P. Kolesnik. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1031-1035.

Phase composition and microhardness of Al-C, Fe-C, Fe-Al and Cu-Al strengthened by electric sparks in air and CO_2 atmospheres. Oxygen in the air affects the phase composition of the surface and forms metastable solid solutions. 13 ref. (J2; Al-b, Fe-b, Cu-b, *C*)

158-J. Modified Martempering for Attaining Close Tolerances in Aircraft Pumps. Edgar C. Wallace and Howard E. Crouse. *Industrial Heating*, v. 26, Apr. 1959, p. 683-686.

Oil hardening toolsteels, 5200 steel or stainless steels quenched in martempering bath at 260° F. Tempering and low temperature treatments. (J26p, J29; TS, SS)

159-J. The How and Why of Quenching. *Industrial Heating*, v. 26, Apr. 1959, p. 704, 706.

(J26n; SS, ST)

160-J.* High Temperature Carburising. H. N. Ipsen. *Metallurgia*, v. 59, Apr. 1959, p. 176-180.

Effect of carburizing temperatures from 927-1093° C. on case depth, grain growth and dimensional growth of AISI 1117, 4615, 8620 and 9315 steels. Microstructures after carburizing and following reheat hardening. (J28g, 2-62; CN, AY)

161-J.* Stress Relieving in Situ. Novel Use of Mineral Wool Insulation. J. W. Dawson. *Metallurgia*, v. 59, Apr. 1959, p. 183-184.

Large steel pressure vessels stress-relieved by covering with mineral wool insulation and applying heat within the vessel by means of electric resistance elements. (J1a, T26q; ST, 17-57)

162-J.* Stress-Relieving Titanium Alloy Weldments. Robert P. Brody and Alfred A. Taylor. *Metal Progress*, v. 75, May 1959, p. 67-71.

Compressor cases made of 5% Al, 2.5% Sn titanium alloy cracked on stress relieving. The problem was solved by altering the heating cycle. Previously heated in 200° F. increments, the case is now placed in a cold furnace and heated directly to 1150° F. (J1a; Ti-b, 7-51)

163-J.* Continuous Furnace Improves Annealing. A. G. Sturrock. *Metal Progress*, v. 75, May 1959, p. 103-105.

Cycle annealing in a continuous furnace insures uniform structures in bars and throughout different lots of steel. Loads are carried through automatically after proper times and temperatures are selected. There are also provisions for protective atmosphere and carbon restorations. (J23, W27g, 1-61; ST)

164-J.* (Hungarian.) Heat Treatment of Steel. Arpad Szombatfalvy. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 36-37.

Hardenability, hardness penetration, carburizing, surface layer alloying and case hardening. (J-general; ST)

165-J.* Effect of Specimen Size on the Quench-Aging of an Aluminum-3.8% Copper Alloy. Ved Prakash and K. M. Entwistle. *Institute of Metals, Journal*, v. 87, Apr. 1959, p. 262-264.

Massive specimens show a much lower hardening rate during the first stage of quench-aging than do thin specimens. Failure to retain vacancies in the larger specimens is the cause of the low hardening rate. 6 ref. (J27d, 2-73; Al-b, *Cu*)

166-J.* Sub-Zero Temperature Refrigeration of Materials. R. L. Lee. *Institution of Production Engineers Journal*, v. 38, Apr. 1959, p. 198-205.

Sub-zero refrigeration and application to industrial processes. (J1b, J26q, K13r, 1-67)

167-J.* Heat Treating Today. Types and Uses of Controlled Atmospheres. Lester F. Spencer. *Tooling & Production*, v. 25, May 1959, p. 40-43.

Includes tables which show temperature, time and atmospheres for various metals and processes. (J2k, W27n)

168-J. Flame-Hardening Excavator Parts. Oxy-Town-Gas Equipment at Ruston-Bucyrus. *Metallurgia*, v. 59, Apr. 1959, p. 181-182, 184. (J2h, J26n; ST)

169-J. (Book-Russian.) Cold Treatment of Steel. P. P. Petrosyan. 121 p. 1957. Gosudarstvennoe Naucho-Teknicheskoe Mashinostroitel'noi Literatury Urainskoe Otdelenie Mashgiza, Kiev, Moskva. 5 Rub. and 50 k.

Kinetics and mechanism of martensite transition and stabilization of residual austenite below 0° C. Effect of residual austenite on properties of hardened steel; influence of subzero treatment on physical and mechanical properties of hardened steel. 206 ref. (J26q, N8)

170-J. (Book.) Quenching of Steels. 77 p. 1958. American Society for Metals, 7301 Euclid Ave., Cleveland 3. $2.95.

A compilation of papers presented at the National Metal Congress, Cleveland, Oct. 27-31, 1958. Papers abstracted separately. (J26n; ST)

171-J.* (Japanese.) Hardenability Specifications for Steel. Kazuo Tsuya. *Government Mechanical Laboratory (Japan)*, Report no. 29, Mar. 1959, 24 p.

H-band hardenability specifications are worked out for Cr-Mo-steel, and these coincide with that of 4140H. Estimation of hardenability cannot be used to determine H-band although sampling can be utilized. (J5; AY)

172-J.* (Russian.) Nitriding Molybdenum-Free Steels. M. V. Pridantsev, G. L. Livshits and G. A. Torpanova. *Stal'*, Mar. 1959, p. 262-267.

Three new grades of Mo-free steels—38KYUA, 38KHVFYUA and 38KHVYUA—have been developed. They are used for nitrided parts of large cross sections of equipment functioning at high temperatures. 4 ref. (J28k; SS, *Mo*)

173-J. (German.) Hot Quenching of Tools and Dies. W. Haufe. *Industrie-Anzeiger*, v. 81, Mar. 3, 1959, p. 253-258.

Directions for hardening in relation to stresses resulting from quenching. Constitution diagrams for 12% Cr steels and hot-work toolsteels. 18 ref. (J26p, N8; TS, *Cr*)

174-J.* (German.) Heat Treatment of Titanium Alloys. Willy Knorr. *Harterei-Technische Mitteilungen*, v. 13, no. 1, 1958, p. 1-29.

Heat treatment directions for unalloyed Ti and various Ti alloys. Effect on mechanical properties, hardness and phase transformations. Precipitation hardening of alloys containing elements of a stabilizing effect of the beta-phase. 34 ref. (J23, J27d, N5, Q-general; Ti-b, Al, Mn, Mo, *Cr, Fe*)

175-J.* (German.) Hardening and Annealing of Spheroidal Cast Iron. W. Patterson and D. Ammann. *Harterei-Technische Mitteilungen*, v. 13, no. 1, 1958, p. 30-45.

End quench tests on spheroidal cast iron and, for comparison, on laminar cast iron and eutectoid steel. Tensile strength in relation to annealing temperature; effect of hardening temperature on hardness and case depth. 38 ref. (J23, J29, J26; CI-r)

176-J. (Japanese.) Carbonitriding by the Salt Bath Method. Atsuo Ohmori. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 82-91.

Types of furnaces; pretreatment, carburizing and quenching. (J28m)

177-J. (Japanese.) Gas Carburizing and Gas Carbonitriding. Amane Yuuki. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 91-98. (J28g, J28m)

178-J. (Japanese.) Flame Hardening. Kanichi Tateishi. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 102-108.

Hardness of case and case depth; effect of rapid heating on transition point. (J2h)

179-J. (Japanese.) Case Hardening by the High Frequency Induction Method. Toshirou Saga. *Metal Finishing Society of Japan Journal*, v. 10, Mar. 1959, p. 108-115. (J28, 1-69)

180-J. (Japanese.) Case Hardening of Office Machine Parts. Toshifumi Ouhashi. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 115-122. (J28, T10f)

181-J. (Japanese.) Disadvantages of Case Hardening. Seitarou Motoyama. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 123-128.

Examples of carburizing failure include incomplete carburizing, inhomogeneous hardness distribution, cracking and corrosion. (J28)

182-J. (Russian.) Effect of Delayed Cooling of Bessemer Steel Rails. A. M. Karpunin. *Stal'*, Mar. 1959, p. 269.

Delayed cooling lowers the tensile strength of rails by 3-5 kg/mm² and generally reduces mechanical properties. (J2, Q27a; ST-b)

183-J.* Oil Quenched Iron-Carbon Alloys Differ. D. J. Fraser. *Canadian Metalworking*, v. 22, May 1959, p. 30-33.

Design of component parts is now possible due to modern heat treatment and quenching oils. (J-general, W28p; CN, AY, Fe-b, *C*)

184-J.* (Italian.) Applications of Controlled Atmospheres. O. E. Cullen. *Trattamenti Termici*, v. 2, Mar-Apr. 1959, p. 3-10, 22.

Carbon diffusion processes. Selection and control of atmospheric mixtures. (J2k, J28; ST)

185-J.* (Italian.) Jominy Hardenability Test. Victor Berg. *Trattamenti Termici*, v. 2, Mar-Apr. 1959, p. 13-16.

Importance of determining hardenability of steels; test procedure, including heat treatment and machining of specimens. (J5; ST)

186-J.* (French.) Precipitation Hardening in a Nickel-Titanium Alloy. C. Buckle, B. Genty and J. Manenc. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 247-259.

Ni-base alloy with 9.26% Ti permits precipitation hardening following solution treatment, quenching and reheating. When the equilibrium phase is the definite hexagonal compound Ni_3Ti, precipitation takes place in three stages. 11 ref. (J27, J27a; Ni-b, *Ti*)

187-J.* (Hungarian.) Experiments With Nodular Cast Iron Crankshafts. Miklos Cseh. *Kohaszati Lapok-Ontode*, v. 92, Feb-Mar. 1959, p. 33-42.

Heat treating processes. Desirable properties and economic advantages compared with forgings. 38 ref. (J-general, T7j; CI-r)

188-J. (Italian.) Minimizing Distortion Due to Heat Treatment. G. Bidigare. *Trattamenti Termici*, v. 2, Mar-Apr. 1959, p. 11-12. (J-general, 9-74)

189-J. (Japanese.) Recent Progress in Case Hardening. Kiyoichi Ogawa. *Metal Finishing Society of Japan, Journal*, v. 10, Mar. 1959, p. 75-82.

Review of cyaniding, nitriding, carburizing, flame hardening and high frequency quenching. (J28, J2b, J2h)

190-J. (Japanese.) Nitriding of Large Steel Parts. Shinji Kojima. *Metals*, v. 29, Mar. 1959, p. 169-173. (J28k; ST)

191-J. (Japanese.) Gas Carburizing of Automobile Parts. Kazui Tobiyama. *Metals*, v. 29, Mar. 1959, p. 174-180.

Types of gas carburizing furnace used for case hardening. (J28, 1-52)

192-J. (Japanese.) Liquid Nitriding. Touohisa Kadokawa. *Metals*, v. 29, Mar. 1959, p. 185-188.

Mechanism and bath control. (J28k)

193-J. (Japanese.) Avoidance of Failures in Carbonitriding. Kiyoichi Ogawa. *Metals*, v. 29, Mar. 1959, p. 193-199.

Degeneration of salt bath is protected by additives of alklaine salts or Ba salts. (J28m)

194-J. (Japanese.) Heat Treatment of Ferromagnetic Alloys. Satoshi Taniguchi. *Metals*, v. 29, Mar. 1959, p. 217-222. (J-general; SGA-n)

195-J. (German.) "Soft" Nitriding of Cast Iron. *Giesserei-Praxis*, no. 8, Apr. 25, 1959, p. 145.

Treatment of cast iron in a cyanate-cyanide salt bath to improve wear resistance of sliding parts. (J28m, Q9n, T7; CI-b)

196-J.* (Japanese.) Hardness Measurement of Carburized Parts and Control of Case Depth. Tohro Yoshida. *Metals*, v. 29, Mar. 1959, p. 181-184.

Control of hardening depth due to carburizing by measurement of surface hardness of carburized steel products. (J28g, Q29; ST)

197-J.* The Thermo-Mechanical Method for Relieving Residual Quenching Stresses in Aluminum Alloys. H. N. Hill, R. S. Barker and L. A. Willey. *American Society for Metals, Transactions*, v. 52, Preprint no. 132, 1959, 32 p.

Residual stresses in quenched Al parts relieved by cooling to -320° F. and reheating in high velocity steam blast. (J1a, J26q, Q-general; Al-b)

198-J.* (German.) Tempering and Isothermal Annealing. B. Finnern. *Draht*, v. 10, Apr. 1959, p. 147-151.

Effects of austenizing, hardening temperature, cooling conditions and isothermal annealing temperature on mechanical properties. 9 ref. (J22, J23, J29, Q-general; AY, *Cr, Mn*)

199-J.* (Japanese.) Selection of Steel Quality for Carbo-Nitriding. Sohsuke Uchida. *Metals*, v. 29, Mar. 1959, p. 189-192.

Carbonitriding is affected by temperature and kind of bath or gas chamber used. If there is a ferrite band in steel, diffusion of carbon and nitrogen is hindered and hardened case has a discontinuous band which causes poor mechanical properties. (J28m)

200-J.* (Japanese.) Titanium Carbide Produced From Sponge Titanium. H. Yamasaki, T. Hirayama and N. Kamaze. *Metals*, v. 29, Apr. 1959, p. 298-302.

Carburizing of Ti is highly explosive if powder Ti is used, whereas it is diffusive if sponge Ti is employed. (J28g; Ti, NM-a35)

201-J.* (Japanese.) Springs Manufactured by High Frequency Induction Quenching. Toshiroh Saga. *Metals*, v. 29, Apr. 1959, p. 305-310.

The usual hot forming, oil quenching and high-temperature tempering processes are replaced by cold forming, high-frequency quenching and low-temperature tempering. (J26, J29, T7c)

202-J.* (Russian.) Effect of High-Temperature Annealing on Magnetic Properties of Soft Magnetic Alloys. N. I. Larkin and V. S. Mes'kin. *Izvestiya Akademii Nauk Seriya Fizicheskaya*, v. 23, no. 3, 1959, p. 280-284.

Data on rolling 50% Ni Permalloy, 50N-NH-S and Mo Permalloy N79-MO4 cold rolled generator and hot rolled transformer steels. Best magnetic properties are obtained when these steels are annealed at 1150-1400° C. in argon, refined with nitrogen, water vapor and heated by a series of moisture absorbent dryers. (J23n, P16; Ni-b, Mo-b, SGA-n)

203-J. (Czech.) Heat Treatment of Large Shells for Mill Rolls Used in Cold Rolling. F. Holoubek and J. Otahal. *Hutnicke Listy*, v. 14, May 1959, p. 415-421.

Basic openhearth steel is the material best suited for these applications. With satisfactory isothermal heat treatment shells of satisfactory properties can be obtained. 4 ref. (J23s, W23k; ST-e, 1-65)

204-J.* (Czech.) Induction Hardening of Roll Surfaces. Ivan Zlatnik. *Hutnicke Listy*, v. 14, May 1959, p. 421-429.

Two induction hardening methods for rolls used in cold rolling. Hardness is influenced by composition, by temperature measured on the roll surface and by time material is held at austenitization temperature. 24 ref. (J2g, W23k; CN)

205-J. (Dutch.) Residual Stresses in Welded Constructions. W. J. Kaufmann. *Lastechniek*, v. 25, May 1959, p. 91-97.

Stress relief by heating, hammering and hydraulic pressure; autogenous stress relief (by temperatures up to 200° C.) 5 ref. (J1a, G23n; 7-51)

206-J. (German.) Autogenous Stress Relief. H. G. Kunz. *Lastechniek*, v. 25, May 1959, p. 97-108.

Certain zones of the weldment are heated to temperatures around 200° C. and water-cooled. 7 ref. (J1a; 7-51)

207-J. (Russian.) Development of Primary Structure and Intra-Crystalline Segregation in Steel and Cast Iron by Austenitizing. Ya. N. Malinochka and N. G. Osada. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 446-447. (J22, M26s; 9-69, AY, *Si*, CI)

208-J.* (French.) Case Hardening. Pt. 1. D. Flament. *Metallurgie et la Construction Mecanique*, v. 91, Apr. 1959, p. 261-262.

Metallurgical factors; physico-chemical reactions; role of carbon, hydrogen and nitrogen; effects of presence of graphite. (J28; ST)

209-J.* (Russian.) Controlled Gas Atmosphere Composed of Technically Pure Nitrogen for the Bright Annealing of Steel. L. V. Beloruchev and A. K. Shvachkin. *Stal'*, Apr. 1959, p. 355-360.

To prevent oxidation and decarburization of high-carbon steel, the nitrogen is treated with dissociated NH_3 which completely removes oxygen and adds the required quantity of hydrogen. 7 ref. (J2k, J23a; ST)

210-J.* Heat Treating the Stainless Steels. Pt. 1. S. W. Cole. *Industrial Heating*, v. 26, May 1959, p. 908, 910, 912, 914, 916.

Effects of various atmospheres related to design of heat treating furnaces; carburizing and oxidizing conditions; preparation of work. (J-general, W27, 17-51; SS)

211-J.* How to Avoid Trouble With Type 431 Stainless. C. C. Angstadt. *Metal Progress*, v. 75, June 1959, p. 86-91.

Although possessing excellent strength and corrosion resistance when properly melted and fabricated, it is difficult to process. Careful heat treatment in hydrogen-free atmospheres is essential to eliminate austenite and prevent embrittlement. Fabrication methods are similar to those needed for the 18-8 stainless types. (J-general, G-general; SS)

212-J.* The Gradient Furnace—a Versatile Research Tool. Andrew Feduska and Paul E. Busby. *Metal Progress*, v. 75, June 1959, p. 92-96.

A furnace muffle heated at only one end will have a range (or gradient) of temperature along its axis. With proper experimental techniques, such a furnace shortens considerably the time normally necessary to determine grain coarsening, austenitizing and tempering temperatures. It can also be used for isothermal transformation, solution treating and aging studies. (J-general, W27j; ST)

213-J. (Japanese.) Measurement of the Quantity of Mineral Oils Used for Quenching. Kenjiroh Hara. *Metal Finishing Society of Japan, Journal*, v. 10, Apr. 1959, p. 143-145.

Quenching curves of the test pieces of Ag, carbon steel and stainless steel in spindle oil. (J26, W28p; Ag, CN, SS)

214-J. (Japanese.) Quenching by Means of Mineral Oils. Kenjiroh Hara. *Metal Finishing Society of Japan, Journal*, v. 10, Apr. 1959, p. 145-148.

Quenching curves of test pieces of Ag, carbon steel and stainless steel in oil, paraffin and naphthalene. (J26, W28p; CN, Ag, SS)

215-J. (Russian.) Experience in Straightening Welded Structures by Local Heating. L. D. Veretnik. *Svarochnoe Proizvodstvo*, May 1959, p. 37-40.

(J-general; 7-51)

216-J.* (German.) Effect of Nitriding on Ultimate Strength of Steels. A. Juenger. *Industrieblatt*, v. 59, May 1959, p. 217-218.

Tests were made on 32A1CrMo4, 22CrA1Ni7, 27CrA16, C10, Ck10, ECN35, ECMo80 and 20MnCr5 steels after nitriding. Data on ultimate tensile strength and ultimate bending strength. (J28k, Q27, Q5; ST)

217-J.* Degassing and Heat Treatment in the Solid State. R. F. Gunow. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 276-292.

Degassing of Ti and Ti alloys; annealing, hardening, brazing and sintering in vacuum. Annealing of Ti and Zr sheet, strip and forging products. 5 ref. (J2k, J23, 1-73, K8; Ti, Zr, 4-53, 4-51)

218-J. High Strength Stainless Alloys Need Close Control of Hydrogen, Argon Atmospheres. Robert L. Ray. *Western Metalworking*, v. 17, June 1959, p. 54-56.

Bell-type furnace used for hardening in protective atmospheres of hydrogen and argon. Surface variables, dimensional problems, structural properties. (J2k; SS, SGB-a)

219-J. Controlled Carburization Increases Life of Drill Steel. Floyd Anderson. *Metal Treating*, v. 10, May-June 1959, p. 8, 42.

(J28g; TS)

220-J. (German.) Hardening Furnaces for Wire. Helmut Junker. *Draht*, v. 10, May 1959, p. 217-219.

(J25, 1-52, W27g; 4-61)

221-J.* (German.) Nimonic 90 Heat Resistant Alloy Under the Electron Microscope. Th. Geiger, R. Kollrack. *Schweizer Archiv*, v. 25, April 1959, p. 111-116.

Investigation of turbine blades subjected to cold deformation and various types of heat treatment. Above the aging temperature, an intermetallic compound, $Ni_3(Ti,Al)$ precipitates in fine particles.

Hardness increase in artificial aging is explained by accumulation of foreign atoms in the lattice. 5 ref. (J27d, N7a, 3-68; Ni-b, *Cr, Co*)

222-J.* (French.) Cementation Processes. Pt. 2. D. Flament. *Metallurgie et la Construction Mecanique*, v. 91, June 1959, p. 459-463.

Carburizing and carbo-nitriding of steel. Composition of salt baths; tests on the composition of case, ductility of samples after cementation, depth of case as a function of temperature and time. (J28, J2j, 2-61, 3-67; ST)

223-J. The Metallurgy of Heat Treating. Lester F. Spencer. *Tooling and Production*, v. 25, July 1959, p. 48-50.

How to select the appropriate heat treating process. (J-general; ST)

224-J. Modern Heat-Treatment Equipment. Pt. 2. L. G. W. Palethorpe. *Wild-Barfield Heat-Treatment Journal*, v. 7, June 1959, p. 2-7.

Atmosphere plants, jigs, quenching and induction heating equipment. (J-general, 1-52)

225-J. (Translation—Brutcher No. 4523.) Causes of Flake Formation in Steel. P. T. Besedin. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 14-18.

Flaking is caused by the presence of hydrogen adequate for any given chemical composition, susceptibility to a considerable supercooling and failure to remove residual stresses during cooling. Normalizing after hot mechanical working eliminates flake formation. (J24, N15e; 9-70, CN, *H*)

226-J. (Translation—Brutcher No. 4530.) Effect of Tempering on Structure and Mechanical Properties of Alloy Steels ML5-T4 and ML5. V. M. Babkin. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 45-49.

Tempering at 200-350° C. for 4 hr. and 1 hr. at 275-350° C. reduced the mechanical properties. ML5-T4 steel must be hardened a second time to restore its mechanical properties to their original value. (J29, Q27a; AY, *Mo, Ti*)

227-J. (Translation—Brutcher No. 4533.) Reduction of Tool Distortion During Quenching. N. N. Lipshin. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 56-59.

Quenching of steel in sodium and potassium alkaline solutions of various strengths reduces susceptibility of tool-steel to distortion. 3 ref. (J26a, J29; TS, 9-74)

228-J. (Translation—Brutcher No. 4534.) Heat Treatment of Metals in Oxygen-Free Atmosphere. P. D. Gavrilov. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 59-60.

Heating metals in hermetically sealed vessels containing metallic Na as an oxygen absorber. (J2k)

229-J. (Translation—Brutcher No. 4566.) Cyclic Aging of E. I. 437 Heat Resistant Alloy. V. S. Ermakov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, April 1959, p. 14-19.

Thermocyclic aging gives the alloy surface the same hardness as conventional aging, the core being only partially affected, thus producing a tough outer surface with a sufficiently ductile center. 8 ref. (J27d; SS, SGA-h)

230-J. (Translation—Brutcher No. 4576.) Lumber Tools Improved by Hardening in High-Frequency Induction Furnaces. M. M. Vasil'ev and A. P. Polishchuk. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, April 1959, p. 55.

(J2g, J26n; TS)

231-J.* (French.) Uniform Structural Changes in Aluminum-Nickel Solid Solutions. Henry Martinod and Jean Calvet. *Comptes Rendus*, v. 248, June 1959, p. 3708-3710.

After water quenching from 635° C. samples are hardened at different temperatures and then oil quenched. During subsequent heating, the degree of softening depends on the degree of perfection of the hardening structure. (J26n, J29, 3-71; Al-b, *Ni*, 14-67)

232-J.* (Italian.) Heat Treatment of Light Metals. *Fonderia*, v. 8, June 1959, p. 259-262.

Directions for heat treatment and its relation to mechanical properties. (J-general, Q-general; EG-a39)

233-J.* Sulphonitriding—the method for Increasing Wear Resistance. Antonin Pospisil and Frantisek Hasil. *Czechoslovak Heavy Industry*, no. 7, 1959, p. 38-42.

New thermal process for surface treatment of steel and cast iron in which sulphur diffuses into material in addition to the usual nitrogen at a temperature over 400° C. (J28, Q9; ST, CI)

234-J.* (German.) Carburizing With the Acetylene Torch. F. Erdmann-Jesnitzer. *Werkstatt und Betrieb*, v. 92, July 1959, p. 459-461.

Carburizing of low-carbon steel with a reducing flame. Depth of case is determined by the temperature of the workpiece. 5 ref. (J28g; CN-g)

235-J.* (German.) Annealing as a Means of Stress-Relief in Alloyed and Unalloyed Steels. M. Kroneis. *Harterei Technik und Warmebehandlung (Supplement to Industrieblatt)*, v. 5, June 1959, p. 277-278.

Expansion of preloaded spring after annealing serves as a measure of residual stress. Decrease of stress is a function of annealing temperature and time. Remarkable relief occurs only in the first hour of heat treatment. (J23, J1a, Q25h, 2-61, 3-67; AY, CN)

236-J.* (German.) Gas Carburization in Electric Furnaces in the Production of Gears. Th. Turk. *Industrieblatt*, v. 59, June 1959, p. 239-245.

Construction of furnaces, furnace atmosphere control, direct hardening, partial carburizing and carburizing times. (J28g, T7a, W27j; ST)

237-J. (English.) Note on the Relief of Welding Stresses in Ships' Hulls and Welded Structures. *Lastechniek*, v. 25, July 1959, p. 146-148.

13 ref. (J1a, T22g, 7-51)

238-J.* (German.) Carburizing of Molten Iron by Means of Solid Carburizing Additives. Roman Krzeszewski. *Giesserei*, v. 46, July 16, 1959, p. 417-421.

Fix's law and Nerst's theory of solubility permit the determination of equations describing the carburizing processes occurring in molten iron when solid carburizing additives are introduced. Application of these equations compared with actual results achieved by carburizing tests. (J3p; CI, 14-60)

239-J.* Reduction of Warpage by Die Quenching of Steel. T. R. Bradley. *Metal Progress*, v. 76, Aug. 1959, p. 71-72.

The trend to higher strengths has resulted in steel parts which are too hard to machine or bend after tempering. Thus, dies which hold the part in shape during quenching are being used more and more. (J26n; ST, 9-74)

240-J.* Reduction of Warpage by the Thermomechanical Method. H. N. Hill, R. S. Barker and L. A. Willey. *Metal Progress*, v. 76, Aug. 1959, p. 73-76.

Cooling to subzero temperatures and reheating rapidly can introduce residual stresses opposite to those produced by conventional quenching. This is the basis of a new method of stress-relieving Al parts of irregular shape. (J29, J26q; Al, 9-74)

241-J. (Itanian.) Controlled Atmospheres. Pt. 5. *Trattamenti Termici*, v. 2, May-June 1959, p. 19-21.

For use in heat treatment. (To be continued.) (J2k)

242-J.* (Italian.) Black-Heart and White-Heart Malleable Cast Iron. *Fonderia*, v. 8, July 1959, p. 275-278.

Properties and production of black-heart, white-heart and pearlitic cast iron. Influence of component elements. (J23b, 2-60; CI-p, *Cr, S, B, Mn*)

243-J.* (Italian.) Development of the Nitriding Process. G. J. Cox. *Trattamenti Termici*, v. 2, May-June 1959, p. 3-13.

Review of research on process conditions and types of steels responding satisfactorily to this treatment. 50 ref. (J28k; ST)

244-J.* (Italian.) Progress in Induction Heating in Japan. S. Ishida. *Trattamenti Termici* v. 2, May-June 1959, p. 15-18.

Hardenability of some types of induction hardening steels; quenching and tendency to rupture; induction hardening and resultant fatigue resistance of variously treated test specimens; gear rolling with induction heating. (J29, G17g, Q7a; ST)

245-J.* (Japanese.) Carburizing Furnaces With Protective Atmosphere. Shinji Hiyama. *Metal Finishing Society of Japan, Journal*, v. 10, May 1959, p. 173-183.

Decarburization of ferrous and nonferrous metal during annealing, normalizing, hardening, is prevented by processing in a protective atmosphere. Oxidation, reduction and neutralization are effectively carried out. (J4a, J2k)

246-J.* (German.) Precipitation Hardening of Al-Ag Alloys. Pt. 2. Effect of Cold Deformation on Electrical Resistance During Aging. Werner Koster and Hans-Peter Rave. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 403-407.

Effect of artificial aging after water quenching from 540° C. on electrical resistance; influence of sample thickness,

subsequent cold deformation and heat treatment following deformation. 7 ref. (J27d, P15g, 3-73, 3-68, 2-64; Al-b, *Ag*)

247-J.* Critical Particle Size for Precipitation Hardening. J. D. Livingston. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 566-571.

The tensile yield stress of various Cu-Co alloys aged at various temperatures is correlated with the precipitate particle size which is determined magnetically. In all cases the peak yield stress is attained at an average particle radius of approximately 70 Å. Results are interpreted in terms of the internal stresses resulting from the coherence between matrix and precipitate. 26 ref. (J27; Cu-b, *Co*)

248-J.* (French-German.) Hardness Conditions of End Quenched Samples in Relation to Large Case Hardened Pinions. Pt. 2. U. Wyss. *Harterei-Technik und Warmebehandlung (Supplement to Industrieblatt.)* v. 5, July 1959, p. 317-319.

End quench tests performed on cylindrical samples permit conclusions as to the hardness conditions in case hardened parts up to considerable depths. (J5, J28, Q29n, T7a; AY)

249-J.* (Czech.) Vermikulite--the New Heat Insulating Additive for Forming and Heat Treatment of Metals. V. Spalensky. *Strojirenstvi,* v. 9, June 1959, p. 445-446.

Insulating additive for use in forming, drawing or heat treatment process. Economy of the furnace heat capacity is achieved. Softening of the steel due to cracks caused by rapid chilling is avoided. Composition of Vermikulite $(Mg,Fe)_3 \cdot (OH)_2 \cdot (Si_4O_{10}) \cdot 4H_2O$. Before use Vermikulite is preheated to 800-900° C. (J2, G-general; AD-q42)

250-J.* (Spanish.) Malleable Casting. Ramon Roman Martinez. *Instituto del Hierro y del Acero,* v. 12, Apr-June 1959 p. 94-105.

Characteristics of various types of malleable cast iron. Effect of C, Si, Mn and other elements on mechanical and casting properties. Malleablizing time as a function of the ratio C to Si. Malleablizing in salt baths. (J23b, 3-73, 2-60, Q27a, J2j; CI-s, 9,*C, Si, Mn*)

251-J. Heat Treatment of Steel. Edwin Gregory. *Edgar Allen News,* v. 38, June 1959, p. 125-126.

Review. (J-general; ST)

252-J.* (German.) Distortion of Bulky Gray Iron Castings Occurring in Flame and Induction Hardening. Kurt Falkenmayer. *Harterei-Technische Mitteilungen,* v. 13, no. 3, 1959, p. 133-199.

During heating a convex warping of the part takes place. This is followed by concave warping during quenching and then by convex warping occurring during the martensite formation and in the cooling of the deeper layers. (J2g, J2h; CI-n, 9-74)

253-J.* (German.) Flame Hardening of Corrosion Resisting Steels. A. Matting and W. Stech. *Werkstatt und Betrieb,* v. 92, Aug. 1959, p. 505-512.

Remanit 1520, 1740 and 1790 V alloy steels were flame hardened and the hardness measured at gradually increasing depths. Hardness as a function of annealing temperature and the sample diameter. 11 ref. (J2h, Q29n, 3-73; SS, SGA-h, SGA-g)

254-J.* (Polish.) Vacuum Decarburization of Ferrochromium. H. Zak and P. Paczula. *Prace Instytutow Hutniczych,* v. 11, no. 2, 1959, p. 75-82.

Effect of reduced pressure on decarburization. 6 ref. (J4a, 1-73; Fe, AD-n32, Cr)

255-J. How Germany Uses Surface Flame Hardening. Pt. 1. W. A. Hawkins. *Metalworking Production,* v. 103, Aug. 28, 1959, p. 1311-1318.

Flame hardening process adopted by Peddinghaus, in which town gas is used instead of more expensive acetylene, proved to be an economical and effective hardening method. (J2h)

256-J.* Heat Treating Today. Pt. 4. Surface Treatments That Change the Properties of Steel. Lester F. Spencer and Charles Weiner. *Tooling & Production,* v. 25, Sept. 1959, p. 56-58.

Basics and principles, including annealing, hardening, tempering, carburizing, nitriding, cyaniding, carbo-nitriding, skin recovery and use of controlled atmospheres. (J-general; ST)

257-J.* Heat Treating the Stainless Steels. Pt. 2. S. W. Cole. *Industrial Heating,* v. 26, June 1959, p. 1146-1150, 1152, 1154.

Effects and processes with specific regard to austenitic stainless steels. Cr-Ni stainless steel alloys cannot be

hardened by heat treatment. Annealing techniques, stabilization and stress relief. (To be continued.) (J23, J1; SS)

258-J.* Heat Treating the Stainless Steels. Pt. 3. S. W. Cole. *Industrial Heating*, v. 26, Aug. 1959, p. 1524-1526.

Annealing procedures and typical mechanical properties of annealed ferritic chromium stainless steel. (To be continued.) (J23n, Q-general; SS-d)

259-J.* Convection and Radiation in High-Speed Heating. Norman H. Davies and Richard J. Reed. *Industrial Heating*, v. 26, Aug. 1959, p. 1546-1550, 1552, 1554, 1556, 1158, 1626.

Convection heat transfer coefficient for 1000 and 2000° F. airstreams of various velocities. Radiation heat transfer coefficient for various metals and surface conditions. Thermal diffusivities; influence of arrangements of heat source and workpiece on heating rate. Advantages of high-speed heating. 21 ref. (J2, P11k, P11m; Al-b, Cu-b, Ti-b, Mg-b, ST, SS)

260-J. (Russian.) Coalescence of Graphite in Malleable Cast Iron. O. M. Galemina. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 168-169.

Influence of the number of graphite inclusions present after graphitization at 950°C. on the speed at which coalescence takes place during heat treatment at 1050°C. (J23b, N8s; CI-s)

261-J. (Russian.) Change and Restoration of the Properties of N36KHT Alloy Steel During Artificial Aging. Van-Zhun', B. G. Livshits and M. P. Usikov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 170-174.

Changes in electrical resistance and hardness of an Fe-Ni-Cr alloy caused by artificial aging, deformation and a further heat treatment. 7 ref. (J27d, P15g, Q29n, 3-68, 2-64; AY, *Ni, Cr*)

262-J. (Russian.) Kinetics of the Induction Heating of Pearlitic Cast Iron. I. N. Kidin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 206-213.

Temperature as a function of heating time. The shape of graphs is influenced by the heating speed and transformations occurring in the ferromagnetic phase. 4 ref. (J2g, P12, N8j, 3-67; CI)

263-J. (Russian.) Chemical Processes Occurring During the Heat Treatment of Steel in $NaNO_3$ and KNO_3 Baths. P. Ya. Yakovlev. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 233-238.

Chemical reactions between bath and components of steel, such as Mn, Si, Cr and C. (J2j; ST)

264-J. (Russian.) Oxidation and Nitration of Special Steels in Nitrate-Nitrite Media. P. I. Protsenko and N. P. Popovskaya. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 244-249.

Experimental heat treatment of the special steels KhVG, R9 and R18 in nitrate-nitrite salt baths. Chemical analysis of the surface layer. Effect of treatment on microhardness and corrosion resistance. 8 ref. (J28k, S11b, Q29q, R-general; ST)

265-J. Temperature-Control Methods in the Heat-Treatment of Aluminum Alloys. G. Fitzgerald-Lee. *Foundry Trade Journal*, v. 107, Aug. 27, 1959, p. 79-81.

(J-general, S16b; Al-b)

266-J. (Russian.) Hardening of Alloys by an Increased Heating Rate. I. N. Kidin and M. A. Shtremel. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 165-172.

Heating and quenching of Fe-Cr and Fe-Ni alloys. Influences of high heating rates, quenching media and cooling rates on the crystal structure and hardening effect. 12 ref. (J26, 3-67, M27; Fe-b, *Cr, Ni*)

267-J.* Austenitic "Cold Working" for Ultra High Strength. D. J. Schmatz, J. C. Shyne and V. F. Zackay. *Metal Progress*, v. 76, Sept. 1959, p. 66-69.

Materials with higher strength-to-weight ratio motivated search for new heat treating processes for steels. Study of plastic deformation in the austenitic "bay" of the TTT-diagram between pearlite and bainite, then quenching to prevent transformation to nonmartensitic products. (J26p, Q27; AY)

268-J.* (German.) Aging Process in Aluminum-Zinc Alloys. O. Dahl and H. Maacks. *Metall*, v. 13, Aug. 1959, p. 719-729.

Influence of quenching temperature, time-rate of quenching, purity, thermal shock and heating on aging. 36 ref. (J27d, J26n, 2-61; Al-b)

269-J. (Russian.) Heat Conduction Coefficients for the Heating of Steel in Salt

Baths. D. V. Budrin and E. L. Sukhanov. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 94-102.
10 ref. (J2j, P11h; ST)

270-J. (Russian.) Simplified Methods for the Computation of Heating Time for Steel Parts in a Salt Bath. A. P. Gulyaev and S. I. Artem'eva. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 103-108. (J2j; ST)

271-J. Induction Heating—Fast, Clean, Versatile. D. H. Lapray. *American Machinist*, v. 103, Sept. 21, 1959, p. 138-140. (J2g)

272-J. Developments in Heat-Treatment. Pt. 4. Hardening by Isothermal Heat-Treatment. J. McMullen. *Metalworking Production*, v. 103, Sept. 18, 1959, p. 1471-1473.
Martempering and austempering processes. (J26p)

273-J.* (German.) Carburization in Methanol by Induction Heating. W. Schnorr and W. Stuhlmann. *Harterei-Technik und Warmebehandlung (Supplement to Industrieblatt)*, v. 5, Aug. 1959, p. 399-403.
Carburization of SAE 8620 steel. Effect of temperature and time on distribution of carbon in the surface layer, hardness, structure and depth of hardness. (J28g, J2g, 2-61, 3-67, 2-60, Q29n; CN-g)

274-J.* (German.) Choice of Material, Surface Hardness and Depth of Case With Reference to the Kind of Wear. H. W. Gronegress. *Industrieblatt*, v. 59, Aug. 1959, p. 357-365.
Influence of hardening temperature and holding time and preheating on depth of case. End quench tests with cast steel. Wear resistance as a function of hardness. Dependence of the propagation speed of ultrasonic vibrations on quantity and size of graphite. 22 ref. (J2h, J5, Q9n, Q29n, N8s, Q21f; AY, ST, 5-60)

275-J.* Novel Form of Heat Treatment Reduces Foundry Rejects. *Iron Age*, v. 184, Sept. 17, 1959, p. 116-118.
"Determinant tempering" is performed by subjecting the casting, during its initial cooling from solidification, to an isothermal treatment. The temperature chosen for this isothermal anneal is at the nose of the TTT curve. (J29, N12; ST)

276-J.* Careful Stress Relieving Is the Key to Quality Welding of Alloy Piping. *Welding Design & Fabrication*, v. 32, Sept. 1959, p. 53, 78.
Induction heating of welded joints in Cr-Mo steel and 316 stainless steel pipes for use in steam power generator. (J1a, J2g; AY, SS, 7-51)

277-J.* (German.) Effect of Austenitization Conditions on the Transformation of High Speed Steels. A. Rose, L. Rademacher and J. M. Syk. *Stahl und Eisen*, v. 79, Sept. 1959, p. 1243-1258.
Analysis of technically feasible austenitizing processes with optimum hardening effects on high speed steels. Hardening temperatures of 1180-1310° C. were applied and quenching times varied from 10-300 sec. Minor melting effects were determined in the high-temperature range. Transformation behavior and interdependence of quenching hardness and austenitizing are investigated. (J22, J26; TS-m)

278-J.* (Swedish.) Hardening and Tempering Structures of Soft Steel. Sten Modin. *Jernkontorets Annaler*, v. 143, no. 6, 1959, p. 335-369.
Tensile and yield strength were about three times higher after quenching than after normalizing all steels. On tempering, the tensile strength was continuously lowered, while the yield strength first rose somewhat on annealing to 200-300° C. before starting to sink on tempering at higher temperatures. 14 ref. (J29, Q27a, J26; CN)

279-J.* Breakthrough in Heat Treating Promises Huge Gains in Strength. F. G. McGuire. *Missles and Rockets*, Sept. 28, 1959, p. 10-11.
Missile parts heat treated by new thermomagnadynamic process to produce improved tensile and fatigue properties. (J21, T24e)

280-J.* (Russian.) Changes of the Microstructure of Beryllium Bronze Caused by Aging. Yu. A. Skakov. *Izvestiya VUZ—Tsvetnaya Metallurgiya*, no. 4, 1959, p. 125-130.
Aging at 330 and 530° C. and its effect on the microstructure. Influence of aging time on hardness. 10 ref. (J27d, M27a, Q29n, 2-64, 3-67; Cu-s, *Be*)

281-J.* High-Temperature Carbonization of Steel by High-Frequency Heating in a Solid Medium. S. F. Yur'ev and S. K. Ginzburg. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 32-38.
Cementation in a packing material composed of charcoal and up to 16%

$BaCO_3$. Carbon content as a function of depth. Case depth varying with the $BaCO_3$ content in the packing material. Improvement of strength behavior by two subsequent heat treatments. 15 ref. (J28g, J2g, Q27a, 2-64; ST)

282-J.* Special Features of Nitriding of a 0.1% C, 13% Cr Steel. I. V. Samolov. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 39-41.

Nitriding of samples with spherical surfaces to study the reasons for defects such as scaling off, unequal depth or partial absence of the case. Good results were obtained on a steel with no less than 0.1% carbon and no more than 13% Cr, and by Cu plating in a thin layer before nitriding. (J28k, 2-61, L17; AY, *Cu,* 9)

283-J.* Low-Temperature Annealing of Carburized and Subsequently Quenched 0.30% C, 0.9% Mn, 0.9% Cr, 0.1% Ti Steel. V. V. Babayan. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 41-43.

After case hardening, the steel is heated up to 850° C. and oil quenched. Effect of subsequent annealing on hardness and impact strength. (J28g, Q29n, Q6n, 2-64; AY)

284-J.* Diffusion of Oxygen and Hydrogen Into Steel During Carburizing. O. K. Kotov. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 43-45.

Samples were treated in a furnace at 920-1050° C. using spindle oil, synthol or tri-ethanolamine as a carburizing medium. The distribution of carbon, nitrogen, oxygen and hydrogen is shown to a depth of 1.4 mm. (J28g, N1h, 2-66; ST, *C, O, H*)

285-J.* Surface Hardening of Automobile Pinion Gears by Cementation. B. A. Stetsenko. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 45-48.

Cementation of a number of pinions and samples in a gaseous medium under equal conditions. Variation of subsequent cooling and heat treatments and their effects on wear resistance, tensile strength and bending deflection. (J28, T21c, 2-64; ST)

286-J.* Heat Treatment of Stamping Punches and Dies. F. I. Golomazov. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 51.

Quenching of high-carbon steel in a salt bath composed of $NaNO_3$, KNO_3 and $NaNO_2$. Effects of crystal water present and of quenching time on hardness. (J26n, W28p; CN-r)

287-J. The Heat Treatment of Steel. Pt. 3. Spheroidizing Ball-Bearing Steels, Austempering and Martempering. Edwin Gregory and Eric N. Simons. *Edgar Allen News,* v. 38, Sept. 1959, p. 196-197.

(To be continued.) (J29, W27; ST, SGA-c)

288-J. Which Heat Treatment for the New Metals? Lloyd Allen and John Ham. *Metalworking,* v. 15, Oct. 1959, p. 30-35.

Suggested procedures for reactive metals. (J-general; EG-d)

289-J.* The Heat Treatment of Steel. Edwin Gregory and Eric N. Simons. *Edgar Allen News,* v. 38, July 1959, p. 153-155.

Heat treatment processes and sherardizing of ball-bearing steels and austempering. (To be continued.) (J-general; ST, 4-53, SGA-c)

290-J.* Heat Treatment of Steel. A. K. Banerjee. *Indian & Eastern Engineer,* v. 101, Jan. 1959, p. 33-36.

Methods of heat treatment to improve toughness and hardness. (J-general, Q29n, Q26; ST)

291-J.* (German.) Precipitation-Hardening of Stainless Steels. H. Anders. *Maschinenmarkt,* v. 65, Aug. 1959, p. 45-46.

Annealing, hardening and formation temperatures; weldability is a function of chemical composition. (J27, K9s, 2-60; SS)

292-J.* (German.) Nitriding Titanium Steel Used for Precision Casting. T. Visi. *Periodica Polytechnica (Budapest),* v. 3, no. 2, 1959, p. 163-168.

Advantages in the precision casting production of sewing machine parts with the use of nitriding Ti steels. When the Ti-C ratio is larger than 4 the hardness of the nitrided layer is equal to the cemented layer. The proposed surface thickness of 0.3 to 0.5 mm is reached at 550° C. in 4 hr. (J28k; E15; AY, Ti)

293-J.* The Right Heat Treatment Keeps It Stainless. Charles W. Sherman. *American Machinist,* v. 103, Sept. 7, 1959, p. 132-136.

Annealing, hardening, stress-relieving and tempering of martensitic stainless. Annealing austenitic and ferritic types. Treatment of precipitation hardening grades. (J-general; SS)

294-J.* Heat Treatment of Steel. Pt. 3. E. Gregory. *Edgar Allen News*, v. 38, Aug. 1959, p. 171-172.

Spheroidizing of ball-bearing steels, austempering, martempering and marquenching. (J23r, J26p; ST, SGA-c)

295-J.* Tool Steels and Heat-Treatments for Copper and Copper-Base Alloy Extruding. *Precision Metal Molding*, v. 17, Oct. 1959, p. 41.

Hardness properties, quenching and tempering procedures for H12, H14, H21, H26 toolsteels. (J26, J29, Q29n; TS)

296-J. How Germany Uses Surface Flame Hardening. Pt. 2. W. A. Hawkins. *Metalworking Production*, v. 103, Sept. 25, 1959, p. 1507-1510.

Flame hardening of gears. (J2h, T7a)

297-J. (Dutch.) Heat Treatment Practices of Willem Smit & Co.'s Transformatorenfabriek N.V. in Nijmegen. S. F. A. Winters. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 234-237.

Examples of induction heat treatment of large welded units. (J2g, J1a; 7-51)

298-J.* The Tempering of 2 1/4% Cr-1% Mo Steel After Quenching and Normalizing. R. G. Baker and J. Nutting. *Iron and Steel Institute*, Journal, v. 192, July 1959, p. 257-268.

Structural reactions and mechanical properties of steel specimens during and after tempering and austenitizing under experimental conditions. (J29, J22, J26, J24; AY, *Cr*, *Mo*)

299-J. (Russian.) Structural Changes in Steel During Resistance Annealing. V. N. Gridnev and V. I. Trefilov. *Izvestiya Adademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 62-69.

Carbon steel is quench hardened and subsequently treated in liquid air. The effect of annealing, performed by resistance heating, on the number of second and third order dislocations and size of mosaic blocks. Changes of tensile strength, ductility and hardness caused by the annealing temperature and heating speed. 17 ref. (J23, 1-68, 2-61, 3-67, M26b, Q27a, Q23p, Q29n; CN)

300-J. (Russian.) Application of an Ionized Gas Current Produced by an Electric Arc for Heating Purposes. I. D. Kulagin and A. V. Nikolaev. *Izvestiya Adademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 78-81.

Parameters influencing the heating power, such as position of electrodes, current density and gas consumption. (J2, E10b)

301-J.* (Japanese.) Warm Working of Medium Carbon Steel. Michio Ono. *Sumitomo Metals*, v. 11, Apr. 1959, p. 36-44.

Steel specimens quenched or tempered; resulting mechanical properties compared. (J26n, Q-general, J29, 3-68; CN-p)

302-J.* (Russian.) Use of a Sylvinite Bath When Heating Parts Before Quenching. A. Ya. Antyshev. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 60.

Heating of steel parts in a bath of molten sylvinite of 840-860° C. Formation of a brown stain appearing on the surfaces after oil quenching can be avoided by slow addition of 20% caustic soda and 2-4% sodium cyanide. (J2j; ST)

303-J.* (Russian.) Optimum Heat Treatment Conditions for the High Manganese Steel G13-L. Ya. K. Alekseev and P. T. Khokhlov. *Metallovedemie i Termicheskaya Obrabotka Metalloy*, Sept. 1959, p. 60-62.

Modification of heating rates and conditions causes no remarkable change of tensile strength and other mechanical properties which can be improved, however, by a higher cooling rate in quenching. (J-general, Q27a, 3-67; AY)

304-J. Annealing Methods Integrated for Processing Stainless Steel Strip at New J. & L Plant. *Industrial Heating*, v. 26, Sept. 1959, p. 1695-1696, 1698, 1700.

(J23; SS, 4-53)

305-J.* The Influence of Tempering Time on Some of the Mechanical and Physical Properties of Steel. J. L. Aston. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 377-382.

Effect on strength and ductility in low-alloy steel investigated by mechanical testing, microscopy and X-ray analysis. An apparatus for uniform heat treatment of small steel specimens, lasting only a few seconds, is described. Specimens tempered at higher temperature for a shorter time have better ductility. 5 ref. (J29, Q23q, Q27a; AY)

306-J.* Annealing Nickel, Monel and Inconel. *Inco Technical Bulletin T20*, Sept. 1959, 22 p.

Stress equalizing, stress-relieving and annealing of Monel, "K", "R" and "S" Monel, Inconel, Incoloy, Duranickel, nickel-clad, Monel-clad, and Inconel-clad steel. Effects of pre-annealing treatment, furnace atmospheres and cooling. 22 ref. (J23, J26, J1, Ni-b)

307-J.* Better Use of Atmospheres in Heat Treating and Metal Processing. Pt. 1. Trends in Atmospheres. *Metal Progress*, v. 76, Oct. 1959, p. 146-150.

Typical protective atmospheres; vacuum as an atmosphere; other developments. (J2k, 1-73)

308-J.* Better Use of Atmospheres in Heat Treatment. Pt. 2. What's New in Atmosphere Controls. *Metal Progress*, v. 76, Oct. 1959, p. 150-153.

Survey of typical equipment. (J2k, 1-52)

309-J.* Better Use of Atmospheres in Heat Treating and Metal Processing. Pt. 3. Choosing the Right Atmosphere. L. L. Patton. *Metal Progress*, v. 76, Oct. 1959, p. 154-156.

Characteristics of common atmospheres and some rules for their selection. (J2k)

310-J.* Atmospheres in Missile Heat Treatment. N. K. Koebel. *Metal Progress*, v. 76, Oct. 1959, p. 156-157.

Furnace atmosphere in the production of the Minuteman must be controlled to eliminate total decarburization and hold partial decarburization to under 0.003 in. Equally important, partial carburization must be held under 0.003 in. (J2k, J28g, T24e)

311-J.* Tool Steels and Heat-Treatments for Steel Extrusions. *Precision Metal Molding*, v. 17, Nov. 1959, p. 64.

Heat treatment procedures for H12, H22, H11, H21, Rexalloy A and Rexalloy 33 toolsteels to produce dies free of local stress risers. (J-general, W24n; TS)

312-J.* (Czech.) Properties of Austenitic Electrodes E 391 and E 891. L. Pilous. *Zvaranie*, v. 8, July 1959, p. 206-210.

Homogenizing and annealing temperatures influence the properties of E 391 and E 891 austenitic electrodes. The magnetic phase is almost completely destroyed at temperatures of 550-750° C. (J23, J21, W29h; SS-e)

313-J.* (German.) Stress Properties of Titanium Alloys After Annealing in Different Gases. H. Wiegand and K. H. Illgner. *Metalloberflache*, v. 13, Aug. 1959, p. 234-237.

Reactions taking place between Ti and gases produced in the annealing atmosphere at temperatures of 500° C. Zones influenced are centered mainly in the thin surface layers. Effect of annealing temperature, time and atmosphere on mechanical properties (J23q, N15e, 2-61, 3-67; Ti-b)

314-J.* (German.) Dynamic Strength and Wear Properties of Salt-Nitrited Nodular Cast Iron Gear Wheels. H. Wiegand and H. Hentze. *Metalloberflache*, v. 13, Aug. 1959, p. 238-242.

Improved strength and wear properties result from salt-nitriding; effect of nitriding time in increasing wear and strength values. (J28k, Q29a, T7a, Q9; CI-r)

315-J. High Frequency Resistance Heating for Wire Annealing. Hugh Cameron. *Metal Treating*, v. 10, Sept-Oct. 1959, p. 8-9.

Thermatool annealer utilizes radically new method of heating and annealing any water-quenchable metal wire. (J23, J2; 4-61)

316-J. (Russian.) Induction Heating of Nickel, Titanium and Brass Ingots With Frequencies as Used in Industry. S. S. Zuev and V. V. Krapukhin. *Tsvetnye Metally*, no. 2, 1958, p. 63-68.

(J2g; Ni, Ti, Cu-n, 5-59)

317-J. (Russian.) Homogenization Annealing of Duralumin Ingots in New Type Electric Furnaces With Air Circulation. A. I. Kolpashnikov and V. D. Korolev. *Tsvetnye Metally*, no. 4, 1959, p. 64-69.

(J21, W27j; Al-b, 5-59)

318-J. (Russian.) Industrial Application of Bright Annealing. V. I. Orlov. *Tsvetnye Metally*, no. 1, 1958, p. 71-76.

Annealing operations with cupro-nickel tubing. (J23a; Cu-b, 4-60)

319-J. (Russian.) Control of the Carbon Content on the Carburized Surface Layer. E. M. Morozova and F. R. Florensova. *Stanki i Instrument*, Sept. 1959, p. 31-34.

(J28g)

320-J.* Quick Chill Aids Hot-Working. *Iron Age*, v. 184, Nov. 12, 1959, p. 160-161.

Die-quenching process reduces cooling time. The die is cast with a 3-in. pipe running through its center with holes

drilled through both. Air at subzero temperature and 60 psi. blasts through the die, chilling the part. (J26)

321-J.* Try Compromise Heat Treatments for Dissimilar Clad Metals. R. C. Bertossa and A. C. Fortlage. *Iron Age*, v. 184, Nov. 12, 1959, p. 162-164.

Heat treatment of clad metals, such as stainless steel on low carbon steel. (J-general; 8-66)

322-J.* Some Age Hardenable Copper Base Alloys for Wire Products. Donald E. Pardon. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1313-1316, 1412-1415.

Effect of process variables, including subsequent forming operations, on tensile properties, electrical conductivity and formability. (J27d, P15g, Q27a; Cu-b, 4-61)

323-J.* (German.) Factors Influencing the Case Hardening of Steel. A. Legat. *Harterei-Technische Mitteilungen*, v. 14, no. 1, 1959, p. 51-67.

Influencing factors cannot be limited to conventional composition analysis and grain size determination although homogeneity degree remains the most decisive factor. The difference in carbon content between the steel core and the carbonized boundary between the case and the core. 13 ref. (J28, J5, 2-59, 2-60; ST, Cr)

324-J.* (French.) Carbonitriding. D. Flamment. *Metallurgie et la Construction Mecanique*, v. 91, Sept. 1959, p. 641-644.

Use of low temperatures; structural changes occurring in steels; composition of atmospheres; influence of dew point of atmosphere on carbon concentration in hardened layer. 5 ref. (J28m, J2k; ST)

325-J. Surface Hardening of Titanium. *Crucible Titanium Review*, v. 7, Oct. 1959, p. 7-8.

Summary of available processes for surface hardening Ti. (J28; Ti)

326-J. (Russian.) Elimination of Low-Temperature Annealing of LS63-3 Brass Rods. I. A. Morosnikov. *Tsvetnye Metally*, no. 11, 1958, p. 67-70.

(J23p; Cu-n, 4-55)

327-J. (Dutch.) Heat Treatment of Steel. Pt. 1-2. P. J. Kool and J. van der Linde. *Metalen*, v. 14, Sept. 30, 1959, p. 276-279; Oct. 15, 1959, p. 294-297.

(J-general; ST)

328-J. (Hungarian.) Nitriding of Ferrochrome and Ferromanganese. V. Bela and V. Laszlo. *Kohaszati Lapok*, v. 92, no. 9, 1959, p. 407-409.

(J28k; Fe, *Cr*, *Mn*, AD-n32)

329-J. (German.) Induction Hardening. W. Kamphaus. *Harterie-Technik und Warmebehandlung (Supplement to Industrieblatt)*, v. 5, Sept. 1959, p. 66-71.

(J2g, T7; ST)

330-J. (Hungarian.) Industrial Practice in the Heat Treating of Light Alloy Pistons. B. Albin. *Kohaszati Lapok-Ontode*, v. 92, Sept. 1959, p. 215-216.

(J-general, T21b; Al-b)

331-J.* (Pamphlet.) Study on Carburizing Ability of Steel. Asei Tsutsui, Takao Furumoto and Mutsuo Ichihara. 23 p. 1959. Toyo Kogyo Co., Ltd., Japan.

Parts of uniform quality may be expected from the continuous gas carburizing process as the carbon penetration curve is uniform. When the carburizing ability of steel increases, the quenching distortion of eccentric test piece becomes large, value of maximum tangential compressive stress in the residual stress decreases and the breaking load and deflection of bending test decreases. (J28g; ST)

332-J. (Translation—Brutcher no. 4592.) Effect of Chemo-Thermic Treatment on Heat Resistance of Alloys. V. P. Elyutin, E. I. Mozzhukhin and V. I. Shulepov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 427-432.

(J-general, 2-66, Q-general, 2-61; 14-68)

SECTION K

JOINING

1-K. A Study of the Deterioration of Adhesives in Metal Bonds at High Temperatures. J. M. Black and R. F. Blomquist. Dept. of Agriculture. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131500, Mar. 1956, 45 p. $1.25.

Performance characteristics of laboratory formulated phenol-formaldehyde-epoxy resin adhesives. Thermal resistance of adhesive bonds in Al and stainless steel as affected by preparation of the metal surface, curing conditions, aging temperature, aging time, atmosphere during aging and stress during aging. Aging of Al bonds at 300 and 400° F. under stress increased the strength of bonds later tested at -70 and 80° F. by as much as 30%. Cycling of bonded Al and stainless steel between 450 and -55° F. produced no evidence of failure caused by thermal shock or differences in expansion between adhesive and adherend. (K12, Q27a, 2-61; Al-b, SS, SGA-h)

2-K. Prevent Hot Cracking in Welding. *Metalworking Production*, v. 102, Oct. 31, 1958, p. 1908.

(K1; ST, 9-72)

3-K. (French.) Factors Influencing Quality of Welding Beads. *Metallurgie et la Construction Mecanique*, v. 90, Oct. 1958, p. 743-751.

German research work on the mechanical properties of welding beads obtained under various temperature and welding conditions. Preparation of test specimens, study of some samples. Influence of hydrogen content; decisive influence of temperature during welding. 7 ref. (K1, K9r, Q-general; 2-60, 2-61)

4-K. (German.) Contribution of Elin to Development of Arc Welding. Richard Marek. *Elin-Zeitschrift*, v. 10, June 1958, p. 63-72.

Short history of arc welding at Elin. 3 ref. (K1, A2)

5-K. (German.) Automatic Welding of Freight Car Side Walls. R. Schuster. *Elin-Zeitschrift*, v. 10, June 1958, p. 106-109.

(K1, T23p, 18-74)

6-K. (Russian.) Joining of Metals by Ultrasonic Waves. Yu. I. Kitaigorodskii, M. G. Kogan, V. A. Kuznetsova, N. N. Rykalin and L. L. Silin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, Aug. 1958, p. 88-90.

Joining Cu, Al, duralumin, stainless steel. The metal through which the ultrasonic waves will be induced is limited in thickness (0.1 - 1.5 mm. for the above nonferrous metals, 0.2 - 0.7 mm. for stainless steel.) (K6r; Cu, Al-b, SS)

7-K.* (German.) Elin-Hafergut Welding Process. *Elin-Zeitschrift*, v. 10, June 1958, p. 79-84.

A heavy coated electrode is placed horizontally over the joint to be welded and covered by a copper bar. After being ignited the electrode melts automatically in this position. Sheet metal thickness is 0.8 to 3 mm. for butt weld, 0.5 to 0.8 mm. for lab weld, 5 mm. and thicker for fillet weld. Description of different parts welded by this method. (K1a)

8-K.* Edge-Welding Small Containers. D. W. Grobecker. *Metal Progress*, v. 74, Nov. 1958, p. 104-107.

Gas-tight edge welds between walls and bases in simple semi-automatic devices. (K1d; T1)

9-K.* (Spanish.) Fatigue Resistance of Butt-Welded Joints Executed by the "Fusarc" and "Unionmelt" Processes. Zosimo García and Francisco Cacho. *Ciencia y Técnica de la Soldadura,* v. 8, July-Aug. 1958, 18 p.

In experimental welding of carbon steel, both techniques produced joints of approximately same average fatigue resistance (about 17.5 kg. per sq.mm.) when tested under cyclic load and without machining of reinforcement, which was excessive. Manually executed joints made with acid and rutile electrodes showed slightly high resistance, but this could be due to differences in base and filler metals. (K1, Q7a, 7-51)

10-K.* Welding Stainless Steels and h.t. Alloys. *Canadian Metalworking,* v. 21, Nov. 1958, p. 38, 40, 42, 44, 46.

Selection of welding techniques, mechanical properties of weld deposits, weldability of age hardening group, including Ni-Cr-Fe alloys. 12 ref. (K1a, K9s; SS, Ni-b, SGA-h)

11-K.* Soundless Soldering and Welding. E. J. Clement. *Mill and Factory,* v. 63, Oct. 1958, p. 108-109.

Ultrasonic energy is introduced into the weld area for a very short cycle—only fractions of a second in some cases. The vibratory energy produces a "solid-state metallurgical bond". Since no heat is applied externally, deformation is very slight. Successful results have been obtained with Al and stainless steel. (K6r; Al, SS)

12-K.* Gas Shielded Self Adjusting Arc Welding as Applied to Steels. Pt. 2. H. Levinsohn. *New Zealand Institute of Welding,* v. 13, Aug. 15, 1958, p. 307-310.

Importance of Ca-Si relationship in mild steel weld deposit. Welding conditions using oxy-argon and CO_2 gas shield, advantages and limitations, cost and health hazards. (K1d; ST)

13-K.* High Temperature Brazing. Charles Raffelock. *Production,* v. 42, Nov. 1958, p. 72-75.

Results of search for tough heat resistant alloys and furnaces that will join metals which do their work above 1000°. (K8j, 2-62; Ni-b, Ti-b, SS, Pd, Mn, Ag, SGA-h)

14-K. Gas Shielded Welding of Structural Grade Carbon Steel. R. A. Stringer. *Australian Welding Journal,* v. 1, Aug. 1958, p. 19-23.

(K1d; CN)

15-K. Special Welding Problems in Nuclear Engineering. *Brown Boveri Review,* v. 45, June 1958, p. 272-279.

(K-general, T11)

16-K. Salvage of Iron Castings by Welding. Jose Carlos Pellegrino. *Foundry Trade Journal,* v. 105, Nov. 6, 1958, p. 573-574.

Arc welding best. (K1; CI-n, 18-72)

17-K. Practical Aspects of Automatic Welding. Pt. 2. J. A. Lucey. *Welding and Metal Fabrication,* v. 26, Nov. 1958, p. 397-402.

Practical application of Unionmelt submerged-arc, Fusarc, Fusarc CO_2 visible-arc processes. Basic requirements of joint design; edge preparation; welding variables. (K1, 1-61)

18-K. (Italian.) Dynamic Behavior of Rotary and Static D-C. Arc-Welding Machines With Rectifiers, Tested With Basic, Acid and Cellulose-Coated Electrodes. Antonio Carrer. *Rivista Italiana della Saldatura,* v. 10, May-June, 1958, p. 97-107.

(K1, W29h)

19-K.* (German.) Development of a Weldable Manganese-Titanium-Aluminum Alloyed Steel St 52 in Hungary. G. Kristof, E. Szues, J. A. Vero and B. Zorkoczy. *Neue Hutte,* v. 3, July 1958, p. 425-432.

Experiments, including weldability tests, to find influence of Ti on the steel; applicability of St 52 steel; standardization and production of Mn-Ti-Al steel. 17 ref. (K9s; AY, *Al, Mn, Ti*)

20-K.* (German.) Automatic Welding of Pipelines With Magnetically Controlled Arc. H. Gunther. *Schweissen und Schneiden,* v. 10, Oct. 1958, p. 385-394.

Use of special electrodes gives uniformly good welds in all circular positions. Single-arc equipment capable of handling

pipes up to 12 in. diameter, multiple arcs tested up to 36 in. diameter. 12 ref. (K1, 18-74; ST, 4-60)

21-K. Fabricator Sets Up "Countdown" to Insure Top-Quality Welds. R. F. Gurnea. *Iron Age*, v. 182, Nov. 27, 1958, p. 65-68.

Intensive inspection system to insure sound welds of elbows from Type-304 stainless steel. (K9r, S13; SS)

22-K. Bonding Iron to Aluminium by Casting-On. *Light Metals*, v. 21, Nov. 1958, p. 355-356. (From Technical Report No. G33/K29 by Hermann Kessler, Laboratouriumsleiter der Aluminiumwerke Nurnberg G.m.b.H., reprinted from *Klepsig Fachberichte*, no. 11, 1957.)

(K5k; Fe, Al, 5-60)

23-K. Welding Standard for Aluminum and Magnesium. *Light Metals*, v. 21, Nov. 1958, p. 363.

British standards for terminology, materials, methods, etc., for manual argon-arc welding. (K1d, S22; Al, Mg, 15-55)

24-K. Automatic Welding: Some Considerations on Its Use. I. C. Fitch. *Metropolitan-Vickers Gazette*, v. 29, Oct. 1958, p. 265-273.

Factors affecting choice of automatic welding; examples of different types of machines. (K1, 18-74, 1-52)

25-K. Resistance Welds Will Improve If You Know Your Metals and Electrodes. Lester F. Spencer. *Welding Engineer*, v. 43, Dec. 1958, p. 54, 56, 58, 59.

Material standards for electrodes and weldability of Cu-base alloys, carbon and low-alloy steel, Sn, Al alloy, Zn, Pb, Ni, muntz metal. (K3, S22, W29h; Cu-b, Sn, Al-b, Zn-b, Pb-b, Ni-b, Cu-s, SS, CN, AY)

26-K. (French.) Chronicle of Steelmaking. Progress in the Welding of Steels. G. Grenier. *Echo des Mines et de la Metallurgie*, Sept. 1958, p. 537-539.

Arc welding. Electrodes, atmospheres, preheating, controlled cooling of welds. (Concluded.) 14 ref. (K1; ST)

27-K. (French.) Planned Standard Code for Filler Metals Used in Gas Welding. *Revue de la Soudure*, v. 14, no. 3, 1958, p. 158-159. (K2, S22, W29h)

28-K. (German.) Welding Collars on Cast Iron Pipelines With Screwed Fittings, M. Jurgens. *Schweissen und Schneiden*, v. 10, Oct. 1958, p. 411-412.

(K2; CI, 4-60)

29-K. Use of CO_2 Arc Welding Expanding in Automative Plants. Andrew W. Shearer. *Automotive Industries*, v. 119, Nov. 1, 1958, p. 64-65.

New process limits weld current to permit "all-position" welding of light-gage metals with larger and lower-cost wire sizes. (K1d, T21a)

30-K.* (German.) Influence of Welding on Design and Manufacture of Industrial Products. H. Seifert. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 535-540.

Examples from the fields of bridge, railway car, locomotive and boiler construction. Application of inert atmosphere welding in the construction of boilers. (K-general, K1d, T26q, 17-51)

31-K.* (Czech.) New Experiences With CO_2-Shielded Arc Welding. Zdenek Duben. *Zvaranie*, v. 7 Sept-Oct. 1958, p. 284-286.

Porosity of the filler metal is main problem. Can be eliminated by additions in coatings of electrodes or in cores of hollow electrodes and by welding machines that automatically stabilize the welding speed according to the length of arc. (K1d, W29, 9-68)

32-K.* (Slovak.) Argon Shielded Welding Applied in the Construction of Steam Generators. Jan Novotny. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 289-291.

Advantages of the process for welding Cr-Ni and Mn-Cr austenitic steels are: minimum oxidation of alloying elements; uniform root weld producing a minimum of stress; reduced costs by use of uncoated electrodes; comparatively low costs of equipment. (K1d, W11K; SS-e)

33-K.* (Czech.) Welding of Alloy Steels in the Lenin Works in Pilsen. Vaclay Pilous. *Zvaranie*, v. 7 Sept-Oct. 1958, p. 291-297.

Composition, primary heat treatment, welding directions for steel used in construction of steam turbines. (K9s, W11K, 2-61, 2-60; SS-b)

34-K.* (Czech.) Friction Welding. J. Mandaus and J. Voboril. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 307-314.

Welding heat is obtained by friction between the rotating parts forced together by compressed air. Technology, bending tests, macrostructure and microstructure; weld economy. 6 ref. (K6;ST)

35-K.* (German.) Strength Properties of Fusion Welded Copper Sheet. H. Fiehn. *Metall*, v. 12, Nov. 1958, p. 1004-1005.

"SD-Cu" sheet gas butt welded with commercial welding wire for Cu. Porosity of joint disappeared after hot hammering. Gas welding with a wire such as used in inert gas welding produced a joint free of pores even without subsequent hammering. 5 ref. (K1d, K2, W29h, 2-60; Cu, Cu-b, 9-68)

36-K. Practical Approach to Inert Gas Welding of Nonferrous Metals. John Palmer. *Australian Welding Journal*, v. 2, Sept. 1958, p. 18-19.

(K1d; 1-52; EG-a38)

37-K. (Czech.) Automatic Slag Welding of Steels 11 474 and 13 123 up to 120 MM. Thick. Antonin Kovar. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 261-270.

(K6, 1-68; ST)

38-K. (Czech.) Submerged Arc Welding Equipment. Milos Zaruba. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 278-282.

(K1e, 1-52, W29c)

39-K. (Czech.) Field Welding. Rudolf Kapoun. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 314-320.

Welding of gas and chemical tanks. (K-general, T26q)

40-K. (German.) Attaching of Ceramic Cutting Plates by Epoxy Resin Adhesive. R. Reinhold. *Fertigungstechnik*, v. 8, Aug. 1958, p. 353-355.

(K11b, T6n)

41-K. (German.) Adhesive Bonding of Metal Parts by Special Equipment. H. Kretzschmar. *Fertigungstechnik*, v. 8, no. 10, 1958, p. 466-469.

(K12)

42-K. (German.) Welding of Copper Alloys. R. Kocher. *Metall*, v. 12, Nov. 1958, p. 1007-1014.

Processes adequate for brass with more than 54% Cu, phosphor bronzes, Si bronzes, Al bronzes and Cu-Ni alloys with 4-46% Ni. 10 ref. (K-general; Cu-b, Cu-s, *Al, P, S, Ni*)

43-K. (Slovak.) Welding Technology and Mechanical Engineering. Josef Cabelka. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 257-261.

(K-general, A4)

44-K (Slovak.) Slag Welding Equipment. Martin Mosny. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 270-274.

5 ref. (K6, 1-52)

45-K. (Slovak.) Economics of the Slag Welding Process. Julius Zeke. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 274-278.

(K6, A5f, 1-68)

46-K. (Slovak.) Some Applications of Submerged Arc Welding. Jaroslav Stembera. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 282-284.

Welding sheet 1 to 2.5 mm. thick of medium alloy; repair of rollers. (K1e)

47-K. (Slovak.) Welding With CO_2-Shielded Carbon Electrode. Anton Hrabovec. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 286-288.

(K1d)

48-K. (Slovak.) Some Problems Occurring in Welding Under Carbon Dioxide. Ladislav Lanyi. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 288-289.

Carbon dioxide protects only against the action of nitrogen and hydrogen since oxygen is freed in welding from the protective gas itself. (K1d)

49-K. (Slovak.) How to Increase the Lifetime of Ploughshares. Jan Skriniar. *Zvaranie*, v. 7, Sept-Oct. 1958, p. 300-303.

Weld repair and hard facing. (K1, L24, W29h; ST, 18-72)

50-K. Fundamentals of Diffusional Bonding. Pt. 3. L. S. Castelman and L. Seigle. Sylvania Electric Products. U. S. Atomic Energy Commission, SEP-251, June 30, 1958, 28 p. (Available from U. S. Office of Technical Services, Washington D. C.) $ .75.

Interdiffusion in the Al-U system and effects of applied pressure. UAl_3 layer growth is accelerated by increasing applied pressure. Growth kinetics are characterized by a "transient" period, during which growth occurs non-parabolically and is followed by a "steady state" period of parabolic growth. Correlations exist between annealing time, annealing temperature and pressure on the one hand and the nature and distribution of structural defects in the UAl_3 diffusion zone. 18 ref. (K5k, 3-74, 2-64; Al; U)

51-K. (Book-Russian.) Contact and Roll Welding of Special Steels and Alloys. D. S. Balkovetz, B. D. Orlov and P. L. Chuloschnikov. 422 p. 1957. Oborongiz, Moscow, USSR. 16 R, 25 K.

Techniques, machines, circuits, generators; basic methods used in quality welding; causes of poor welding; composition of welding rods. (K1, K5j)

52-K.* Magnetic-Force Welds Join Vinyl-Clad Steel. F. R. Park. *Metalworking Production*, v. 102, Nov. 28, 1958, p. 2079-2082.

By projection welding techniques, extremely short weld time and high voltage are realized in resistance welding. (K3; ST, NM-d, 8-69)

53-K. Tests for the Evaluation of Weldments. L. R. Jackson. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 518-556.

Circumstances under which a failure may initiate and then propagate as a crack or system of cracks showing little ductility. Failures of this type always originate as a disconinuity, which may be a design feature, such as a sharp notch or fillet, or may be an unintentional flaw or crack. Most tests therefore incorporate some sort of notch or crack as a part of the test piece. 30 ref. (K9r, Q26q)

54-K.* (Russian.) Slag Welding by Means of Strip Electrodes. B. A. Kokh. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 3-7.

Relation between separate parametric weld conditions and effect of their changes on the process stability and on size and shape of the seam. Charts illustrate various relationships, such as depth of slag bath and pressure, size of weld bead, speed at which current is supplied to the electrodes, current density. (K6)

55-K.* (Russian.) Method of Evaluating Notch-Ductility and Sensitivity to Low-Temperature Practice in Manual and Semi-Automatic Welds. M. M. Kraichik and N. V. Pashkov. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 7-9.

Various positions of a notch in steel specimen for testing ductility and cold brittleness. Ductility value and threshold of weld seam change, depending on position of notch and whether weld layer was heat treated or not. (K9r, Q26s, Q23p, 2-64; ST)

56-K.* (Russian.) Study of Pipe Pressure Welding. V. D. Taran, N. V. Bobritskii, A. S. Fal'kevich and I. E. Neifeld. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 12-14.

Diffusion and nondiffusion hypotheses in pressure welding. (K5, K9n, N1c; ST, 4-60)

57-K.* (Russian.) Effect of Twin-Arc Welding Conditions on Fusing of Electrodes and on Parent Metal. V. N. Sherstyuk. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 15-16.

Twin-arc welding can be carried out with thin welding rods as electrodes with or without flux. Voltage of the second arc in a stable parameter is greater than in the first. Distance between arcs, as the rate of welding is increasing, must be shortened, since the length of the molten bath is reduced. (K1g)

58-K.* (Russian.) Automatic Overhead Submerged Arc Welding of Pipes. A. S. Fal'kevich, A. G. Mazel, Yu. T. Marchenko and I. I. Mikhlin. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 19-22.

Data for butt welded pipe of carbon and low-alloy steels. (K1e, K9r, 18-74; CN-g, AY)

59-K.* (Russian.) Selection of Spot Welding Conditions for High-Strength Aluminum Alloys. B. D. Orlov and P. L. Chuloshnikov. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 23-26.

Description and operation of welding machines. (K3n, 1-52; Al)

60-K.* (Russian.) Application of Gas Welding in Repairing Cast Iron Parts. K. P. Voshchanov. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 26-29.

Gas welding produces a bond equal in strength, structure and ease of mechanical working to those of native metal. Requires preheat of 300 to 400° C. (K2; CI, 18-72)

61-K.* (Russian.) Welding of Low-Alloy Steel in Railroad Cars. I. T. Zhdan. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 35.

Results depended upon type of electrodes used. In some cases these were nonfusion defects and in other cases good results. (K1, T23p; AY)

62-K.* (Russian.) Elimination of Cracks in Medium-Carbon Steel Castings by Welding. A. I. Pashchenko. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 36.

Techniques and results in welding together a hollow cylindrical stand cast in two parts. (K1, T26q; CN, 5-60)

63-K.* (Russian.) Use of Slag Crust as a Flux in a Six-Electrode Automatic Welder. E. D. Lonskii and N. P. Emel'yanov. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 38-39.

Experiment on wheel rim of railway steam engines. Slag crust as a flux gives a solid nonporous seam, does not lower the manufacturing properties of native metal, is economical and is recommended for beaded weld seams. (K1g, T23; ST)

64-K. Brazing—Practical and Versatile Art. H. Thomasson. *Canadian Metalworking*, v. 21, Dec. 1958, p. 30-32.

Survey on high-frequency, furnace and resistance brazing. (K8j, K8k, K8m)

65-K. Determination of Arc Welding Costs. Pt. 1. H. Thomasson. *Canadian Metalworking*, v. 21, Dec. 1958, p. 42-46. (K1, 17-53)

66-K. Transition Layer Is Key to Good Ceramic-to-Metal Bonds. G. R. Van Houten. *Materials in Design Engineering*, v. 48, Dec. 1958, p. 112-114. (K11b)

67-K. Welded Rings Cut Costs. *Steel*, v. 143, Dec. 29, 1958, p. 68-59.

With proper steel and flash buttwelding, will perform like a solid piece. (K3r; ST, 4-53, 4-55)

68-K.* (German.) Electric Arc Welding With High-Duty Electrodes. E. Kauhausen, P. Kaesmacher and F. J. Adamski. *Werkstatt und Betrieb*, v. 91, Oct. 1958, p. 597-603.

High-duty electrodes with cover thickness surpassing by about a half that of standard types tested to compare performances in respect to flash welding capacity, weld appearance, depth of penetration and most favorable width of gap with corresponding data of standard electrodes. (K1a, W29h)

69-K.* (Russian.) New Fluxes for Arc Welding. K. V. Lyubavskii and E. P. L'vova. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 1-5.

New flux FTSK makes possible welding high-alloy steels and alloys. Among its advantages is complete elimination of slag scabs from the surface and no escaping gases during welding. (K1; SS, RM-q)

70-K.* (Russian.) Iron-Nickel Electrodes for Cold Welding of High-Strength Iron and Gray Cast Iron. G. N. Larin, V. V. Bazhenov and L. M. Yarovinskii. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 5-8.

Cold welding may eliminate defects arising in hot welding. Cold welding with austenitic Fe-Ni electrodes has high tendency to form cracks. This can be avoided by introducing light alloy eutectoid in metal seam. 5 ref. (K1, W29h, 1-67; CI-c, CI-n, Fe, Ni)

71-K.* (Russian.) Weldability of Oxygen Melted Converter Steel. A. S. Astaf'ev. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 12-14.

Welds in rimming converter steel have tendency to hot cracks when sulphur in base metal exceeds 0.05%. Impact toughness of articles made from converter steel is much higher after aging, particularly when metal surface was blown with pure oxygen. Mechanical properties of welds are in every respect equal to those of rimming openhearth steel. 3 ref. (K9s, D3f, 9-72; ST-d)

72-K.* (Russian.) Effect of Boron on Tendency of Heat Resistant Austenitic Steels to Crack During Welding. A. V. Russiyan and M. Kh. Shorshorov. *Svarochnoe Proizvodstov*, Oct. 1958, p. 14-18.

Search for new austenitic heat resistant steels and welds to withstand continuous rise in steam pressure and temperature of modern turbines. Increase of B content from 0 to 0.015% lowers the temperature in zone adjacent to welds from 1150 to 1010° and widens temperature intervals of embrittlement as result of decomposition of B compounds along grain boundaries. Flux composition has greatest effect on hot crack formation. 4 ref. (K9s, W11m, 2-60, 9-72; SS-e, *B*)

73-K.* (Russian.) Electroslag Welding of 20 GS Steel. V. M. Semenov. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 21-23.

Electroslag welding of a low-alloy steel for large components of hydroturbines. This steel has good weldability

and good weld properties. Low carbon content permits electroslag welding without preliminary heating which creates danger of crack formation. Steel 20 GS is rapidly becoming the accepted steel for weld-forging and weld-casting. (K6, W11n; AY)

74-K.* (Russian.) Features of Welding the First Layer of Gas Turbine Rotor Butt Seams. V. A. Toropov. *Svarochnoe Proizvodstov*, Oct. 1958, p. 24-26.

Welding of parts for 10-ton rotor of austenitic steel. Tests show that one means of eliminating rupture in metal seams between gaps is to widen these gaps. Also use of lining between parts of butt seam lessens danger of rupture. Metallic coated electrodes were used. 8 ref. (K1a, W11m; SS-e)

75-K.* Adhesive Bonding of Titanium. H. E. Pattee, C. E. Faulkner and P. J. Rieppel. *Light Metal Age*, v. 16, Dec. 1958, p. 22-24, 27, 33.

Effect of surface treatment on the lap-shear strength joints; average lap-shear strengths of joints made with various alloys; effect of surface treatment on hydrogen pickup; production considerations. (K12; Ti-b)

76-K.* (French.) Arc Welding With Coated Electrodes. J. Hinde. *Revue du Nickel*, V. 4, Sept-Oct. 1958, p. 79-89.

Factors deciding choice of metals to be used together, selection of electrodes, welding techniques. 10 ref. (K1a; ST, Ni-b)

77-K.* (German.) Welding of Copper. Otto Horak. *Schweisstechnik*, v. 12, Oct. 1958, p. 136-140.

Problems due to chemical properties of metal, high conductivity, shrinking during cooling, stresses, O content of commercial Cu; tendency to absorb O at increased temperatures; reaction with H, which may result in tears; solubility of gases in molten Cu, leading to pores and similar defects. (K-general; Cu-b)

78-K. One Temperature for Successive Brazes. G. D. Cremer and R. S. Mueller. *Product Engineering*, v. 29, Dec. 8, 1958, p. 84-86.

Tighter production control with special brazes allows multiple brazing without reducing operating temperature of the final assembly. (K8, 2-61, SGA-f)

79-K. (German.) Shrink Fit Assemblies Produced by Means of Liquid Nitrogen. Paul Zorner. *Werkstatt und Betrieb*, v. 91, Oct. 1958, p. 621-624.

(K13r)

80-K. (Russian.) New Method of Plug Welding. A. Ya. Brodskii. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 18-21.

Welding in symmetrical position gives better results than in angular position. New method makes possible welding together of 4 to 6 plates, each 8 mm. thick. 3 ref. (K1)

81-K. (Russian.) Precision Automatic Arc Welding by Nonfusing Electrode in Hydrogen Atmosphere. F. I. Kislyuk, V. V. Gorbanskii and A. F. Khudyshev. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 26-29.

New equipment for welding of infusible and other metals. Conditions established for welding with nonfusing electrodes of difficult-to-weld metals. Technology perfected for welding nonferrous metals with automatic nonfusing electrodes. (K1, 1-52, 18-74; EG-a 38)

82-K. (Russian.) Automatic Welding and Cutting at the Saratov Heavy Machine Building Plant. N. P. Anisimov. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 29-30.

(K1, G22h, 18-74)

83-K. (Russian.) Repair Welding of Rolling Mill Electric Motors. N. S. Bashanov. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 35-37.

(K-general, W11q, 18-72)

84-K. (Russian.) Welding of Chain Links in Carbon Dioxide Atmosphere. L. K. Ershov, Z. I: Shirokova, N. Burkhutov and N. I. Yakovlev. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 17-18.

New tack welding technique. (K1d; ST)

85-K. (Russian.) Developments in Welding Techniques in the Chinese People's Republic. Chzhou-Min-Khun. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 40-42.

(K-general, W29)

86-K.* (German.) Bonding of Heavy Metals. H. Winter and H. Meckelburg. *Schweissen und Schneiden*, v. 10, Nov. 1958, p. 423-433.

Survey of present techniques; adhesives, surface treatments, joining of heavy metals to heavy metals; heavy to light metals; metal to nonmetal. 63 ref. (K11, K12)

87-K.* (German.) Welding as Used in Harbor Structures. Otto Lutgens. *Schweissen und Schneiden*, v. 10, Nov. 1958, p. 434-438.

Quality of materials (low in P and S), preparation of parts and strict control of welding procedures most important. (K-general, T22k)

88-K.* (German.) Welding of Railroad Wheel Rims Using Inert Gas. H. Becker. *Schweissen und Schneiden*, v. 10, Nov. 1958, p. 442-444.

Method of restoring profiles of wheel rims instead of removing metal and thus wasting valuable surface steel. (K1d; T23p)

89-K.* (German.) Problems of Welding Practice. Summary of Meeting of the German Welding Engineering Assoc. at Mannheim. Erich Sudasch. *Werkstatt und Betrieb*, v. 91, Aug. 1958, p. 497-502.

Weldability of steels and low-temperature welding techniques. Automatic cutting of nonferrous metals, corrosion of welds, welding and soldering in design of reactors. Welding chemical apparatus. (K-general, G22g; ST, EG-a38

90-K.* (German.) Fatigue Strength of Filler Metals Used in Welding. Olavi Eiro. *Acta Polytechnica Scandinavica (Finnish Contribution)*, v. 4, no. 3, 1958, p. 5-26.

Hydrogen that enters the filler material in the welding process reduces strength of fresh weld. After a time or after heating to 250° C., strength is regained. High elastic limit among the properties of filler metal. 6 ref. (K1, K9r, Q7a, W29h; ST, *H*)

91-K. Production and Engineering Data. Welding of Cast Stainless Steel. *Industry and Welding*, v. 31, July 1958, p. 38-39.

Procedures, currents, rod sizes, preheats and post heats for 28 cast alloys. (K-general; SS)

92-K. Dip Brazing Magnesium. *Metal Industry*, v. 93, Dec. 19, 1958, p. 513-514. (K8n; Mg-b)

93-K. Multiple Arc Trebles Welding Speed. *Metalworking Production*, v. 102, Dec. 19, 1958, p. 2224-2225.

Tandem-head submerged arc welder uses two 3/32-in. electrodes in leading head, a single 3/16-in. electrode in trailing head. High deposition rates, speeds of 65-70 in. per min. obtained. Set-up and handling time cut on welds up to 75 ft. long. (K1e, 1-52)

94-K. Metal Joining. Peer Fossen. *Missiles and Rockets*, v. 4, Dec. 15, 1958, p. 30, 32-35.

Ultrasonic welding technique permits joining of dissimilar metals at Aeroprojects Inc., West Chester, Pa. (K6r)

95-K.* Automatic Welding on the Right-of-Way. Donald M. Taylor. *Petroleum Engineer*, v. 30, Dec. 1958, p. D-24-D-25.

Welding machine and magnetic belt composed of series of electromagnets cause weld metal to penetrate, adhere and freeze in 4:00 to 8:00 positions on pipe. (K1g, 1-52; 4-60)

96-K.* What Do the Russians Weld With? Peter Trippe, David Swan and Dimitri Vvedensky. *Product Engineering (Design Edition)*, v. 30, Jan. 19, 1959, p. 64-67.

Review of Soviet processes—electroslag welding, submerged-arc and resistance welding processes; evaluation of equipment. (K-general)

97-K.* Joining Metals With Adhesives. Nairn Ringueberg. *Tool Engineer*, v. 42, Jan. 1959, p. 53-56.

Adhesive joining of Al and stainless steel parts to produce rear rotor blades for heliocopter. Requirement for bonding in autoclave or oven. Equipment, tooling needed, advantages. (K12, T24a; Al-b, SS)

98-K.* Steam Generating Plant Production. William Weightman. *Welding and Metal Fabrication*, v. 26, Dec. 1958, p. 426 - 434.

Welding techniques in the fabrication of boiler drums and pressure vessels. Extensive use is made of radiographic examination. (K-general, T26q, S13e)

99-K.* Fabrication of Aluminum Pressure Vessels. J. F. Lancaster. *Welding and Metal Fabrication*, v. 26, Dec. 1958, p. 455-459.

Weldability of $1\frac{1}{4}$% Mn alloys, Al-Mg alloys and the heat treatable Al-Mg-Si alloys. 5% Mg alloys NS6 and NP5/6 are the strongest materials at present available for pressure-vessel work. (To be continued.) (K-general, K9s, T26q; Al-b, Mg-b, *Mn*, Si)

100-K.* Electrical Resistance Welding. D. S. Faulkner. *Wire Production*, v. 7, Oct. 1958, p. 3, 5-9.

Flash and upset welding and advantages. Electric welding machine design proposed. (K3, W29p, 17-51)

101-K.* (German.) Rapid Repair of Cracked or Broken Cast Iron Machine Parts. H. Droscha. *Werkstattstechnik und Maschinenbau*, v. 48, Nov. 1958, p. 604-606.

Cold riveting (Metalok) process which uses cross splines, stoppers, rivets, screws, and sometimes larger size fastener members, for repairing broken machine parts, particularly machine tools. (K13n, W25, 18-71)

102-K.* (Translation—Brutcher, 4412.) Effect of Columbium on the Structure of Welds in Austenitic 18-8 Steel. G. G. Mukhin and N. Yu. Pal'chuk. *Avtomaticheskaya Svarka*, v. 10, no. 2, 1957, p. 1-10.

Occurrence of a previously unknown phase, the H-phase, in welds with over 2% Cb, after ordinary heat treating or quenching or stabilizing, in addition to columbium carbide, columbide Fe_3Cb_2, and silicide $Fe_4Cb_5Si_3$. Effect of Cb on ductility of 18-8 weld metal; conditions under which H-phase is formed and effect of this phase on the impact strength. (K9r, 2-60, 2-64; SS, *Cb*)

103-K. (Translation—Brutcher, 4426.) Stability of Electroslag Welding as Depending on Properties of Flux. Yu. N. Gotal'skii. *Svarochnoe Proizvodstvo*, no. 3, 1957, p. 1-3.

Difference between electroslag welding and conventional submerged arc welding. Effect of electrical conductivity, viscosity and boiling point of flux. Advantages of low-silica as against high-silica fluxes. (K6)

104-K. (Translation—Brutcher, 4433.) Effect of Some Technological and Design Factors on Mechanical Properties of High-Strength Low-Alloy Steel. O. L. Bendryshev. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 51-56.

For high-strength steels electric arc welding with heavily covered electrodes or automatic welding with flux is recommended. Quality is controlled by visual inspection as well as magnetic and X-ray methods. Where it is not possible to place the work in a furnace, local annealing by induction heating at 650-700° is recommended. 8 ref. (K1a, K9; AY, SGB-a)

105-K.* Investigation Into Slag Welding With Plate Electrodes. B. A. Koch. *Engineers' Digest*, v. 19, Dec. 1958, p. 513-515.

Relationships between various parameters of welding conditions; effect of variations on stability and efficiency of process and size and shape of weld. (K6)

106-K.* (French.) Submerged-Arc Welding. L. Adam. *Revue Universelle des Mines*, v. 14, Oct. 1958, p. 317-328.

Principles, theory of passage of current through flux; equipment, current sources, consumable materials; development of techniques involving use of multiple electrodes for surfacing operations; principal applications. (K1a)

107-K.* (French.) Welding With Continuous Electrodes and Magnetic Flux. G. Doneux. *Revue Universelle des Mines*, v. 14, Oct. 1958, p. 349-358.

Conventional continuous arc welding processes compared with those using electrodes with magnetic coatings. New process combines features of both types, has operational similarities to manual arc welding; basic fluxes used in Co_2 atmosphere produce welds with properties equivalent to those produced by basic electrodes. Operation of automatic and semi-automatic machines; applications. (K1a)

108-K.* (Russian.) Experience With Slag Welding 1X18 H-9-T Steel. A. G. Fomin. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 21-23.

Steel composition 0.10% C; 1.10% Mn; 0.54% Si; 17.75% Cr; 0.51% Ti; 0.018% S and 0.028% P. This steel is satisfactorily welded by electro-slag method provided the laminated electrodes are of the same composition. (K6; ST)

109-K. Electric Process Welds Rail Into Continuous Ribbons. *Iron Age*, v. 183, Jan. 15, 1959, p. 92-93.

Rail ends are preheated by electric current to a plastic, molten stage. Then they are welded with an upset forging blow of more than 50 tons to form the flash butt resistance weld. (K5, T23q)

110-K. AWS Standard Welding Symbols. *Metalworking*, v. 15, Jan. 1959, p. 18-19.

Chart of more common symbols, available from American Welding Society. (K-general, S22)

111-K. Non-Manual Pipeline Welding. William B. Handwerk. *Petroleum Engineer*, v. 31, Jan. 1959, p. 40-41.

Four methods have possibilities: submerged arc, flash, induction pressure and consumable electrode welding. (K-general, T26r)

112-K. (French.) Applications of Inert Gas Shielded Arc Welding. A. Moreau. *Revue Universelle des Mines*, v. 14, Oct. 1958, p. 329-342. (K1d)

113-K. (Japanese.) Temperature Distribution in Welding Bead. K. Nakane and T. Fujimoto. *Railway Engineering Research, Journal*, v. 15, June 1958, p. 120-122.

Distribution is calculated mathematically by the equation of thermal conduction. (K9r, P11h)

114-K. (Russian.) Prevention of Deformation of Welded Cranes. N. O. Okerblom and J. P. Baikova. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 1-5.

Tolerances for welding and assembling crane bridge. Mathematical derivation of various moments, moments of inertia beam deflection and bending. (K-general, W12q, 17-55)

115-K. (Russian.) New Injectionless Pressure Regulator for Gas Welding and Hard Surfacing. V. D. Nechaev. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 17-20. (K2h, L24, 1-52)

116-K. (Russian.) Modernization of Butt Welding Machine for Flash Welding of Austenitic Steel Pipe. A. F. Kozhaev. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 27-29. (K3r, 1-52; SS-e, 4-60)

117-K. (Russian.) Stud Welding Equipment. D. I. Vaiboim. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 32. (K1f, 1-52)

118-K. (Russian.) Seam Welding Machine for Stainless Steel Parts of Unequal Thickness. F. A. Axelrod and M. P. Zaitsev. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 33-35. (K3p, 1-52; SS)

119-K.* Welding and Metal Forming in Russia. Arthur B. Tesmen. *Metal Progress*, v. 75, Jan. 1959, p. 79-83.

Electroslag welding used to fabricate large parts from components while friction welding is more efficient than flash welding. (K6, F22, F24, W22p)

120-K.* (French.) Tests With Welded Titanium Sheet. R. Lachenaud. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1065-1072.

Ti sheets were welded together in an argon atmosphere, heat treated at 600° C. and examined by macrographs and micrographs. Hardness, tension and flexure fatigue tested. Properties of joints found to be the same as those of the base metal. (K2, K9r, J23, Q-general; Ti-b, Ar, 4-53)

121-K.* Producer Gives Instructions for Welding Moly. R. R. Freedman and J. Z. Briggs. *Welding Engineer*, v. 44, Jan. 1959, p. 38-41.

Welding for aircraft and missile applications must be done in controlled atmosphere. Commercial Ar, He and H may contain enough O to cause porosity and cracking unless special cleansing measures are followed. Brazed joints may be more ductile than welded joints, provided temperatures over 1700° F. are minimized. (K1d; Mo)

122-K.* (German.) Use of a Protective Gas Composed of N and H in Welding Alloy Steels. J. Wingerath and K. Boeckhaus. *Schweissen und Schneiden*, v. 10, Dec. 1958, p. 471-475.

"Formiergas" of a standard composition of 80% N and 20% H has all the properties required for use in welding pipelines and tubing. (K-general; AY, RM-g)

123-K.* (German.) Hydrogen Content and Mechanical Properties of Weld Metal in Arc Welding With Coaded Electrodes. Influence of Storing Time. W. Hummitzsch. *Schweissen und Schneiden*, v. 10, Dec. 1958, p. 476-480.

Welded joints tensile tested to detect influence of hydrogen. In storage the hydrogen escapes and, as a rule, the strength of weldments improve. (K1a, K9r, Q27, W29h; ST, H, 7-51)

124-K.* (Portuguese.) The No. 1 Problem in Arc Welding. Victor E. de Strasser. *Engenharia, Mineracao e Metalurgia*, v. 28, Dec. 1958, p. 337-340.

Effect of gases absorbed by weld metal; hot cracking. (K1, K9; ST, 9-72)

125-K. Welded Aluminium Tanks for Canadian Brewery. *Light Metals*, v. 22, Jan. 1959, p. 11.

Fabrication by inert-gas metal-arc and tungsten-arc methods of welding. (K1d, T26q; Al-b)

126-K. Induction Brazing Overcomes Distortion of Fabricated Carbine Barrel Casings. Peter Trippe. *Metalworking Production*, v. 102, Dec. 26, 1958, p. 2255-2257. (K8k, T2g; ST)

127-K. Welding Heat Exchangers for Nuclear Power Plant. *Metallurgia*, v. 58, Dec. 1958, p. 297-298.

World's largest welding boom in use at Hunterston, Scotland, utilizing arc welding processes. (K1, W29k, W13b)

128-K. Flexible Automation on Welding Lines. *Welding Engineer*, v. 44, Jan. 1959, p. 42-43.

Resistance welding techniques at Norge Division of Borg-Warner Corp. in the production of cabinets, food compartment liners and doors. (K3, T10c, 18-74)

129-K. Typewriter Parts Are Projection Welded. *Welding Engineer*, v. 44, Jan. 1959, p. 44-45. (K3q, T10f)

130-K.* (French.) A Welding Process Applicable to the Fabrication of Steel Pressure Vessels for Atomic Energy Purposes: Argon Arc Welding With a Consumable Electrode. J. Tigeot. *Soudage et Techniques Connexes*, v. 12, Sept-Oct. 1958, p. 325-335.

Neutron irradiation raises transition temperature of carbon steels. Argon arc welding with consumable electrode gives the weld metal good impact values for the construction of nuclear reactor vessels of varying thickness. Costs are only slightly higher than submerged arc welding. (K1d, T26q, 2-67; ST)

131-K.* (French.) Determination of the Total Hydrogen Content of Weld Metal. *Soudage et Technique Connexes*, v. 12, Sept-Oct. 1958, p. 335-338.

Tests by British and Norwegian laboratories to determine H content of one-pass welded beads. Method includes washing, polishing, drying and heating. Gas extracted by heating is analyzed for H content. (K9r, S11r; H)

132-K.* (French.) Cooperative Investigation of the Controlled Thermal Severity Weldability Test for Low-Alloy Steels. *Soudage et Techniques Connexes*, v. 12, Sept-Oct. 1958, p. 345-353.

A restrained fillet weld test consisting of the deposition of a fillet weld under predetermined conditions and examination of transverse sections of the weld for cracks in the heat affected zone of the parent plate. Results from five laboratories show that this test is satisfactory for scientific investigations. 5 ref. (K9r, K9s, 2-61; AY)

133-K.* (French.) Comparison of Methods of Assessing Spot Weld Ductility in Sheet Steels. E. J. French and A. A. Wells. *Soudage et Techniques Connexes*, v. 12, Sept-Oct. 1958, p. 369-392.

Mechanical tests (tensile, shear, torsion, hardness) carried out on spot welds under different welding conditions on four steels. Interpretation of the results compared with theoretical values; relations derived can be used as new bases for assessing spot weld ductility. 17 ref. (K9r, K3n, K9s, Q-general; ST)

134-K.* (German.) Nodular Iron—a New Material. Pt. 2. Weldability. R. Werner and G. Czesany. *Schweisstechnik*, v. 12, Nov. 1958, p. 144-148.

Welding without preheating by electric arc satisfies only limited requirements. For good machinability, warm welding after preheating to 400 to 750° C., preferably with oxy-acetylene torch, is indicated. 4 ref. (K9s; CI-r)

135-K.* (Hungarian.) Weldable Construction Steels Type St. 52. Pt. 2. Istvan Balsay. *Kohaszati Lapok*, v. 91, July 1958, p. 326-333.

Increased tensile strength or higher yield point, by varying composition. Standards specifying composition and properties for the Mn-Si and the Cr-Mn-Cu groups. (K9s, S22, Q27a, 2-60, AY, 17-52)

136-K. Simple Spray-Brazing Process Makes Tough Jobs Easy. Harry E. Miller. *Iron Age*, v. 183, Jan. 29, 1959, p. 85-87.

Oxy-acetylene hand torch sprays powdered Ni-Si-B alloy in the fabrication of heat exchangers. (K8g, W13b; Ni-b, Si, *B*)

137-K. Mass Production of All-Welded Rail Wagons. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 2-4.

Submerged-arc welding processes at the Canadian Car and Foundry Co. (K1e, 1-52, T23p)

138-K. Torch Brazing and Hard Soldering Pure Titanium in Air. R. C. Shelley. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 31-32.

Use is made of the chlorides of Ag and Cu, sufficient chlorine being made available

to attack any film upon the Ti. "Wetting" takes place without any additional fluxing, before any titanium oxide film can re-form. Optimum composition of flux is Cu 30-35%, Ag 70-65%. (K8g, K7, Ti-a, *Cu*, Ag)

139-K. Fabrication of Aluminium Pressure Vessels. J. F. Lancaster. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 33-34.

Inert-gas tungsten-arc welding of Al-Mg alloys. 17 ref. (K1d, T26q; Al-b, *Mg*)

140-K. New Pipeline Welding Method Makes U.S. Debut. Ted Jefferson. *Welding Engineer*, v. 44, Feb. 1959, p. 44, 46.

(K1a, T26r; ST)

141-K. (Dutch.) Recent Publications on Welding. G. van Schaick Zillesen. *Lastechniek*, v. 25, Jan. 1959, p. 9-15.

96 ref. (K-general, 11-65)

142-K. (French.) Riveting. Pt. 1. Paul Penel. *Revue de l'Aluminium*, no. 259, Nov. 1958, p. 1125-1135.

Fundamentals of riveting; fabrication of rivets, alloys used, form and dimensions, production and determination of sizes. (K13n)

143-K. (French.) Welding Developments in Austria. Franz Rapatz. *Soudage et Techniques Connexes*, v. 12, Sept-Oct. 1958, p. 339-344.

(K1)

144-K. (French.) Welding at the Lacq Gas Field Works. P. Berthier, R. Enous, J. Souviron, R. Terminet and G. Reynes. *Soudage et Techniques Connexes*, v. 12, Sept-Oct. 1958, p. 357-364.

Careful composition and welding of collecting pipes and gas washing towers are necessary because of corrosive properties of the gas. (K1, K9, R6; ST, 4-60)

145-K. Speed Missile Parts Output With Induction Heating. L. C. Porter. *Iron Age*, v. 183, Feb. 5, 1959, p. 86-87.

(K7e, K8k, T24e, 1-52)

146-K. Progress Report on Ultrasonic Welding. *Machinery*, v. 65, Feb. 1959, p. 122-123.

(K6r)

147-K. (French.) Spot Welding on the "Caravelle". J. Coupain. *Soudage et Techniques Connexes*, v. 12, Nov-Dec. 1958, p. 422-432.

Methods and equipment for spot welding jet airliner airframes. (K3n, T24a, 1-52)

148-K.* Problems of the Reactive Metals. F. G. Cox. *Nuclear Energy Engineer*, Jan. 1959, p. 40-44.

Argon arc and resistance welding are satisfactory for some reactive metals, but others require welding in a vacuum, via the electron gun method. Ultrasonics also are useful in avoiding deformation. (K1d, K3, K6r, Cb, Zr, Be, Mo)

149-K.* (French.) Welding Stainless Steels. Richard E. Paret. *Machine Moderne*, v. 52, Oct. 1958, p. 19-24.

Welding of austenitic, ferritic and martensitic types by autogeneous, electric arc, inert atmospheric, H atomic, submerged arc, electric resistance and pressure welding methods. Evaluation of adaptability and relative merits. (K-general; SS)

150-K.* (French.) Controlled Thermal Severity (CTS) Test. P. H. R. Lane. *Revue de la Soudure*, v. 14, no. 4, 1958, p. 201-212.

Weldability of low-alloy steels was tested by joining sheets of the steel by fillet welds. Transverse sections across the weldments are then tested microscopically for fissures. 5 ref. (K9; AY)

151-K. Ultrasonic Welding of Structural Aluminum Alloys. J. B. Jones and E. E. Weismantel. Aeroprojects, Inc., *U.S. Office of Technical Services*, PB 131680, Jan. 1957, 88 p. $2.25.

Continuous seam-type ultrasonic welding of structural Al alloys shown to be feasible. Ultrasonic welding also produced spot-type solid-state junctions. Metallographic studies indicated good quality solid-state bonding. (K6r; Al-b)

152-K. Development of Brazed Sandwich Construction Materials for High Temperature Applications. C. F. Burrows and F. J. Ragland, Jr. Martin Co. (Wright Air Development Center.) *U.S. Office of Technical Services*, PB 151272, July 1958, 105 p. $2.50.

Base-braze metal combination was Type A-286 steel, an austenitic superalloy containing Ti and Al, brazed with a Ni-Cr-Si-Fe-B alloy. At operational temperatures from 1000 to 1200 F. this combination showed excellent structural and fatigue properties. Satisfactory preformed and resistance welded honeycomb core was made from five corrosion resistant steel alloys. Static flexure, edgewise compression, and flexural fatigue

tests provide fairly significant and reliable data on brazed sandwich construction. (K8, Q-general; SS, SGA-h, 7-59, 7-51)

153-K.* (French.) Hydrogen Content and Mechanical Properties of Arc Welds. W. Hummitzsch. *Revue de la Soudure*, v. 14, no. 4, 1958, p. 213-221.

Influence of hydrogen content on strength of welds produced with different electrodes. Tests performed at different periods (from 4 up to 5100 hr.) after welding showed an increase in strength as the hydrogen was given off by the filler metal during storage. Electrodes with basic coating produced welds of low hydrogen content. (K1a, K9r, Q27a; ST, 7-51)

154-K. (Translation.) Carbon Dioxide Welding of Austenitic Steels. B. I. Medovar and I. N. Rublevsky. *Metal Progress*, v. 75, Jan. 1959, p. 178, 182, 184. (Digest of "The Question of CO_2 Welding Austenitic Steels and High-Temperature Alloys". *Avtomaticheskaya Svarka*, no. 3, 1957, p. 70-84.)

Tests compared CO welding with arc welding. (K1d; SS-e, SGA-h)

155-K. (Translation—BISI, no. 1138.) Practice for Welding Circular Seams on Large Diameter Pipes. L. Hense and H. Scheruhn. *Schweissen und Schneiden*, v. 10, May 1958, p. 162-166.

See item 390-K, 1958. (K1, 4-60)

156-K.* Arc Welding 27 Types of Stainless Steel With 18 Different Coated Electrodes. W. E. McFee. *Industry & Welding*, v. 32, Feb. 1959, p. 30-31.

Flux-coated electrodes shield and protect the molten metal from the atmosphere, prevent oxidation of Cr, stabilize the arc and produce strong corrosion resistant welds. Chart indicates proper electrode selection. (K1, W29h; SS)

157-K.* Joining Aluminum. *Precision Metal Molding*, v. 17, Jan. 1959, p. 52-53.

Soldering, brazing and welding in relation to the great affinity of Al for O, the high thermal conductivity of Al and the total absence of color change during heating. Weldability ratings given for 17 alloys. (K-general, K7, K8, K9s; Al-b)

158-K. High Speed Stud Welding on Bridge Beams. *Industry & Welding*, v. 32, Feb. 1959, p. 26-27.

Shear connectors are stud welded to structural beams and concrete is poured around them providing composite construction. (K1f, T26p)

159-K. High-Strength Welded Fabrications Replace Aircraft Forgings. *Industry & Welding*, v. 32, Feb. 1959, p. 38-39.

Weldments are made from AMS 6434 steel and joined by AISI 502 low-hydrogen type stainless steel electrodes. Weldments cost less than machined forgings while design changes are easier. (K1e; ST, SS, 7-51)

160-K. Welding Hastelloy Alloy X to Inconel and to Mild Steel. Carl Johnson. *Industry & Welding*, v. 32, Feb. 1959, p. 40-42.

Tungsten arc inert gas shielded process. (K1g; Ni-b, CN)

161-K. Tungsten Inert Arc Welding. Frank Kuncz. *Industry & Welding*, v. 32, Feb. 1959, p. 55-56.

Guide to selection of proper type of welding current. (K1g)

162-K. You Can Do More With CO_2 Welding. *Metal Progress*, v. 75, Feb. 1959, p. 110-114, 170, 172, 176, 178.

Improvements in automatic and semi-automatic welding heads, and refinements in shielding techniques add to the versatility of the process. With a reactor in the circuit, good overhead and vertical-up welds are possible. In addition to its shielding function, CO_2 gas raises the temperature of molten weld metal and deepens penetration. (K1d, 1-52)

163-K. Bonding of Polyethylene to Metals. H. Peters and W. H. Lockwood. Digest from "Bonding Polyethyelene to Rubber, Brass and Brass-Plated Metals". Monograph 2932, Bell Telephone System Technical Publications. *Metal Progress*, v. 75, Feb. 1959, p. 157-158.

Bonding polyethylene to rubber, brass or brass-plated metals using a cement based on partially hydrogenated polybutadiene (8% unsaturation.) (K11d; Cu-n, 8-62, NM-d)

164-K. (Russian.) Heat Balance of Gas Shielded Arc Welding. I. D. Kulagin and A. V. Nikolaev. *Izvestiya Akademii Nauk, Otdelenie Teknicheskikh Nauk*, no. 11, 1958, p. 89-91.

(K1d)

165-K.* (Russian.) Crack Formation When Soldering Steel to Brass. A. I. Gubin. *Vestnik Mashinostroeniya*, Dec. 1958, p. 58-61.

Soldering in electric furnaces with protective ordinary atmospheres and in salt

bath. 5 ref. (K7g, 9-72, 3-66; ST, *Cu-n, Ag*, 4-60)

166-K.* Success—Welding Method for Type 347. A.M. Bain, A.H. Clark and M.J. Lavigne. *Canadian Metalworking*, v. 22, Feb. 1959, p. 28-30, 32, 34, 38.

Technique in welding a stainless steel pressure vessel. 4 ref. (K1d, K9r, T26q; SS)

167-K.* Fabrication of Refractory Metals. W.L. Bruckart. *Metal Industry*, v. 94, Feb. 6, 1959, p. 103-106.

Joining, heat treatment and cleaning of Mo. (To be continued.) (K-general, J23, L12; Mo, W)

168-K. With Care, Warpage Can Be Controlled. H. Thomasson. *Canadian Metalworking*, v. 22, Feb. 1959, p. 36, 38.

Cause and cure of nonuniform change of dimensions during welding. (K-general, P10d)

169-K. Automatic Open Arc Welding at 150 Ipm. *Industry & Welding*, v. 32, Jan. 1959, p. 51-52.

Flux-cored electrode and automatic welding equipment gives higher heats, faster speeds and better welds. (K1, W29h)

170-K. Recent Developments in Inert-Gas Welding in the Aircraft Industry. R.C. Hesketh-Jones and R.L. Fannon. *New Zealand Institute of Welding*, v. 13, Dec. 15, 1958, p. 447-450.

Welding gas turbines, welding equipment. (K1d, T24b, W29; Ni-b)

171-K.* (German.) Open Joint Technique in Submerged Arc Welding. W. Schatz. *Schweissen und Schneiden*, v. 11, Jan. 1959, p. 23-29.

Joint preparation, effects of amperage, voltage, width of gap to be filled, welding speed and composition of base material on weld quality. (K1e)

172-K.* Adhesive Bonding of Primary Aircraft Structure. W. S. Hay. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 36-47.

Application of nitrile-phenolic and epoxy-phenolic type adhesives to metal-to-metal panels and sandwich panels of Al alloys. (K12; Al-b, 7-59)

173-K.* Some of the Growing Pains of the B-58 Sandwich Construction. E. H. Watts. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 48-53.

Problems in adhesive bonding a resin-impregnated fiberglass honeycomb core and two Al alloy faces with nitrile rubber-phenolic resin for the metal-to-metal areas, and epoxy resin for the core area, to provide good filleting and creep resistance at temperature. (K11a, K12; Al-b, 7-59)

174-K.* Accelerated Aging Tests and Life Aging Properties of Aircraft Metal Adhesives. J. P. Thomas. *ASTM Bulletin*, no. 235, Jan. 1959, p. 58-63.

New test methods of high-temperature resistance adhesives predict performance and longevity in service. 10 ref. (K11d, T24a, 2-62; Al-b, 7-59)

175-K.* Properties, Jointing Methods and Applications of Plastic-Coated Steel Sheet. F. H. Smith. *Sheet Metal Industries*, v. 36, Feb. 1959, p. 91-96, 99-100, 118.

Jointing methods include cold seaming, hot air welding, resistance welding, hot bonding, riveting, joining by extrusions (metallic and plastic) and high-frequency welding. (To be concluded.) (K-general; ST, 4-53, 17-57)

176-K.* Fabricating Stainless Steel. Pt. 3. Joining. Richard E. Paret. *Tool Engineer*, v. 42, Mar. 1959, p. 119-124.

Methods for each class of alloy. (K-general; SS)

177-K.* (Dutch.) Survey of Cast Iron Joining Techniques. J. G. van Beijeren Bergen en Henegouwen. *Lastechniek*, v. 24, Nov. 1958, p. 226-229.

Basic properties in relation to welding possibilities. 12 ref. (K-general; CI)

178-K.* (Dutch.) Improvements in the Weldability of Ni-Mo Alloys. C. Vollers. *Metalen*, v. 13, Nov. 15, 1958, p. 384.

Weldability and resistance against intercrystalline corrosion improved by small additions of V. (K9s, 2-60; Ni-b, *Mo, V*)

179-K. (German.) Measurement of Welding Currents. Ebbe Rohloff. *Schweissen und Schneiden*, v. 11, Jan. 1959, p. 17-22.

In resistance welding processes. 9 ref. (K3)

180-K.* (Spanish.) Inspection and Testing of Weldments. *Fusion de Metales*, v. 20, Nov-Dec. 1958, p. 12-24.

Importance of inspection; nondestructive tests; principles of visual inspection; flame characteristics as guide to inspection during welding; magnetic methods. (To be continued.) (K9r, S13; 7-51)

181-K.* Weldable Aluminum Alloys. *Modern Metals*, v. 15, Feb. 1959, p. 40, 42, 44, 48, 50.

History, composition, physical properties, welding methods, bending, deep drawing, welding procedures, performance of welds, testing of welds, applications. (K9s, K9r, 2-60; Al-b)

182-K.* Filler Metals for Joining. Orville T. Barnett. *Welding Engineer*, v. 44, Mar. 1959, p. 36-37.

Composition, properties and applications of solders; soldering technique. (K7; Sn, Pb, Sb, Ag, Cd, Zn, Al, In, SGA-f)

183-K.* (German.) Welding Properties of Chemically Stable Cr-Ni Steels With Mo and Mo-Cu Additions. Alfred Schmidt. *Schweisstechnik*, v. 12, Dec. 1958, p. 153-156.

Good welds are achieved with austenitic Cr-Ni steels. Arc welding with basic electrodes is recommended, and for thin sheets and root joints argon-shielded arc welding. Heat cracking susceptibility, stress-corrosion. (K9s, K1, 2-60; SS-e, *Cr, Ni, Mo, Cu*)

184-K.* (German.) Progress in the Welding Metallurgy of Ferrous Metals. K. L. Zeyen. *Oerlikon-Schweissmitteilungen*, v. 17, no. 32, 1959, 131 p.

Literature survey relating weldability tests, Mechanical properties and behavior of weldments, corrosion and scaling, filler metals and electrodes, defects and the effect of heat treatment, design of welded constructions. 557 ref. (K-general, Q-general, R-general; Fe, ST, 17-51,9)

185-K.* Furnace Brazing With Nickel Alloys at Fabriform Plant. *Industrial Heating*, v. 26, Feb. 1959, p. 417-418, 422.

Stainless steel brazed with Ni-Cr or Ni-Mn brazing material in hydrogen atmosphere. (K8j; SS, Ni-b, *Cr, Mn*, SGA-f)

186-K.* Inert-Gas Metal-Arc Welding Aluminum Using Fine Wire Electrodes. J. E. Tomlinson and A. J. King. *Welding and Metal Fabrication*, v. 27, Feb. 1959, p. 42-50.

Operating characteristics of welding gun with pull-through wire feed system. Range in welding variable using 0.03 and 0.02-in. diameter electrode wires. Appearance and tensile properties of butt, fillet and lap welds. Influence of chilling on penetration. (To be continued.) 8 ref. (K1d, W28h; Al-b, 4-53)

187-K.* Some Facts About Iron Powder Electrodes. A. B. Fieldhouse. *Welding and Metal Fabrication*, v. 27, Feb. 1959, p. 61-70.

Types of iron powder electrodes, effect of iron powder in coverings on arc striking characteristics, arc voltage, electrode burn-off rate, metal recovery and rate of metal deposition. Relationship between weld metal ductility and cooling speed, aging, welding current and hydrogen content. Applications. 5 ref. (K1a, W29h; ST)

188-K.* (German.) Fatigue Strength of Filler Metal. Olavi Biro. *Publications of Valtion Teknillinen Tutkimuslaitos*, no. 41, 1958, p. 3-26.

Fatigue tests of weld-deposited metals obtained from various types of electrodes. Influence of hydrogen. 6 ref. (K1, K9r, Q7a, W29h, 7-51, *H*)

189-K.* (German.) Vacuum-Proof Seals by Glass-Metal and Ceramic-Metal Joints. Albert Hofmann. *Schweiz. Technische Zeitschrift*, v. 55, Dec. 11, 1958, p. 974-976.

Joints obtained by means of adhesives, by melting glass-to-metal, by melting glass-to-ceramic material on one side and to a metal on the other side and by soldering ceramic-to-metal. (K11a, K11b, 7-58; NM-f42, NM-f)

190-K.* (German-French.) Crack Prevention in the Welding of Austenitic Steel Castings. W. A. Stauffer and A. Keller. *Zeitschrift fur Schweisstechnik*, v. 49, Jan. 1959, p. 2-6.

Cracking in welded parts is caused by crack initiation and propagation at the grain boundaries. Cold working previous to welding reduces cracking while new grain boundaries result from recrystallization produced by heat generated in welding. 4 ref. (K-general, N5, M27f; SS-e, 5-60)

191-K.* (German-French.) New Welding Techniques in Nuclear Technology. C. G. Keel. *Zeitschrift fur Schweisstechnik*, v. 49, Jan. 1959, p. 7-9.

Vacuum fusion welding makes use of thermionic emission of electrons to bombard the two pieces to be welded with a beam of electrons. Basic elements are a W cathode to emit a large number of electrons, a focusing system to form the electrons into a beam and a vacuum chamber.

Process can be applied to Zircaloy-2, W, Mo, Ti, Ni and stainless steel alloys. (K6, K9r, 1-73; Zr-b, W, Mo, Ti, Ni, SS)

192-K.* (German-French.) Electroslag Welding. C. G. Keel. *Zeitschrift fur Schweisstechnik*, v. 49, Jan. 1959, p. 15-17.

Characteristics of the process, demonstration of a similar method using a protective gas instead of slag. (K6)

193-K.* (German-French.) Properties and Weldability of New Metals and Alloys. C. G. Keel. *Zeitschrift fur Schweisstechnik, Journal de la Soudure*, v. 49, Feb. 1959, p. 32-36.

Welding characteristics of Zr, Hf, V, Cb, Ta, Cr, Re, Be, U, Ti, Mo and W. Diffusion bonding processes. (To be continued.) (K9s, K5k, Zr, Hf, V, Cb, Ta, Re, Be, U, Ti, Mo, W)

194-K.* (German-French.) Applications of Gas-Shielded Arc Welding. A. Smarcan. *Zeitschrift fur Schweisstechnik, Journal de la Soudure*, v. 49, Feb. 1959, p. 37-40.

Description, data, economy and legal aspects of different welding methods. (K1d; CN, SS-d, 4-53, Al-b)

195-K.* (Norwegian.) Automatic Submerged Arc Welding of Thin Steel Sheet. *Teknisk Ukeblad*, v. 106, Feb. 5, 1959, p. 110.

Automatic equipment for welding on a water-cooled surface kept in contact with the metal by compressed air. (K1e, 1-52; ST, 4-53)

196-K. Twin Coach Checks and Double Checks Resistance Welding. Andrew Brown. *Metal Forming & Fabricating*, v. 21, Feb. 1959, p. 17-19.

Control of welders; destructive and nondestructive testing of Al welds. (K3n, S-general; Al-b, 7-51)

197-K. Welding Costs Are High—Here's Why! Bela Tonay. *Welding Engineer*, v. 44, Mar. 1959, p. 52, 54.

Costly practices are: overwelding; use of fabricated components instead of structural shapes; failure to use positioners; correcting preventable distortion; unwarranted postheat treatments; lack of mechanized welding equipment. (K-general, 17-53)

198-K. (French.) Manufacture and Welding of Clad Steel Plates. H. Gerbeaux. *Soudage et Techniques Connexes*, v. 12, Nov-Dec. 1958, p. 441-459.

Manufacture of clad steel and welding of clad steel plates. 5 ref. (K-general, L22; ST, 4-53, 8-66)

199-K. (Spanish.) Electronically Controlled Three-Phase Resistance Welding Machines. A. Plaza. *Ciencia y Tecnica de la Soldadura*, v. 8, Nov-Dec. 1958, 12 p.

(K3, 1-52)

200-K.* Adhesive Bonding of Titanium. H. E. Pattee, G. E. Faulkner and P. F. Rieppel. *Materials in Design Engineering*, v. 49, Feb. 1959, p. 96-99.

Commercial adhesive blends are listed together with surface treatments to prepare Ti and Ti core materials for bonding. 8 ref. (K12; Ti, 7-59)

201-K.* Influence of the Peltier Effect in Resistance Welding. T. C. Balder. *Philips Technical Review*, v. 20, Feb. 1959, p. 188-192.

Effect of current direction in resistance welding of different metals together. 5 ref. (K3, 2-61, Mo, Ni, 4-61)

202-K.* (German.) Behavior of Welded Seams in the Temperature Range -200 to +500° C. W. Hummitzsch. *Schweissen und Schneiden*, v. 11, Feb. 1959, p. 39-46.

Mechanical properties of ferritic and austenitic steels; welding of cold ductile, fine-grained and heat resistant steels; gas-shielded welding of structural steels; steels for pressure vessels; heat treatment. 8 ref. (K1a, 2-64, T26q; ST)

203-K.* (Russian.) High-Frequency Resistance Welding of Large-Diameter Pipes. N. P. Glukhanov, V. N. Bogdanov and V. L. Kulzhinskii. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 6-8.

Longitudinal weld made while the pipe's brim is being heated by high-frequency resistance current. Mechanical properties of weld are higher than the original metal. (K3p, Q-general; 4-60, 7-51)

204-K.* (Russian.) Techniques and Equipment for Welding Nonrotating Butt Joints of Large-Diameter Pipes. A. S. Fal'kevich and Yu. I. Marchenko. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 8-12.

Gas-shielded arc welding in CO_2 atmosphere permits complete root penetration and a well-formed weld in any position of the pipe. 4 ref. (K1e; 4-60)

205-K.* (Russian.) Flux Effect Upon Properties of High-Strength Steel Welds. K. V. Lyubavskii, B. N. Bad'yanov and G. F. Chepelyugin. *Svarochnoe Proizvodstvo,* Feb. 1959, p. 23-25.

Fluxes of various composition for welding of high-strength steel 30KHGSNA. Best results are obtained with nonoxidizing ceramic flux together with 15KHGSNA welding rods. 5 ref. (K1e; RM-q, ST)

206-K. (Pamphlet.) Soldering Aluminum. Charles Bruno. 22 p. 1959. Reynolds Metals Co., Richmond 18, Va. Free.

Soldering techniques, fluxes, solders, performance of soldered joints. (K7, W29; Al-b, SGA-f)

207-K. (Book.) Welding Handbook, 4th Ed., Section 2. Gas, Arc and Resistance Welding Processes. Arthur Phillips, Editor. 550 p. 1959. American Welding Society, 33 West 39th St., New York 18, N. Y. $9.

Procedures for gas welding and brazing. Pressure gas welding, carbon-arc, coated electrode arc, inert-gas metal-arc, submerged-arc, bare-metal arc and spot, seam, projection, flash, upset and percussion welding. Equipment for gas, arc and resistance welding. Standard welding symbols; bibliography. (K-general, 11-68)

208-K. (Translation.) Fatigue Strength of Weld Metal. O. Eiro. *Engineers' Digest,* v. 20, Jan. 1959, p. 45-57. (From *Acta Polytechnica Scandinavica,* no. 3, 1958, 26 p.)

See item 90-K, 1959. (K1, K9r, Q7a, W29h; 7-51, ST, *H*)

209-K. (Translation—BISI no. 785.) Contribution to the Study of the Influence of Hydrogen on the Impact Properties of Metals Laid Down by the Electric Arc With Coated Electrodes. M. Moneyron and D. Seferian. *Soudage et Techniques Connexes,* v. 11, Sept-Oct. 1957, p. 277-289.

See item 50-K, 1958. (K1, Q27a, W29h, 1-52; ST, *H*)

210-K. (Translation—BISI no. 815.) Arc and Gas Butt Welding of Ferritic Steel Boiler Tubes. J. Hennion. *Soudage et Techniques Connexes,* v. 11, Sept-Oct. 1957, p. 323-332.

See item 52-K, 1958. (K1, K2, K9p; ST, 4-60)

211-K. (Translation—Brutcher no. 4454.) Welding With UONI-13 Electrodes on Alternating Current With a Pulse Generator. M. L. Fukel'man. *Svarochnoe Proizvodstvo,* Jan. 1958, p. 27-28.

Pulse generators for welding on alternating current with coated electrodes. Advantages for the various shielded-arc welding techniques and for welding of nonferrous metals and alloys with a carbon arc. (K1a)

212-K.* (German.) Welding of Copper. R. Kocher. *Metall,* v. 13, Feb. 1959, p. 107-114.

Gas welding; arc and inert gas welding; joining of Cu to steel. (K-general; Cu, ST)

213-K.* (Hungarian.) Argon-Arc Welding in the Fabrication of Aluminum Products. Zoltan Buray. *Kohaszati Lapok,* v. 91, Sept. 1958, p. 397-403.

Applications; costs; possible future applications. 13 ref. (K1d; Al-b)

214-K.* Fusion Welding of Titanium in Jet Engine Applications. H. W. Hoefer. *Hawker Siddeley Technical Journal,* v. 1, no. 1, Winter 1958, p. 19-27.

Equipment, techniques and quality control methods developed to overcome problems in jet engine welding. 5 ref. (K-general, T24b; Ti-b)

215-K.* (Russian.) Properties of Heat Affected Zone in Welds of B-95 Alloy. V. L. Russo and I. P. Prosyankin. *Svarochnoe Proizvodstvo,* Jan. 1959, p. 9-12.

Fusion welding of alloy steel V-95 of the system Al-Cu-Mg-Zn produces structural changes in the heat affected zone which sharply reduce mechanical properties. Properties improve after suitable cooling and heat treatment. (K3, Q-general, 2-64; AY, *Zn, Mg, Cu, Al,* 7-51)

216-K.* (Russian.) Spot and Seam Welding of Steel E.1.703. A. F. Malyukov. *Svarochnoe Proizvodstvo,* Jan. 1959, p. 31-35.

Steel has a tendency to form nonuniform segregations in the molten zone of the weld, which lowers the workability of the joint. A welding procedure is recommended which assures good structure and stabilized strength for the welded joint. (K3n, K3p, Q-general; ST, 7-51, 9-69)

217-K.* Why Arc Welding Cast Iron Is a Problem. H. Thomasson. *Canadian Metalworking*, v. 22, Mar. 1959, p. 36-38.
Effect of the carbon content and microstructure on weldability. (K1, K9s; CI-n)

218-K.* Six Basic Design Rules for Brazed Honeycomb Sandwich. Floyd F. Rechlin. *Materials in Design Engineering*, v. 49, Mar. 1959, p. 100-105.
Effect of brazing on design; efficiency of the sandwich in the end product. (K8j; SS, Ni-b, 7-59)

219-K.* Contribution of Brazing in Light Engineering: Design and Process Selection. E. V. Beatson. *Sheet Metal Industries*, v. 36, Mar. 1959, p. 191-200.
Brazing stainless steel, Ti, Mo, Zr, Ta, Al and Nimonics. (K8; Al-b, Mo, Ni-b, Ta, Ti, Zr, 17-51)

220-K. Fundamentals of Glass-to-Metal Bonding: Pt. 4. Wettability of Gold and Platinum by Molten Sodium Disilicate. Milton L. Volpe, Richard M. Fulrath and Joseph A. Pask. *American Ceramic Society, Journal*, v. 42, Feb. 1, 1959, p. 102-106.
9 ref. (K11a; Au, Pt)

221-K. (German.) Welding in the Peaceful Uses of Atomic Energy. J. Ruge. *Schweissen und Schneiden*, v. 11, Feb. 1959, p. 52-60.
Impressions from the 2nd Atomic Energy Conference in Geneva. Reactor systems and materials and their welding. 10 ref. (K-general, T11)

222-K. (Russian.) Study of Thermal Processes in Gas Pressure Welding of Bars. M. S. Nikitin. *Svarochnoe Proizvodstvo*, Jan. 1959, p. 24-27.
Thermal effectiveness of the burner "MG-40" in welding 28 mm. diameter rods is greater than that of burner "MG-60 U" with a 70-mm. diameter rod. Method for calculation of heating and cooling processes of rod and for pressure gas welding. (K1k; ST, 4-55)

223-K. (Russian.) Butt Welding by High Voltage Capacitor Discharge. P. E. Evtifeev. *Svarochnoe Proizvodstvo*, Jan. 1959, p. 28-31.
Discharge assures mechanical strength of welded joints for Cu; Al and Cu + Al wire equal to the strength of the base metal. Joints have no pores, blisters, cracks or inclusions. (K-general; Al, Cu, 4-61)

224-K. (Russian.) Arc Welding of Copper-Nickel Alloy Pipes. B. I. Smirnov. *Svarochnoe Proizvodstvo*, Jan. 1959, p. 35-37.
(K1; Cu-b, *Ni*, 4-60)

225-K. (Russian.) Resistance Welding of Pipe. B. E. Paton, G. V. Garbunov and V. K. Lebedev. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 1-5.
Method permits completely mechanized production of welded assemblies for pipes 219 to 529 mm. in diameter. 6 ref. (K3, 4-60)

226-K. (Russian.) Aluminum Alloy Pipes in Gas Mains. L. S. Livshits and A. S. Rakhanov. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 16-17.
Because of smooth inside Al surfaces, pressure losses are about 10-15% lower than in steel pipes. Although flux components and coated electrode components used in automatic arc welding are likely to enter into a chemical interaction and produce corrosion, argon-arc welding eliminates this difficulty. (K1d, T26r; Al-b, 4-60)

227-K. (Russian.) Submerged Arc Welding of Copper Anodes Under Ceramic Flux. K. V. Bagryanskii, D. S. Kassov and V. M. Ivanov. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 33-35.
Process achieves good mechanical properties and high electrical conductivity. 4 ref. (K2e; Cu)

228-K. (Russian.) Thick Steel Plates Welded Without Beveling the Edges. V. F. Donchenko. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 35-37.
Use of submerged arc welding process. (K2e; ST, 4-53)

229-K. (Russian.) Welding Cast Iron in the Cold State. V. P. Ryabinkin and C. V. Rul'kov. *Svarochnoe Proizvodstove*, Feb. 1959, p. 37-42.
(K1a; CI)

230-K.* Welding Distortion: What Causes It and How to Cure It. Louis J. Larson. *Industry & Welding*, v. 32, Apr. 1959, p. 35-36, 67.
Prevention and correction procedures. (K-general; ST, 7-51, 9-74)

231-K.* Ultrasonic Welding: Theory and Practice. J. R. Wirt. *Industry & Welding*, v. 32, Apr. 1959, p. 38-39.
Al, Pt, Mo and other metals can be welded ultrasonically without alloying of base metal microstructures. (K6r; Al, Pt, Mo)

232-K.* (German.) Material Problems in Welding Austenitic Stainless Steels. Karl Bjorkroth. *Chemische Rundschau*, v. 66, Feb. 1, 1959, p. 59-65.

Welding temperature causes precipitation of chromium carbide which makes the welds susceptible to intercrystalline corrosion (knife-line attack). Stabilizing with Cb on Ti prevents such precipitation. Effects of electrode diameter, welding current, heat treatment, etc. Welding of steel sheets with bonded stainless steel layer. (K1, R2h, SS-e, 7-51, 8-66)

233-K.* (German.) The Choice of A-C. or D-C. for Arc Welding. C. Stieler. *Industrieblatt*, v. 59, p. 46-49.

Blowing effect of d-c. arc by magnetic field. Most coated electrodes can be used both with a-c. and d-c. For several steels no differences in the weldments are found in the micro or macrostructure or by X-rays. 10 ref. (K1a, K9; ST)

234-K. Electron-Beam Welding Process Operates in a Vacuum. *Iron Age*, v. 183, Mar. 26, 1957, p. 156-158. (K6)

235-K.* Metal Powder Electrodes and Their Development. A. J. Girouard. *Machine Production*, v. 18, Feb. 1959, p. 17-19.

Characteristics of electrode, techniques in welding. (K1a, W29n)

236-K.* (French.) Weldability of Various Carbon or Alloy Steels. P. Bastien, Ch. Dubois, H. Lejay and C. Roques. *Soudage et Techniques Connexes*, v. 13, Jan-Feb. 1959, p. 5-30.

Study of twelve carbon steels and seven low-alloy steels with tensile strengths ranging between 25 and 98 kg. per sq. mm. and yield strengths between 25 and 89 kg. per sq.mm. Brittle fracture in welded structures; causes of weld failure; Pellini and impact tests and their interpretation; properties of heat affected zones; hard spots, carbon equivalent, effect of hydrogen. 33 ref. (K9s, Q26, 2-61; CN, AY)

237-K.* (Slovakian.) Spot Welded Automobile Wheels. Milan Lipa. *Zvaranie*, v. 8, Jan. 1959, p. 6-9.

Fatigue tests performed to determine best welding parameters. (K3n, Q7, T21c; CN-g, 7-51)

238-K.* How to Do a Better Welding Job. Ray Kolb. *Engineering and Mining Journal*, v. 160, Jan. 1959, p. 71-78.

Base metal, geometry of parts to be welded, selection of electrodes and filler metals. (K1)

239-K.* Inert-Gas Metal-Arc Welding for Aluminum Sheet and Strip. J. E. Tomlinson. *Light Metals*, v. 22, Mar. 1959, p. 73-76.

Adaptation of the Mig process permits electrode wire to be pulled off reel by rolls situated in welding gun, thereby increasing reliability of feed for fine electrode wires. Typical "pull-through" guns illustrated. (K1d; Al, 4-53)

240-K.* Assessment of Gas-Shielded I^2Rt Welding. R. E. Jahn and L. M. Gourd. *Welding and Metal Fabrication*, v. 27, Mar. 1959, p. 92-101.

Increase in electrode deposition when varying electrode extension, type of electrode and plate thickness of mild steel. (K1d; CN)

241-K.* Control of Welding Distortion. E. H. Lee. *Welding and Metal Fabrication*, v. 27, Mar. 1959, p. 104-108.

Causes and types of distortion; various ways of control. (K9, 9-74)

242-K.* Inert Gas Consumable Electrode Welding of Thin Material. T. McElrath. *Welding Journal*, v. 38, Jan. 1959, p. 28-33.

It is possible to weld 0.015 to 1/8-in. thick materials by combination of new short arc techniques, suitable constant-potential power supply units and the ability to feed small-diameter wire. (K1d; CN, SS, Al)

243-K.* Joining Aluminum With High Zinc Solders by Abrasion Soldering. O. R. Singleton, Jr. *Welding Journal*, v. 38, Jan. 1959, p. 34-36.

Above 700° F. Zn solders become molten and alloy with Al when Al surface is subjected to a slight abrading action under the molten solder. (K7; Zn, Al)

244-K.* Electroslag Method of Welding Metals of Large Thickness. M. M. Barash, W. B. Heginbotham and P. B. L. Oxley. *Welding Journal*, v. 38, Feb. 1959, p. 132-134.

Process, applications and mechanical properties of carbon and alloy steel. 10 ref. (K6; CN, AY)

245-K.* Ultrasonic Welding Techniques. J. Bryon Jones and W. C. Potthoff. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 152. American Society of Tool Engineers, Detroit, 1958, 8 p.

Spot type and continuous ultrasonic welding equipment and application. Strength of ultrasonic single spot welds in various materials. (K6r, W29, 1-74; Al-b, Ni-b, Ti-b, Zr-b, Cu-b, Mo-a, SS, ST)

246-K. Development of Brazing Materials for Joining Zircaloy. R. E. Droegkamp. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 9-13. U. S. Office of Technical Services, Washington 25, D. C.

Four alloys, when used to induction-braze Zircaloy, form joints which are resistant to attack by 680° F. water. These are Zircaloy-2 with 4% Be, Ni with 7% P (Kanigen), Ni with 20% Pd, 10% Si and Cu with 20% Pd, 3% In. The Zircaloy-2 alloy has the best flow properties, strength and corrosion resistance. Kanigen has the advantage that it can be plated. (K8k; Zr-b, SGA-f, Be, Ni, *P, Pd, Si,* Cu, *In*)

247-K. Plate-Type, UO_2 Bearing Fuel Elements for the PWR Core 2 Blanket. E. F. Losco, R. I. Fischer, N. T. Saunders and R. A. Wolfe. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 57-72. U. S. Office of Technical Services, Washington 25, D. C.

Fabrication of plate-type fuel elements containing compartmented ceramic fuel. Method involves eutectic diffusion bonding of the Zircaloy-2 cladding components. Ni is unsatisfactory as a bonding agent because it results in excessive absorption of hydrogen and embrittlement of the cladding during corrosion testing. Cu and Fe do not adversely affect corrosion resistance and appear to be satisfactory bonding agents. 6 ref. (K5k, T11g; Zr-b, Ni, Cu, Fe, 8-66)

248-K.* (Czech.) Cracking of Low-Alloy Steel Weldments. Rene Rohan. *Zvaranie*, v. 8, Feb. 1959, p. 48-51.

Influence of various welding processes and electrodes on crack development in self-hardening alloy steel. Effects of preheating, heating during welding and relief annealing. (K1, K9, AY, 7-51, 9-72)

249-K.* (Slovakian.) Capillary Soldering. Viliam Ruza. *Zvaranie*, v. 8, Feb. 1959, p. 34-40.

Effects of base material, solder, width of gap between parts to be soldered, solder composition on strength. 6 ref. (K7; ST, SGA-f)

250-K.* (Slovakian.) Flash Welding of Aluminum Alloy AK-6. Milan Lipa. *Zvaranie*, v. 8, Feb. 1959, p. 52-54.

Optimum procedures; factors influencing strength of weldments. (K3r; Al-b, *Cu*)

251-K. Fabrication of Aluminium in Nuclear Engineering. *Light Metals*, v. 22, Mar. 1958, p. 87-88.

Applications of the inert-gas tungsten-arc and inert-gas metal-arc techniques. (K1d, T11; Al)

252-K. Semi-Automation in Domestic Iron Production. D. D. Williams. *Welding and Metal Fabrication*, v. 27, Mar. 1959, p. 102-103.

New resistance welding machine welds and flash tests which improves production speed and controls quality. (K3, T10c, 1-52)

253-K. How to Weld Copper to Stainless Steel and Mild Steel. H. B. Bott. *Welding Journal*, v. 38, Mar. 1959, p. 236-238.

(K3p; SS, CN, Cu)

254-K.* Unusual Stud Welding Application. Digest of "The Application of Stud Welding to Vibrating Wire Strain Gages". J. C. Chapman. Paper awarded the 1958 Gregory Award during the National Metal Congress, Cleveland, Oct. 28, 1958. *Metal Progress*, v. 75, Apr. 1959, p. 190, 194.

The wire is anchored to robust studs which are then monolithic with the structure; the studs are correctly oriented without difficulty. The gage post stud is correctly aligned with the welding gun by a tongue within the chuck which projects into the slot milled in the post. The gun is aligned with the template by locating the tripod studs in holes in the template, and the gage post stud is driven. (K1f, X28j)

255-K.* Electron Beam Welding: a New Development for Industry. W. L Steinkamp and W. L. Wyman. *Welding Engineer*, v. 44, Apr. 1959, p. 38-40.

Process advantages and mechanical properties of welds made in stainless steel, Al and Zircaloy-2 by bombardment of parts in a vacuum with a beam of high-energy electron. (K6, 1-73; Zr-b, Al-b, SS)

256-K.* Application Data on Kaiser's New Mig Techniques. M. B. Kasen, George Allen and F. R. Baysinger. *Welding Engineer*, v. 44, Apr. 1959, p. 44-46.

Procedures for welding Al alloy by Qualiweld, Chlorecon and Econoweld processes. Mechanical properties of weldments obtained using argon, helium and nitrogen shielding with and without chlorine additions. (K1d; Al-b)

257-K.* Welding Stainless Steel to Carbon or Low-Alloy Steel. John J. B. Rutherford. *Welding Journal*, v. 38, Jan. 1959, p. 19s-26s.

Development and successful application of the practice of welding stainless to ordinary steels. Difficulties which have arisen, proposed remedies and limitations. 18 ref. (K1; SS, CN, AY, 4-60)

258-K.* Welding Structural Steel. *Australian Welding Journal*, v. 12, Jan. 1959, p. 7-11.

Weldability, fabrication, inspection. (K-general; ST, SGB-s)

259-K.* Electro-Molding Replaces Forged Engine Components. R. L. Peterson. *Welding Engineer*, v. 44, Apr. 1959, p. 52-54.

Mild steel weld made inside mold-like water cooled Cu dams using arc process and protective flux to produce a diesel engine component. (K1e; ST)

260-K.* Argon Pinch-Hits for Helium in Zircaloy-2 Welding Operations. H. E. Soisson. *Welding Engineer*, v. 44, Apr. 1959, p. 59.

Comparison between weldments in Zircaloy-2 produced by tungsten inert-gas process with helium and with argon atmospheres. (K1d; Zr-b)

261-K.* Alloy Welding Fluxes for Low Alloy Steels, Stainless Steels and Hard Surfacing. R. A. Wilson. *Welding Journal*, v. 38, Jan. 1959, p. 20-27.

Compounding four primary, Cr, Mo, V, Ni fluxes and one neutral flux to make alloy combinations. Applications using semiautomatic equipment. (K-general, W29h; AY, SS, *Ni, Cr, Mo, V*)

262-K.* Carbon Dioxide Shielded Metal Arc Welding of Carbon Steel Plate. R. J. Keller. *Welding Journal*, v. 38, Jan. 1959, p. 27s-38s.

Advantages and disadvantages on plate with carbon content up to 0.3% and in thickness up to $1\frac{1}{2}$ in. welded. 10 ref. (K1d; CN, 4-52)

263-K.* Sterling Plus Lithium Alloy Selected for Brazing B-58 Stainless Steel Sandwich Panels. A. A. Lanzara and A. M. Setapen. *Welding Journal*, v. 38, Feb. 1959, p. 118-124.

Corrosion tests, preparation and assembly, brazing and heat treating. (K8, T24a; SS, Ag-b, SGA-f, *Li*, 7-59, 17-57)

264-K.* (Translation.) Welding in CO_2 With Electrode Wire. A. G. Potapevskii. *British Welding Journal*, v. 6, Mar. 1959, p. 129-131. (From *Avtomaticheskaya Svarka*, 1958, no. 2, p. 53-58.)

Influence of welding variables on composition of metal deposited by CO_2 shielded arc welding with mild steel electrode wire. Relation between intensity of metallurgical reactions and metal transfer characteristics. 4 ref. (K1d, W29h; ST)

265-K.* (Translation.) Temperature Distribution Through the Weld Pool in the Automatic Welding of Aluminum. D. M. Rabkin. *British Welding Journal*, v. 6, Mar. 1959, p. 132-137. (From *Avtomaticheskaya Svarka*, 1956, no. 2.)

Temperatures in weld pool of Al measured using chromel-alumel and Pt—Pt/Rh immersion thermocouples. Effects of welding rate, arc voltage and parent metal temperature on the distribution of temperatures. 4 ref. (K1g, K9n, X9q; Al-b)

266-K. (Translation—BWRA.) U.S.S.R. Seven Year Plan as It Applies to Welding. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 1-3.

Future research program of VNIIESO (All Union Scientific Research Institute for Arc Welding Equipment) and VNIIAUTOGEN (All Union Scientific Research Institute for the Gas Welding and Cutting of Metals). (K-general, A9)

267-K. (Translation—BWRA.) Diffusion Welding in a Vacuum. N. F. Kazakov. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 4-16.

Diffusion data and microstructures for T5K10, VK8 and T30K4 hard alloys joined to 18KhGT steel. Effects of pressure, temperature, surface cleanliness, composition and properties of metals and alloys on their weldability. 17 ref. (K5k, K9s, M27, 1-73; SS)

268-K. (Translation—BWRA.) Current Sources for Electroslag Welding. Yu. D. Gupalo. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 17-24.

Welding transformers with flat characteristics are most expedient in electroslag welding since circuit voltage oscillations have a lower effect on edge penetration in the articles being welded. Variations in electrode feed rate have less effect on edge penetration. Higher power factors are also obtained by welding transformers with flat characteristics. 5 ref. (K6, 1-52, W11r)

269-K. (Translation—BWRA.) Influence of Current Type and Polarity on Desulphurization of the Molten Metal in the Electroslag Process. B. I. Medovar. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 25-31.

Under fluoride fluxes, the sulphur is removed most rapidly by a-c. The desulphurization is almost as rapid on reverse polarity d-c., but is completely absent with direct polarity d-c., when the sulphur content of the metal may even increase somewhat by transfer from the slag. 13 ref. (K6)

270-K. (Translation—BWRA.) Effects of Silicon and Maganese on Weld Formation in Single Side Welding. A. I. Pashchenko. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 66-73.

Manual welding of type ST 4 steel with UONI-13/45 electrodes. Increase to 0.45-0.50% in the quantity of Si in welds, with quite a high Mn content (0.75-0.85%) does not reduce the plastic properties or impact strength of single side welds, nor does it result in raising the cold-shortness thresholds of welds to higher temperatures. (K1, Q-general, 2-60; ST, *Si, Mn*, 7-51)

271-K. (Translation—BWRA.) The Static Arc Characteristics in Gas Shielded Welding With Consumable Electrodes. V. R. Verchenko. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 74-77.

Arcs for consumable electrode gas-shielded welding have rising static volt-ampere characteristics. The slope of the characteristics depends on the shielding gas being used, the arc length, the diameter and physical properties of the electrode wire. The steepness of the characteristics increases with increase in the arc length and reduction in the electrode diameter. 5 ref. (K1d)

272-K. (Translation—BWRA.) Experience in the Automatic Welding of Aluminum Containers of 2 Cubic Meters Capacity. I. V. Dovbishchenko and V. G. Sventsinskii. *Avtomaticheskaya Svarka*, v. 65, p. 89-92.

Automatic single side welding of small Al containers by semisubmerged arc through a layer of flux, using twin consumable electrodes. Good mechanical properties and corrosion resistance of welded joints are achieved. (K1e, Q-general; Al, 7-51)

273-K. (Translation—BWRA.) Experience in the Use of GSR 9000-Watt D. C. Generators for Arc Welding. V. M. Timofeev. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 93-95.

Suitably converted these aircraft generators can be used either for welding with consumable electrodes (flat characteristic) or for welding with nonconsumable electrodes (drooping characteristic). (K1, 1-52, W11q)

274-K.* Adhesion and Surface Roughness. Pt. 1. Polyethylene and Metals. Dean Taylor, Jr., and John E. Rutzler, Jr. *American Chemical Society, Division of Paint, Plastics, and Printing Ink Chemistry*, v. 19, Apr. 1959, p. 219-248.

Adhesion of polyethylene to a metal oxide surface is poorer for rough than for smooth surfaces; only a small portion of the total surface of a metal is involved in adhesive bonding. 7 ref. (K11d)

275-K.* Low-Head Welding of Aluminum. B. Cliffe. *Australian Welding Journal*, v. 12, Jan. 1959, p. 12-15.

Characteristics of Al, weld fluxes, techniques of joining. (K-general; Al)

276-K.* Welding of Alloy Steels. J. W. Shedden. *Australian Welding Journal*, v. 12, Jan. 1959, p. 18-21.

Welding of armor plate materials using "austenitic" or stainless steel electrodes; low-alloy high-tensile steel weldable by the usual run of mild steel electrodes; low-hydrogen electrodes. (K1, W29h; AY, SS)

277-K.* What's Coming in Welding. *Steel*, v. 144, Mar. 30, 1959, p. 74-78.

Electron beam, plasma jet, pilot arc spot, and low voltage inert gas welding; deuterium and high-frequency power sources. (K-general)

278-K.* Welding of Inconel for Nuclear Power Applications. W. A. Fragetta and G. G. R. Pease. *Welding Journal*, v. 38, Apr. 1959, p. 347-356.

Ti-Mn modified Inconel wire, deposited by the inert-gas-shielded

consumable-electrode process, produces overlays on steel, as well as transition welds between Inconel and stainless steels. (K1d, W11p; ST, SS, Ni-b, *Cr, Fe*)

279-K.* (German.) Internal Stresses, Distortions and Dimensional Accuracy in Welding. H. G. Kunz. *Schweissen und Schneiden*, v. 11, Mar. 1959, p. 84-92.

Temperature distribution and deformation during welding; internal stresses and their distribution; warping; distortion and deformation; dimensional stability; longitudinal, transverse and angular contraction. 15 ref. (K9, Q25; ST)

280-K.* Brazed Steel Honeycomb Structures for 800°F. Charles F. Burrows. *Materials in Design Engineering*, v. 49, Apr. 1959, p. 110-112.

Selecting materials, brazing, properties of structures. (K8, Q-general, R-general; SS, 7-59)

281-K. Development of Titanium-Clad Steel Using a Vacuum Brazing Process. D. Canonico and H. Schwartzbart. *Welding Journal*, v. 38, Feb. 1959, p. 71s-77s.

Filler metal composition, brazing cycle, degree of vacuum, and surface preparation. Welding and joint design. (K8, Q2g, K1d, 1-73, 2-62; ST, Ti, *Ag*, 8-66)

282-K. Methods for End Capping Zirconium-Clad Reactor Fuel Pins. J. J. Vagi, R. L. Koppenhoffer and D. C. Martin. *Welding Journal*, v. 38, Feb. 1959, p. 78s-84s.

Best seal obtained by using a pin in which the core is recessed to receive an end-cap insert that is attached and sealed by arc welding. (K1, K3s, K6n, K3r, K8k, T11g; Zr, 8-66)

283-K. Effect of Zinc Coatings on Resistance Seam Welding of Sheet Steel. C. W. Volek and M. L. Begeman. *Welding Journal*, v. 38, Mar. 1959, p. 113s-121s.

Changes in welding variables necessary for various thicknesses; welding schedules. (K3p; ST, Zn, 4-53, 8-65)

284-K. Aluminum Welding Using the Inert-Plus-Nitrogen-Gas Metal-Arc Process. George Allen. *Welding Journal*, Mar. 1959, p. 132s-141s.

Procedure, mechanical properties, cost and application. (K1d, Q27a, Q23; Al-b)

285-K. Quartz Lamp Radiant Brazing of Titanium Alloy Honeycomb Sandwich Panels. John F. Rudy, Robert M. Necheles and Harry Schwartzbart. *Welding Journal*, v. 38, Apr. 1959, p. 202s-208s.

Advantages are rapid and uniform heating, clean heat source. Application to full-sized production panels. (K8; Ti, 7-59)

286-K. Structural Applications of Stud Welding. R. W. Taylor and J. C. Chapman. *British Welding Journal*, v. 6, Mar. 1959, p. 97-104.

Uses in construction of large tanks, gantry cranes, bridges and buildings. (K1f, T26)

287-K. High Quality Joints. . . With Brazing Alloy Clad Strip. Allen G. Gilbraith. *Welding Engineer*, v. 44, Apr. 1959, p. 79-80.

(K8; SGA-j, 4-53, 8-66)

288-K. Welding of Equipment for the Dresden Nuclear Power Station. William R. Smith. *Welding Journal*, v. 38, Apr. 1959, p. 307-316.

Materials, processes and quality-control methods to fabricate equipment in plant's nuclear portion. (K-general, W11p)

289-K. Progress Report on the Flux-Cored CO_2 Welding Process. A. F. Chouinard and J. A. Howery. *Welding Journal*, v. 38, Apr. 1959, p. 334-341.

(K1d; CN, AY, RM-q)

290-K. (German.) Influence of Welding on Stiffness and Damping of Welded Constructional Elements. F. Eisele and H. Drumm. *Schweissen und Schneiden*, v. 11, Mar. 1959, p. 75-83.

Static stiffness in fusion and spot welding; influence of welding on damping capacity; distortion of component parts; measuring dynamic stiffness of fusion welded structures. 11 ref. (K-general, Q21, Q8)

291-K. (Slovakian.) Automatic Welding Machine VUS-Arc 350. Argon-Shielded Arc Welding of Aluminum Strip. Jan Novotny. *Zvaranie*, v. 8, Feb. 1959, p. 44-47.

(K1d, 1-52; Al, 4-53)

292-K.* Welding the Jupiter. *Machinery*, v. 65, Apr. 1959, p. 111-115.

Mig, Tig and spot welding employed in fabricating an Al alloy missile. (K1d, K3n, T24e; Al-b, *Mg, Mn, Cr*)

293-K.* Strong Welds at Brazing Temperatures. *Metalworking Production*, v. 103, Apr. 3, 1959, p. 583-586.

Special alloys and fluxes give welds of exceptional strength. Eutectic alloys used as weld metal. (K1, W29h, 2-61)

294-K.* (Russian.) Welding Rotary Butt Joints in Low-Carbon Steel Pipe Under Carbon Dioxide Atmosphere. A. I. Akulov, V. V. Spitsyn and A. K. Krzhechkovskii. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 6-7.

Automatic arc welding produces no porosity or slag inclusions and insures good mechanical properties. (K1e, Q-general; CN-g, 4-60, 7-51)

295-K.* (Russian.) Prevention of Slag Inclusions at the Root of Annular Welds in Pipe Ends During Automatic Butt Welding. L. A. Kopel'man. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 11.

The most effective means of preventing inclusions during automatic arc welding of pipe butts used in gas transmission lines is to reduce the arc voltage to 35-38 v. and the amperage to 450-500. (K1, T26r, 9-69).

296-K.* (Russian.) Welded Joints in 1KH18N9T and KH18N12M2T Alloy Steel Pipes. I. A. Opekhov. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 38-39.

Various types of "V" grooves used in welding of high Cr-Ni alloy steel pipes. (K-general; AY, *Cr, Ni*, 4-60)

297-K.* (Russian.) Technology of Stud Welding With Free or Forced Shaping of the Weld Metal. D. I. Vainboim. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 31-35.

In one position of the stud, the molten weld metal, protected by argon or a flux, assumes by itself the right shape when filling the joint. For other positions, protection rings composed of flux, flux plus porcelain, or porcelain, provide the shaping. 8 ref. (K1f; CN-g)

298-K.* New Honeycomb Brazing Meets Quadrupled Needs. *Product Engineering (Design Issue)*, v. 30, Apr. 27, 1959, p. 23-24.

Study of improved methods at North American Aviation. (K8; SS, 7-59)

299-K.* Welding Repair of Aircraft Fuel Tanks. W. P. Campbell. *Canadian Metalworking*, v. 22, Apr. 1959, p. 52-53.

Combination of inert-gas tungsten-arc welding and gas welding flux. (K1d, T26q; Al-b, RM-q, 18-72)

300-K.* (Czech.) Welding of Steel 13123 Under a Flux. O. Hajzler. *Zvaranie*, v. 8, Mar. 1959, p. 92-96.

Manual arc welding, automatic submerged arc welding and electroslag welding of boilers made from steel 13123 with wall thicknesses of 10 cm. average. (K1, T26q; CN-g)

301-K.* (French.) Pressure Welding of Aluminum and Copper at Room Temperature. D. Both. *Metalurgia si Constructia de Masini*, 1958, p. 51-55.

Al and Cu bars are butt welded end-to-end by pressing together clean end surfaces which must be normal to the axis. 7 ref. (K5k; Al, Cu)

302-K.* (French.) Automatic Arc Welding in the Manufacture of Vessels for Liquefied Petroleum Gases. Adolphe Million. *Metalurgia si Constructia de Masini*, 1958, 61-64.

Segments of STAS 1988-51 steel are assembled by automatic welding with EL 50 or S1A STAS 1126-52 electrodes and AN-348 or Z-41 fluxes. (K1g, T26q; CN-g)

303-K.* (Spanish.) Hydrogen, Fisheyes and Tensile Tests. J. Izaguirre Cobo. *Ciencia y Tecnica de la Soldadura*, v. 9, Jan-Feb. 1959, p. 2/1-2/8.

Mechanism of hydrogen diffusion into the weld and sources of hydrogen. Theoretical explanation of the formation of fisheyes. The defect occurs frequently when electrodes with rutile or organic-rutile coatings, or basic electrodes, are used. (K1a, Q27a; ST, 7-51, 9-68, *H*)

304-K. (French.) Mechanical Testing of Weldments. Stefan Nadasan. *Metalurgia si Constructia de Masini*, 1958, p. 28-33.

Sequence and tests revealing the weldability of base materials and the mechanical properties of welds. Determination of proper filler metals and optimum welding processes. 8 ref. (K9s, Q-general, 7-51)

305-K. (Russian.) Welding of Critical Cast Iron Components by the Cold Method. N. K. Malyshev and N. V. Vasil'ev. *Cement*, no. 6, 1958, p. 31-32.

(K5k; CI)

306-K. (Russian.) Field Welding Equipment for Gas Pipe Lines. D. A. Dudko, F. M. Vinogradskii and S. V. Egorov. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 7-8.

Submerged arc welding, under field conditions, of steel pipes with a diameter of 720 mm. Pipe sections 50 m. long were attained. (K1a, T26r)

307-K. (Russian.) Quantitative and Qualitative Improvements in the Welding of Gas Pipeline. K. I. Zaitsev. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 8-10.

Surfacing and preparation of pipe ends. (K-general, T26r)

308-K. (Russian.) New Welding Electrodes and Fluxes for Welding Pipes Used in Gas and Oil Industries. A. G. Mazel'. *Svarochnoe Prozvodstvo*, Mar. 1959, p. 10-11.

For field weldments on steel MSt_3, electrodes with a cellulose (plastic) type coating are recommended because of their resistance to rust in field conditions and because of ease of manufacture with existing equipment. (K1, W29h; ST)

309-K. (Spanish.) Stud Welding. Joel Aversten. *Ciencia y Tecnica de la Soldadura*, v. 9, Jan-Feb. 1959, p. 6/1-6/6.

Equipment and processes. (K1f, 1-52)

310-K.* Design and Application of Flash Butt-Welded Rings. Forrest W. Johnson. *Machine Design*, v. 31, Apr. 30, 1959, p. 123-126.

Materials, fabrication, advantages. (K3r, 17-51)

311-K. The Inert-Gas-Shielded Metal-Arc Welding of Titanium. E. A. Franco-Ferreira and P. Patriarca. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission*, ORNL-2612, Mar. 17, 1959, 59 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Welding procedures for single-pass full-penetration square butt welding of $\frac{1}{4}$-in. thick Ti plates in the downward position. (K1d; Ti)

312-K.* New Welding Process Speeds Truck Body Assembly. *Modern Assembly Practice*, Mar-Apr. 1959, p. 17-18.

Automatic carbon dioxide process blankets both arc and weld zones with CO_2 gas. (K1d, T21e)

313-K.* Welding Locomotive Traction Motor Frames. H. E. Schneider. *Modern Machine Shop*, v. 31, May 1959, p. 116-119.

Operation involves joining four lengths of special heavy rolled steel section at edges by internal and external welds. (K1e, T23m; ST)

314-K.* Mass Production Brazing Machine. *Modern Metals*, v. 15, Apr. 1959, p. 48, 53.

Brazing Al coffee pots. (K8, T10a; Al, 17-57)

315-K.* The Weld Heat-Affected Zone. Ernest F. Nippes. *Welding Journal*, v. 38, Jan. 1959, p. 1s-18s.

Effect of weld thermal cycles on the microstructure of all steels and mechanical behavior of the base metal in the zone. Development of a high-speed dilatometer for determination of continuous cooling transformation diagrams. 14 ref. (K9n, J22; ST, CN, SS)

316-K.* Fabrication of Zirconium. B. S. Payne. *Advanced Materials Technology*, v. 2, Apr. 1959, p. 8-9.

Welding techniques, examples of Zr process equipment. (K1d; Zr, 17-57)

317-K.* Flange Deformations in the Welding of T-Sections. N. O. Okerblom. *British Welding Journal*, v. 6, Apr. 1959, p. 145-154.

Equations expressing theoretical relationship between flange plate deformation and welding conditions, weld dimensions and dimensions of sections being welded. Comparison with experimental data in welding T and H sections. 8 ref. (K1e; ST, 9-74)

318-K.* Effect of Storage Time on the Hydrogen Content and Mechanical Properties of Arc Welds Made With Covered Electrodes. W. Hummitsch. *British Welding Journal*, v. 6, Apr. 1959, p. 155-160.

Influence of up to 5100 hr. storage on hydrogen content and tensile properties of mild steel weld metal deposited by different types of electrodes. (K1a, Q27a, W29h; CN)

319-K. Gas-Pressure Bonding of Flat-Plate Fuel Assemblies. Stan J. Paprocki, Edwin S. Hodge, Charles B. Boyer and Ralph W. Getz. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1312, Jan. 20, 1959, 44 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Simultaneous cladding and bonding of flat-plate Zircaloy-2 clad fuel assemblies utilizing the gas-pressure bonding technique. Components to be bonded are assembled in a container which is then evacuated, sealed and placed inside a high-pressure cold-wall autoclave and subjected to a high inert gas pressure at an elevated

temperature. Pressure and temperature are maintained to allow for the diffusion bonding of all the component interfaces to form an integral assembly. (K5k, T11g; Zr-b)

320-K.* (French.) Welding of High-Temperature Cr-Mo-V-Steel Possessing High Cold Strength. E. Pouillard. *Metaux Corrosion-Industries,* v. 34, Feb. 1959, p. 58-71.

A 709 steel was welded with commercial coated electrodes to produce welds of Cr and Mo, and with special electrodes to deposit Cr-Mo-V. Weldments with Cr-Mo-V possess better strength. Properties are not markedly improved by complete heat treatments as compared to simple annealing. (K1a, K1d; SS, SGA-h, *Cr, Mo, V*)

321-K.* (German.) New Welding Methods for Clad Steels. Josef Cabelka. *Schweisstechnik,* v. 13, Feb. 1959, p 19-23.

Welding of 13, 18 and 25% Cr steels. Effect of oxygen on crack formation and on intercrystalline corrosion in 18-8 Cr-Ni steel weldments. (K1a, K1d, R2h, Q26q; SS, 7-51)

322-K.* Even Rookie Welders Can Use This Method. *Steel,* v. 144, May 11, 1959, p. 150.

Dip transfer technique involves fine wire, lower current and lower voltages. (K1d)

323-K.* (German.) Adhesive Joining. H. Schwarz and H. Schlegel. *Plaste und Kautschuk,* v. 6, Jan. 1959, p. 3-5.

Results indicate the superiority of warm hardened over cold hardened epoxy resins in relation to adhesion and resistance to temperature. 5 ref. (K12)

324-K. What Next for Resistance Welding. *Modern Assembly Practice,* Mar-Apr. 1959, p. 15-16.

Recent developments in spot, flash-butt and projection welding. (K3)

325-K. Fluxes for Brazing. *Modern Assembly Practice,* Mar-Apr. 1959, p. 29.

Fluxes for Ag alloy brazing of various metals. (K8, RM-q)

326-K. (Italian.) Developments in Arc Welding for Shop and Construction Site Use. (Conclusion.) Oscar Grossi. *Macchine,* v. 14, Feb. 1959, p. 131-139.

Welding machines, accessories, materials; special techniques; nondestructive inspection. (K1, 1-52)

327-K.* Process Selection for Aluminum Welding. P. T. Houldcroft and N. T. Burgess. *Light Metals,* v. 22, Apr. 1959, p. 121-125.

Application of tungsten inert gas, tungsten-arc, inert gas metal-arc, metal arc, flash, resistance, cold and gas welding processes to various Al alloys. Joints, thickness of material and welding positions. Equipment and economics. 12 ref. (K-general; Al-b)

328-K.* Fabrication for Nuclear Power. *Welding and Metal Fabrication,* v. 27, Apr. 1959, p. 120-127.

Bending, arc welding, stress relief and inspection in fabrication of heat exchangers from steel plate. (K1, J1a, S13e, S13g, W13b; ST, 7-51, 4-53)

329-K.* Automatic Welding in the Shipyards. P. Shaw. *Welding and Metal Fabrication,* v. 27, Apr. 1959, p. 128-134.

Equipment for submerged arc and CO_2-shielded covered-electrode processes for automatic fillet welding of steel plate to stiffeners. Application of argon-shielded bare wire arc welding to contruction of Al superstructures. (K1a, K1e, K1d, 1-52, T22j; ST, Al-b)

330-K.* Welding the Victor V-Bomber. C. A. Burton and H. Tyte. *Welding and Metal Fabrication,* v. 27, Apr. 1959, p. 135-142.

Spot welding of Al alloy sheets to corrugated core in production of sandwich panels, roll spot and spot welding equipment. Tests and properties of welds. (K3n, K3p, 1-52, T24a; Al-b, *Cu, Zn,* 7-59)

331-K. Welding and Brazing of Molybdenum. N. E. Weare and R. E. Monroe. *Defense Metals Information Center,* PB 151063, Mar. 1, 1959, 43 p. (Available from U. S. Office of Technical Services, Washington, D. C.)

Microstructure, impurities, alloying elements, notches and physical properties. Testing, cleaning and joining procedures. 44 ref. (K1d, K3n, K5, K8, Mo)

332-K. Brazing Titanium Sandwich Construction. John F. Rudy, Robert M. Necheles and Harry Schwartzbart. Armour Research Foundation of Illinois Institute of Technology. *Wright Air Development Center,* Technical Report 58-467, Jan. 1959, 88 p.

Available Ti alloys; properties affecting suitability for use as sandwich panel face sheets; evaluation of brazing alloys for Ti or stainless steel cored sandwich. Comparison of furnace retort brazing with quartz lamp radiant heating process. Data

from edgewise compression, salt spray corrosion and oxidation tests. (K8j, W29m, Q-general, R11J, R1h; Ti-b, SS, 7-59)

333-K.* Spot-Welded Corrugated Sandwich Construction for Aircraft. *Machinery (London)*, v. 94, Apr. 22, 1959, p. 876-888.
Forming the corrugated sheet, welding and riveting the sandwich. (K3n, G9; Al-b, *Cu, Zn*, 7-59)

334-K. Solder Joint Reliability. Alvin B. Kaufman *Electronic Technician*, Apr. 1959, p. 34,66.
Temperature characteristics of tip, solder and flux. (K7, 2-61; SGA-f)

335-K. A Question of Design for Welding. *Light Metals*, v. 22, Apr. 1959, p. 118-119.
Pressing, roll forming and welding of component parts in production of Al milk cans. (K1d, G4d, G11, T3s, 17-51; Al-b)

336-K. (Spanish.) Maintenance of Arc Welding Equipment. *Fusion de Metales*, v. 21, Jan-Feb. 1959, p. 6-7.
(K1, 1-52)

337-K.* Brazing Under an Electric Blanket. Donald E. Wernz and Mel Schwartz. *Metal Progress*, v. 75, May 1959, p. 109-112.
New brazing technique appears as a substitute for furnace brazing in a number of applications. The method is said to be cheap and efficient, equipment is compact and the production cycle considerably shortened. (K8, 7-59)

338-K.* Some Aspects of Cross Wire Welding of Aluminum Alloys. G. H. Batten. *Metropolitan-Vickers Gazette*, v. 30, Feb. 1959, p. 65-69.
Type of equipment needed and correct current waveform and pressure. (K3n, W29; Al-b, 4-61)

339-K.* Cast Iron Welding. K. Fairweather. *New Zealand Engineering*, v. 14, Mar. 15, 1959, p. 95-98.
Oxy-acetylene, bronze and arc welding. (K1, K2h, K8; CI)

340-K.* (Italian.) New Welding Method. Oscar Grossi. *Macchine*, v. 14, Apr. 1959, p. 381, 383, 385, 387.
Description of "Arcosarc" process, which uses an electrode containing deoxidizing and slag-producing substances. The weld metal in liquid state is protected by CO_2. (K1d)

341-K. (German.) New Resistance Welding Equipment. Georg Deubel. *Industrieblatt*, v. 59, Apr. 1959, p. 150-154.
(K3, 1-52)

342-K. (Russian.) Use of Ultras in Welding. G. A. Nikolaev and N. A. Ol'shanskii. *Vestnik Mashinostroeniya*, v. 39, Apr. 1959, p. 51-55.
Process results in an improvement in the mechanical properties of the welded joint. This derives from changes in the crystallization conditions of the molten bath and changes in grain size. (K6r)

343-K. (Book-Russian.) Electric Arc Welding. V. L. Tsegel'skii. 227 p. 1957. Trudrezervizdat, Moscow. 4 Rub. 20 k.
Elementary information on electric welding machines and equipment with direct and alternating current; up-to-date arc welding technology and basic information about automatic and semi-automatic welding. (K1, 1-52)

344-K.* Trepan Joint and Low Ferrite Overlay Stop Microfissuring. *Industry & Welding*, v. 32, May 1959, p. 32-34, 46.
A special trepan joint plays a key role in fabricating nuclear power heat exchangers. A leak between the sides would let radioactive fluid contaminate other fluid and be carried through the system. Material properties, overlay preparation and welding technique. (K1d, W13b; SS)

345-K.* High Temperature Brazing of Turbojet Components. *Industry & Welding*, v. 32, May 1959, p. 36-37, 46-47.
High-temperature brazing is used in turbojet engines to make joints that will stand up under temperatures ranging from -60 to 3500° F. (K8, T24b)

346-K.* (German.) Development of Standardized Test Procedures in Adhesive Joining. H. Winter and H. Meckelburg. *Aluminium*, v. 35, Apr. 1959, p. 192-196.
Jointing procedures in the application of Redux 775, Redux Film 775, Araldid, I and XV, Bostik 476, Metallon 130, Araldid 101, 123 B, Metallon K and Agomet A as bonding media. (K12)

347-K.* (Russian.) Selection of Welding Methods for Gray Cast Iron. B. G. Ivanov. *Svarochnoe Proizvodstvo*, Apr. 1959, p. 34-40.
Welding rods and qualitative properties of the welded metal; chemical composition of electrodes; composition of electrode coatings; fluxes for gas welding. (K1a; CI-n)

348-K.* (Russian.) Multiple Use of Slag Crust in Automatic Welding. N. E. Sergienko.

Svarochnoe Proizvodstvo, Apr. 1959, p. 40-41.

Slag crust, formed after welding flux is consumed, can be successfully reused as a flux. Hardness, X-ray and metallographic tests on welds formed by the use of such flux crusts show good tensile strength, elongation and impact strength. Each crust can be used twice. (K1; RM-q)

349-K.* Design and Welding of Alloy Cast Steel Steam Turbine Applications. L. W. Songer. *Modern Castings,* v. 35, May 1959, p. 79-87.

Quality control aspects of high quality castings. (K1, W11k; AY, 5, 17-51, 17-57)

350-K.* Effect of Welding Conditions on the Shrinkage Distortion in Welded Structures. Pt. 1. Masaki Watanabe and Kunihiko Satoh. *Osaka University, Technology Reports,* v. 8, Oct. 1958, p. 405-415.

The two main factors in shrinkage are welding heat and internal constraint. 6 ref. (K9n, P10c; 7-51)

351-K.* Zirconium Welds Join Parts for Atomic Power Plant. J. Glatter, E. G. Schwartz, W. L. Frankhouser and J. H. Eyler. *American Machinist,* v. 103, May 18, 1959, p. 128-130.

Shielded arc welding of Zircaloy-2 tubes, rods and sheets. (K1d, T11; Zr-b)

352-K.* Before Tackling the Refractory Metals. Alan F. Busto. *Product Engineering (Design Issue),* v. 30, May 25, 1959, p. 43-45.

Inert gas shielded welding of Cb, Mo, Ta and W. (K1d; Cb, Mo, Ta, W)

353-K. Inert Arc Spot Welding Cuts Costs 60%. *Industry & Welding,* v. 32, May 1959, p. 31, 46.

Two weld times can be set on the control panel, one for light-gage metal, the other for heavier types. (K3n)

354-K. Tungsten Inert Arc Welding. Frank Kuncz. *Industry & Welding,* v. 32, May 1959, p. 35.

Process analysis check list and trouble shooting guide. (K1d)

355-K. (German.) Frequent Faults in Gas Welding. H. Ehrenberg and H. Schmidt. *Schweissen und Schneiden,* v. 11, Apr. 1959, p. 121-126.

(K2, 9)

356-K. (Russian.) Butt-Welding of Low Carbon Steel Bars for Subsequent Rolling. N. S. Kabanov. *Svarochnoe Proizvodstvo,* Apr. 1959, p. 25-30.

(K-general; 4-55, CN-g)

357-K. (Russian.) Automatic Welding of Oil Apparatus Made of Double Layer of Steel. A. G. Fomin. *Svarochnoe Proizvodstvo,* Apr. 1959, p. 30-32.

Submerged arc welding process with split electrodes. (K1e, T26q; AY)

358-K.* Welding of Molybdenum. D. C. Martin. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 63-76.

Effect of recrystallization, oxygen, nitrogen and carbon contents, grain size and alloying elements on brittle transition temperature of Mo. Ductility of tungsten arc and metal arc welds inert gas shielding devices and control of welding atmosphere. Spot, seam and flash welding. 16 ref. (K1, K3, Q23r, 2-59, 3-69; Mo-b)

359-K.* Brazing of Molybdenum. G. S. Hoppin. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 77-87.

Brazing processes, metallurgical problems and high-temperature applications; microstructure and elevated temperature tensile properties of joints brazed with Pd-base alloys. 5 ref. (K8, Q27a, 2-62; 7-52, Pd, SGA-f)

360-K.* Ultrasonic Welding. J. Byron Jones. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 88-102.

Ultrasonic welding of Al alloys, Ni alloys, stainless steels, carbon steels, Ti alloys, Zr alloys, Ta alloys, W alloys, Au alloys, Cu, Be, and Kovar. Joining dissimilar metals; strength of ultrasonic welds in arc cast and sintered Mo sheet materials. Influence of Ni or Pt foil interleaf on quality of Mo welds. (K6r; Mo-b, Ti-b, SS, CN, Cu-a, Al-b, Ni-b, Ta-b, W-b, Zr-b, Be-b)

361-K.* Fusion Welding of Molybdenum Power Plant Components. Jesse S. Sohn. Paper from "Fabrication of Molybdenum" American Society for Metals, Cleveland, 1959, p. 103-118.

Influence of recrystallization and structural conditions on tensile transition temperature for Mo alloys containing up to 9.4% W, 0.2% Ti, 0.06% Cr and 0.015% C. Tensile strength and ductility of welds made in Mo sheets with up to

1.25% Ti, 0.3% Cb, 2% W or 1% V by inert gas shielded tungsten arc process. Fabrication of power plant components, using flash welding, inert gas shielded tungsten arc and metal arc processes. 5 ref. (K1d, K3r, N5, Q23r, Q27a, T24b; Mo-b, *W, Ti, Cr, Cb, V, C*)

362-K.* Resistance-Welding Characteristics of Sheet Steels. G. E. Grotke and W. D. Doty. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 13-25.

Characteristics of rimming, capped, semikilled and killed steels, especially in relation to weldability. (K3, K9s; CN-g, 4-53)

363-K.* (German.) Crack Elimination by Special Electrodes. Hermann Hoffmann. *Oerlikon Schweissmitteilungen*, v. 17, no. 33, 1959, p. 5-6.

Procedures for welding vessel bottoms. (K1a, T26r, 9-72; ST)

364-K. (Dutch.) Weldability. H. G. Gerrlings. *Lastechniek*, v. 25, Apr. 1959, p. 69-71.

(K9s)

365-K. (German.) Time Studies in the Production of Weldments on Pipelines. Gerhard Brauniger. *Oerlikon Schweissmitteilungen*, v. 17, no. 33, 1959, p. 7-9.

(K-general, A5d, T26r)

366-K. Joining of Beryllium. N. E. Weare and R. E. Monroe. *Defense Metals Information Center*, Memorandum no. 13, Mar. 30, 1959, 26 p.

Since Be is a brittle metal it is difficult to fabricate and join. Limited success is reported on direct welding by tungsten arc, pressure and electron beam processes. Cracking is the major problem encountered. Good joints are achieved by braze welding with Al filler and brazing with Ag and Ag-Cu eutectic alloy. 16 ref. (K-general; Be)

367-K.* Effect of Welding and Stress Relief on the Parent Plate. J. E. Roberts. *British Welding Journal*, v. 6, Feb. 1959, p. 72-81.

For mild steel, notch-ductile steel and low-alloy high-strength weldable steels, properties of the heat affected zone are equal to those of parent plate, provided there is no cracking or excessive hardening which may lead to cracking. Initiation of brittle fracture in a welded structure is strongly dependent on presence of residual stresses. Use of notch-ductile steels reduces risk of such fractures even in presence of residual stress. 11 ref. (K9s, Q26s, Q25h; AY, CN)

368-K.* Welding From the Viewpoint of Lloyd's Register of Shipping. G. M. Boyd. *British Welding Journal*, v. 6, May 1959, p. 205-210.

Applications of welding and welding research in relation to ships. 38 ref. (K-general, T22, A9)

369-K.* Inert-Gas Metal-Arc Welding Aluminum Using Fine Wire Electrodes. Pt. 2. J. E. Tomlinson and A. J. King. *Welding and Metal Fabrication*, v. 27, May 1959, p. 204-209.

Critical current for the spray transfer of Al electrodes in argon is a linear function of electrode diameter. Substantially lower welding currents become available as the electrode diameter is reduced below the minimum size presently employed. (K1d, W29h; Al)

370-K.* (Czech.) Weldability of the Heat Resistant Skoda T56 Cr-W-Mo-V-Steel in the Forged State. Vaclav Pilous. *Hutnicke Listy*, v. 14, May 1959, p. 429-435.

Experimental welding with the electrode V Lof Spec Extra. The steel is weldable after tempering at 750° C.; preheating before welding; influence of preheating and of the vanadium content on the rate of cooling after welding. 10 ref. (K9s, 2-64, 2-60; CN, *Cr, W, Mo, V*, SGA-h)

371-K. Diffusion Bonding Joins Zircaloy and Stainless. J. M. Gerken. *American Machinist*, v. 103, June 1, 1959, p. 118-119.

(K5k; SS, Zr-b)

372-K. Electron Beams—New Technique for Welding. George Burton and R. L. Matchett. *Metalworking Production*, v. 103, May 22, 1959, p. 901-904.

Method of joining high-temperature metals. (K6)

373-K. (Slovakian.) Manual Arc-Spot Welding Equipment. Ladislav Muncner. *Zvaranie*, v. 8, Apr. 1959, p. 104-107.

(K1g, 1-52)

374-K.* Pressure Welding of Metals. E. C. Rollason. *British Welding Journal*, v. 6, Jan. 1959, p. 1-4.

Variety of parameters and difficulty in devising methods for the measurement of bond strength which can be related to

fundamental properties of metal. In welding of dissimilar metals, development of alloys and intermetallic compounds complicates interpretation of results. 11 ref. (K5)

375-K.* Industrial Practice in Cold Pressure Welding. J. A. Donelan. *British Welding Journal*, v. 6, Jan. 1959, p. 5-12.

Principles of cold welding, preparation of metal surfaces, influence of die design on weld strength, applications to welding of Al and Cu foil, sheet, wire, rod and tubes. (K5b; Al, Cu)

376-K.* Pressure Welding by Rolling. L. R. Vaidyanath, M. G. Nicholas and D. R. Milner. *British Welding Journal*, v. 6, Jan. 1959, p. 13-28.

Investigation of mechanism of pressure welding. Test was devised for measuring bond strength of Al, Cu, Pb and Sn welded at room temperature. Role of oxide film and of adsorbed layer of water vapor; initiation and development of bonding; influence of degree of reduction, variations in pressure, temperature, roll diameter and speed; structure of bonded area. 18 ref. (K5j, L22, N-general, 7-51; Al, Cu, Pb, Sn)

377-K.* Influence of Relative Interfacial Movement and Frictional Restraint in Cold Pressure Welding. E. Holmes. *British Welding Journal*, v. 6, Jan. 1959, p. 29-37.

Results of pressure welding tests on similar and dissimilar Al and Cu assemblies indicate the relative importance of oxide dispersal and modification of surface roughness in bond strength, particularly when sliding occurs between members and when frictional restraint is changed. 12 ref. (K5h, Q27a; 7-51, Al, Cu)

378-K.* (French.) Determination of the Weldability of Steels. Pt. 1. *Metallurgie et la Construction Mecanique*, v. 91, Apr. 1959, p. 275-281.

Criteria of weldability, standard tests; influence of composition, hardenability and mechanical properties on welding behavior of carbon and low-alloy structural steels. (K9r, K9s, Q-general; AY, CN)

379-K.* (French.) Recent Developments in Arc Welding Processes. A. Gaubert. *Soudage et Techniques Connexes*, v. 13, Mar-Apr. 1959, p. 85-98.

Automatic and semi-automatic processes for arc welding mild and low-alloy steels in relation to application and optimum results. (K1; AY, CN)

380-K.* (French.) A Transition Weld Between Ferritic and Austenitic Piping in Steam Plant Superheaters. B. Lofblad and G. Lindh. *Soudage et Techniques Connexes*, v. 13, Mar-Apr. 1959, p. 103-111.

Effective joint is made between two dissimilar steels by using a transition piece made of stabilized high-Ni alloy with Cr content similar to that of ferritic steel. Cyclic heating tests and brittleness study of joint. 9 ref. (K1, K9, T26r; SS)

381-K.* (Russian.) Butt Welding of High Carbon to Alloy Steel Wire. A. T. Galaktionov and A. A. Fofanov. *Stal'*, Apr. 1959, p. 374-377.

To prevent often-occurring weld breaks in the welding of high carbon to alloy steel wire, it is necessary to eliminate weld burrs while the fused metal is in a hot and plastic state and to hold the heat to 500-600° C. during cooling. (K1, K9q; AY, CN-r, 4-61)

382-K.* (German.) Pressure Welding. Wilhelm Hofmann and Fritz Burat. *Feinwerk Technik*, v. 63, Mar. 1959, p. 82-85.

Tensile strength of Ag, Fe, Al and Cu weldments as a function of surface enlargement investigated together with the tensile strength at a varying radius of the welded cross section. 8 ref. (K5k; Ag, Fe, Al, Cu)

383-K.* (German.) Welding of Thin Thermo-Elements. Hansgeorg Specht. *Zeitschrift fur Metallkunde*, v. 50, Jan. 1959, p. 36.

Procedure given to make thermocouple junctions with wires of 0.03 to 0.1 mm. diameter and weld them to metal surfaces by condensor discharges. (K6, X9q)

384-K.* Welding Nuclear Power Equipment. Roger Sutton. *Metal Progress*, v. 75, June 1959, p. 124-126.

Weldments for reactor systems must meet more rigid quality standards than required in conventional power-plant applications. Materials and welding processes for fabricating equipment for nuclear systems were discussed at a recent meeting of the American Welding Society in Chicago. (K-general, W11p; SS, Ni-b)

385-K.* New Developments in Welding Stainless Steels. G. E. Linnert. *Metal Progress*, v. 75, June 1959, p. 127-128.

Tests continue on an improved weld metal to replace Type 347. Procedures are disclosed for welding AM-350 and AM-355. Study shows that CO_2 welding of

stainless may be undesirable for some applications because of carbon pickup. (K-general; SS)

386-K.* Resistance Welding of Aluminum Alloys. J. J. Deffenbaugh. *Welding Engineer*, v. 44, June 1959, p. 50-52.
Basic flexible variables and selection of machine for welding Al alloys through comparison with mild steel welding techniques. (K3; Al-b)

387-K.* Good Mechanical Properties Can Be Obtained Easily When Tig Welding Titanium. Helmut van Kann. *Welding Engineer*, v. 44, June 1959, p. 58-61.
German industries studied, tested and approved this technique. (K1d; Ti)

388-K.* Consider Residual Stresses When Welding. R. E. Holt. *Welding Engineer*, v. 44, June 1959, p. 66, 68.
Proper sequence in the welding of channels and I-beams controls stresses. (K-general, Q25)

389-K. Arc Welding Tantalum by the Tungsten Inert Gas Process. Pt. 1. Alan F. Busto. *Fansteel Metallurgy*, May 1959, p. 2-3.
(To be continued.) (K1d; Ta)

390-K. Electro-Slag Welding Comes to UK. *Metalworking Production*, v. 103, May 29, 1959, p. 950-954.
Process and equipment. (K6, 1-52)

391-K. Welding Chrome-Moly to Carbon Steel Calls for Low-Hydrogen Electrodes. *Industry & Welding*, v. 32, June 1959, p. 31, 61.
(K1a, W29h; Cr-b, Mo-b, CN)

392-K. (French.) Body Welding at Simca's Poissy Plant. J. Vandamme and J. Peronnin. *Soudage et Techniques Connexes*, v. 13, Mar-Apr. 1959, p. 127-136.
(K-general, T21a)

393-K. (Italian.) Use of Ultrasonics in the Nondestructive Testing of Weldments. Angelo Brioni. *Calore*, v. 30, Feb. 1959, p. 73-81.
(K9r, S13g; 7-51)

394-K. A Comparison of Argon and Helium Welding Shields. J. Barker. *Nuclear Power*, v. 4, June 1959, p. 119-120.
(K1d)

395-K.* (German.) New Aspects in the Welding and Design of Boiler Components. W. Muller. *Schweissen und Schneiden*, v. 11, May 1959, p. 159-171.
Tubes are classified according to material and designation. Composition and strength properties for steels in boiler tubes; gas welding, electric welding and inert-gas-shielded welding of DIN 10CrMo910 steel. Improvement in weld-root formation is claimed, resulting from the use of protective gas. (K1d, K2, T26q; AY, *Cr, Mo*)

396-K.* (German.) Adhesive Strength of Steel Brazed With Flux-Covered Brass. J. Colbus. *Schweissen und Schneiden*, v. 11, May 1959, p. 175-178.
Joint strength of flux-coated and flux-containing soldering rods is measured in joints of various sheet thicknesses. Flux-containing brazing sticks showed best results. (K8; ST, SGA-f)

397-K.* (German.) Tungsten-Inert Gas Arc Welding of High Performance Blunt Seams in Copper Pressure Vessels of Medium Wall Thickness. L. Poth. *Schweissen und Schneiden*, v. 11, May 1959, p. 194-196.
High-performance welding on Cu is obtained in various sheet thicknesses. (K1d; Cu, 4-53)

398-K.* (Russian.) High-Vacuum Electron Beam Welding of Reactive Metals. A. V. Mordvintsev and N. A. Ol'shanskii. *Svarochnoe Proizvodstvo*, May 1959, p. 4-7.
Hard-to-weld metals, such as Mo, Zr and Ta, which react with oxygen, nitrogen, hydrogen and carbon monoxide during welding at temperatures below their melting point, are successfully welded by this technique. Resulting welds were free from porous defects and gas inclusions. (K6, 1-73)

399-K.* (Russian.) Properties of Welds Produced With SVO8GSA and SVO8G2SA Rods in Carbon Dioxide Atmosphere. N. M. Novozhilov and A. M. Sokolova. *Svarochnoe Proizvodstvo*, May 1959, p. 7-12.
Welds have a high impact strength at room and low temperature and after aging. Amount of nonmetallic inclusions was less than with the ordinary submerged electric arc method. 9 ref. (K1g, Q6n, 2-65; CN, AY, 7-51)

400-K.* (Russian.) Effect of Sulphur on Weld Porosity in Automatic Submerged Arc Welding. L. S. Sapiro. *Svarochnoe Proizvodstvo*, May 1959, p. 12-13.
Deleterious effect of sulphur in welds, causing porosity, is attributed to hydrogen liberation by the sulphur in gaseous form.

Elimination of moisture in the arc zone will produce a nonporous weld even with high amounts of sulphur in the steel. 9 ref. (K1e, 9-68; ST, S, H)

401-K.* (Russian.) Flash-Butt Welding of Heat Resistant Austenitic Steel Tubes. E. S. Slepak and A. S. Gel'man. *Svarochnoe Proizvodstve*, May 1959, p. 20-24.

Short and long tests of butt welded tubes produced a weld with mechanical properties approaching those of base metal. Tensile strength of the weld metal is the same as that of base metal. (K3r, Q-general; SS-e, 4-60)

402-K. (Pamphlet.) Fabrication of Small Piping by Welding and Brazing. A. N. Kugler. 9 p. May 1959. Air Reduction Sales Co., Inc., 150 E. 42nd St., New York 17, N. Y.

(K-general; 4-60)

403-K. (Book.) Aircomatic and Heliwelding of Aluminum. 116 p. 1959. Air Reduction Co., Inc., 150 E. 42nd St., New York 17, N. Y.

Use of inert gas-shielded arc welding processes for high-purity Al and Al alloys in wrought and cast forms. (K1d; Al, 4, 5)

404-K. (Translation—Brutcher no. 4517.) Bonding of Brass to Steel With a Gas Flame. I. A. Nenaezdnikov. *Svarochnoe Proizvodstvo*, July 1958, p. 35-38.

See item 525-K, 1958. (K2h, 9-72; Cu-n, CN, SS)

405-K.* Braze Bonding Stainless Steel Fuel Elements for Nuclear Reactors. P. P. King and R. K. McGeary. *Welding Journal*, v. 38, June 1959, p. 241s-246s.

Technique depends upon electroless Ni-P plating on the tubular structural members to serve as the braze alloy. With thin, uniform coatings (0.0005-0.001 in.) it is possible to produce ductile single-phase bonding alloy at the contact area of the tube parts in as little as 5 min. at 1850° F. (K8, T11g; SS, SGA-f)

406-K.* Vacuum Diffusion Joining of Titanium. E. J. Clark. *Welding Journal*, v. 38, June 1959, p. 251s-258s.

A-110-AT Ti alloy components can be vacuum brazed with fine Ag filler and diffused in one operation to give joints with tensile and shear properties equal to those of the base metal. Where a metal-to-metal fit of parts exists, Ti alloy joints can be vacuum diffusion bonded in the 1800-1900° F. temperature range without filler to give metallographic homogeneity and strength equal to that of the base metal. (K8, K5k, 1-73; Ti-b)

407-K.* Solder Bonding Aluminum to Uranium. H. W. Mishler, J. T. Niemann, R. P. Sopher and D. C. Martin. *Welding Journal*, v. 38, June 1959, p. 268s-272s.

Uranium was plated with Cr, Fe or Ni which served as a diffusion barrier. The solders used were Pb, Sn, Zn and their alloys. No provision was made for removing surface oxides on the base metals. Therefore it was necessary to plate the Al and the U diffusion barrier. The best bonds were produced with Al plated with 0.5 mil of Cu and Ni-plated U given a Cu flash. (K7; Al, U, SGA-f, *Cr, Sn, Zn, Fe, Ni, Al*)

408-K.* Some Considerations on Design for Fatigue in Welded Aircraft Structures. J. Koziarski. *Welding Journal*, v. 38, June 1959, p. 565-575.

Welding permits design of joints that are cleaner, lighter and more efficient than joints designed for riveting. Wherever possible, preference should be given to joints designed to work in compression or tension. Transverse shear welds should be the second choice, and longitudinal shear welds the third choice. 26 ref. (K-general, 17-51, Q7a; 7-51)

409-K.* (German.) Arc Welding of Aluminum Under Inert Gas Shield. W. Mantel. *Aluminum*, v. 35, June 1959, p. 308-315.

Techniques and applications of Tig and Sigma (Mig) welding. (K1d; Al)

410-K.* (German.) Welding of Aluminum. W. Hegmann. *Aluminium*, v. 35, June 1959, p. 316-320.

Heat consumption, fluxes, flame regulation, stresses, gases and filler rods. (K2; Al)

411-K.* (German.) Determination of Flux and Solder Temperatures in Hard Soldering of Aluminum. E. Lueder. *Aluminium*, v. 35, June 1959, p. 327-330.

Al specimens were soldered by AlSi13, pure Zn, Cu, AlZn70, AlZn50, AlZn30 and Ag hard solders. Melting points of solders were determined together with flux temperatures. (K7; Al, *Zn, Si, Ag, Cu, Si,* ; SGA-f)

412-K.* (German.) A New Process of Pretreating Aluminum Prior to Bonding. K. Krekeler, A. Matting and H. Winter. *Aluminium*, v. 35, June 1959, p. 333-338.

Tensile strength of joints in sheet specimens of $AlCuMg_2$ determined after a pretreatment by a bath containing alkali fluoride and 15-20% nitric acid and adhesive joining by Redux 775, Metallon 130, Agomet E, Araldit 1 and 123B and Lipatol MK. Test results were compared to those obtained after surface pretreatment by conventional pickling. (K12, Q27; Al-b, *Cu, Mg,* 7-58)

413-K. Automatic Spotwelding Replaces Riveting. George H. DeGroat. *American Machinist,* v. 103, June 15, 1959, p. 118-119.

Tape control of welding positioners, use of television are new techniques used in building huge Al fuselage sections. (K3n; Al)

414-K. (Russian.) Static Characteristics of Under-Water Welding Arc. T. I. Avilov. *Svarochnoe Proizvodstvo,* May 1959, p. 16-17.

Cooling action of the water which uninterruptedly "washes" the outer arc column increases the current density. Large amount of hydrogen in the arc zone causes higher voltage and the voltage-ampere characteristics usually rise. (K1)

415-K. (Russian.) Prevention of Cracks in Fillet Welds of Low-Alloy Steels. G. V. Nazarov. *Svarochnoe Proizvodstvo,* May 1959, p. 36-37.

Welding cracks in T assemblies were eliminated by reducing welding rod diameter from 5 mm. to 2 mm., employing a double metal deposit, reducing the amp. from 650-750 to 380-400 amp.; voltage from 36-40 to 32-36 v. and maintaining a welding rate of 21 m. per hr. (K3p, 9-72; AY)

416-K.* Aluminum Alloy Rivets Excel for Magnesium Sheet. J. L. Nichols. *Iron Age,* v. 183, June 11, 1959, p. 138-139.

Use of high-purity 5056 Al alloy as a high-temperature fastening material. Excellent compatibility exists with Mg. (K13n, Q-general; Mg, 4-53, Al-b, 7-53)

417-K. Bonding of Various Metals and Alloys by Isostatic Pressing at Elevated Temperatures. J. Fugardi and J. L. Zanbrow. Sylvania-Corning Nuclear Corp. *U. S. Atomic Energy Commission,* SCNC-272, Dec. 1958, 37 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Maintenance of an operating temperature of 1200° C. and 12,000 psi. for 20 min. enabled the successful bonding of various materials such as Zircaloy-2 to 8% U-Zr, Zircaloy-2 to 10% Cb-U and Nichrome to 35% UO_2-Cb. (K5k; Zr-b, U, Ni-b, *Cr*)

418-K.* Resistance Welding Thin Metal Sheets. J. A. Donelan. *Welding and Metal Fabrication,* v. 27, June 1959, p. 234-242.

Control of weld current, time and electrode pressure; resistance welding equipment; weldability chart; series and projection welding; electrodes; seam welding and applications. (K3, W29h, K9s; 4-53)

419-K.* Cleanliness of Welds in Alloys for High Temperature Service. D. J. Heath. *Welding and Metal Fabrication,* v. 27, June 1959, p. 243.

Modified welding equipment eliminates oxygen contamination in the weld zone of 80A and 90 Nimonic alloys. (K1d, 1-52; Ni-b, SGA-h)

420-K.* (French.) Burning Phenomena and Quality of Light Alloy Welding. R. Develay, M. Croutzeilles and R. Chevigny. *Revue de Metallurgie,* v. 56, May 1959, p. 409-417.

Blistering on weld beads is investigated in sheet specimens of A-G5, A-SG, A-U46 and A-Z86U Al alloys and pure Al. Effect of Be additions, heat treatment, flux protection and yielding under vacuum, pressure, air, argon, nitrogen, mixtures of nitrogen, mixtures of nitrogen and oxygen with argon, and P_2O_5 on blister formation. (K2h, 2-60; Al-a, Al-b, *Be,* 9-71)

421-K.* (German.) Current Developments in Ultrasonic Treatment of Metal Surfaces. Hans Joachim Gollmick. *Industrieblatt,* v. 59, May 1959, p. 200-204.

Application of ultrasonic methods to cleaning, soldering, brazing, drilling, tinning and descaling. 10 ref. (K7, K8, G17, L10f, 1-74)

422-K. Supersonic Stainless Honeycomb Panels Produced. Bill Durkee. *Western Metalworking,* v. 17, June 1959, p. 41-44.

Die quench brazing, salt bath and electric blanket brazing. (K8, T24a; 7-59, SS)

423-K.* Some Aspects of the Metal Arc Welding of Monel. M. K. Williams. *Welder,* v. 28, no. 137, Jan-Mar. 1959, p. 7-9.

Preparation for welding, welding procedures; corrosion resistance of weld metal; use of Monel and Monel-2 electrodes; overlaying Monel to mild steel welds. (K1g; Ni-b, *Cu,* CN)

424-K.* The Metal-Arc Welding of Stainless Steels. Pt. I. Welding Metallurgy and Techniques. M. C. T. Bystram. *Welder*, v. 28, Jan-Mar. 1959, p. 17-22.

Effects of composition on the metallurgical structures of stainless welds; hot cracking; martensitic cracking; sigma-phase formation; corrosion resistance; recommendations for obtaining high radiographic standards in austenitic welds. (To be continued). (K1g, Q26q, 2-60; SS)

425-K. (Czech.) Spot Welding Equipment With Vertical Electrode Holders. Ladislav Pliva. *Zvaranie*, v. 8, May 1959, p. 142-148. (K3n, 1-52)

426-K.* Welding Titanium for Missiles. C. W. Handova. *Sheet Metal Industries*, v. 36, May 1959, p. 359-360.

Welding, brazing and soldering techniques. (K1d, K8j, K7; T24e; Ti-b)

427-K.* (Czech.) Electroslag Welding in Boiler Construction. Oldrich Hajzler. *Zvaranie*, v. 8, May 1959, p. 136-140.

Mechanical properties of weldments produced with various base materials using the same electrode and flux. (K6, Q-general, 2-60; ST, 7-51)

428-K.* (Slovakian.) Brazing. Pavel Slysko. *Zvaranie*, v. 8, May 1959, p. 130-136.

Brazed assemblies with Cu and Cu alloys as a base material. Diffusion depends on temperature and holding time and is influenced by surface cleanliness, wetting power of the solder and solubility of base metal and solder. 5 ref. (K8; Cu, SGA-f)

429-K.* (Slovakian.) Welding of Gray Cast Iron in Rumania. Traian Salagean. *Zvaranie*, v. 8, May 1959, p. 140-142.

New resistance welding method without the application of pressure. Arc welding of gray iron with steel, Monel and Cu-Fe electrodes without preheating. (K3, K1a; CI-n)

430-K.* (Slovakian.) Built-Up Welding Under a Molten Slag With Large-Diameter Electrodes. *Zvaranie*, v. 8, May 1959, p. 156.

Built-up weldments on cylindrical parts produced with electrodes of approximately the same diameter, a CaF_2 flux and a funnel-shaped, water-cooled sleeve to keep the molten slag and metal in place. (K6; ST)

431-K.* An Evaluation of Mig and CO_2 Welding. G. H. Cotter. *Welding Engineer*, v. 44, July 1959, p. 22-24.

Comparison of the processes in relation to applications where flux cannot be tolerated because of dirt hazard or where flux cannot be held in place easily; gas-shielded welding is the only practical solution. (K1d)

432-K.* (German.) New Gas-Shielded Arc Welding Methods for Aluminum. P. Krekel. *Industrie-Anzeiger*, v. 81, June 1959, p. 763-764.

Tig and Mig welding processes. Tabular survey on the mechanical properties of various Al alloys before welding, after welding and after welding and heat treatment. (K1d, Q27; Al-b)

433-K.* (German.) New Welding Methods for Clad Steel. Josef Cabelka. *Schweisstechnik*, v. 13, Mar. 1959, p. 31-35.

Prerequisites for gas cutting. Joint design and electrodes used in arc welding; factors influencing weldment quality. (K1a, G22g; ST, 8-66)

434-K.* (German.) Progress and Developments in Structural Steels and Weldability. K. L. Zeyen. *Werkstatt und Betrieb*, v. 92, June 1959, p. 313-323.

Samples of unalloyed and alloyed structural steels experimentally welded using three different electrodes to investigate weldability and mechanical properties. (K9s, Q-general; ST, SGB-s, 7-51)

435-K.* (German.) Effect of Magnetic Fields on Weld Metal. F. Erdmann-Jesnitzer and H. Friedrich. *Werkstatt und Betrieb*, v. 92, June 1959, p. 325-334.

The porous weld metal produced by an uncoated electrode was exposed to a magnetic field during the transformation at the Ar_3 and Ar_1 points. A slight increase of the dynamic strength was achieved. 21 ref. (K1g, P16; 7-51, *ST*)

436-K.* Evaluating the Economy of Reconditioning and Coating Underground Steel Pipe. George M. Pemberton. *Corrosion*, v. 15, May 1959, p. 75-77.

Determination of a method and formula for evaluation by carefully selecting pipe for reconditioning and accurately determining the time required for spot welding, the cost per foot for reconditioning an underground bare steel gas pipe line can be predicted. Welding and wax coating methods used. (K3n, L26q, R8, T26r; ST, 18-72)

437-K.* (Dutch.) Cracking of Welds Performed on Stainless Steel. B. Mulder. *Lastechniek*, v. 24, June 1959, p. 113-115.

Factors causing cracks and methods of elimination. Prevention by preheating, correct shaping of the joint, optimum choice of electrodes and welding procedures. (K1, 9-72; SS)

438-K.* Hot Cracking of Mild Steel Welds: Final Report on High-Temperature Tensile Tests. P. W. Jones. *British Welding Journal*, v. 6, June 1959, p. 269-281.

Tests made in vacuo, in hydrogen and nitrogen atmospheres. Attempts to correlate hot cracking of weld metals to reduction in area and temperature of rupture. (Conclusion). 6 ref. (Kgr; 7-51, CN, 9-72)

439-K.* An Investigation of Hot Cracking in Low-Alloy Steel Welds. P. W. Jones. *British Welding Journal*, v. 6, June 1959, p. 282-290.

Effects of alloying elements (C, Ni, Cu, Cr and Al) which might be derived from either electrode or alloy steel plates. Effects of preheating and weld size. 18 ref. (Kgr, 2-60; 7-51, AY, 9-72)

440-K.* Stronger Joints Can Cost Less. *Iron Age*, v. 184, July 1959, p. 72-76.

ASTM and SAE markings for steel bolts; torque for steel bolts; surface finish factors for torque equation given for clamping power of bolts. (K13p, T6f; ST)

441-K.* A Survey of Ceramic-to-Metal Bonding. G. R. Van Houten. *American Ceramic Society, Bulletin*, June 1959, p. 301-307.

Literature review with some 142 references. The Mo-Mn, hydride and the active metals processes are compared. (K11b)

442-K.* New Welding Developments. John J. Chyle. *Machine Design*, v. 31, July 9, 1959, p. 156-158, 160, 162, 163.

Recent ideas and applications in pressure welding, ultrasonic welding, high-frequency resistance welding, foil seam welding, magnetic-force welding, percussion welding, friction welding, thermo-pressure welding, diffusion bonding, fusion welding, electroslag welding, electro-beam welding, arc plasma and brazing. (K-general)

443-K.* (French.) Determination of the Weldability of Steels. Pt. 2. (Concluded.) *Metallurgie et la Construction Mecanique*, v. 91, May 1959, p. 377-381.

Methods and special precautions to be taken in welding structural and some alloy steels to avoid hardening and subsequent cracking. 7 ref. (K-general, K9s; AY, SS, 7-51, 9-72)

444-K.* (German.) Autogeneous Pressure Welding. P. Steidl. *Industrie-Anzeiger*, v. 81, June 9, 1959. p. 27-29.

New technique applied to low-alloy steel, Inconel and Ti alloys. (K2j, K2k; AY, Ti-b, Ni-b)

445-K.* (Spanish.) Deformation Phenomena in Welded Structures. Jose Martinez Paris. *Ciencia y Tecnica de la Soldadura*, v. 9, Mar-Apr. 1959, p. 1-22.

Results of heating and cooling of parent and weld metal during fabrication of butt and fillet welds. Factors and parameters influencing deformation, calculation of anticipated contraction and methods of prevention. (K-general, P10d; ST)

446-K. Welding and the Draughtsman. H. B. Merriman. *British Welding Journal*, v. 6, June 1959, p. 255-265.

Stress calculations and diagrams for various types of members, welds and steel. 6 ref. (K-general, 17-51)

447-K. Spot-Welded Corrugated Sandwich Construction for Aircraft. *Machinery (London)*, v. 94, June 10, 1959, p. 1301-1306.

Methods and equipment employed by Handley Page, Ltd. (K3n, T24a, 7-59)

448-K. (Italian.) Notes on Brazing. Antonio M. Butta. *Macchine*, v. 14, May 1959, p. 505-513.

(K8)

449-K. (Spanish.) Introduction to Modern Welding Methods. F. Zubeldia. *Ciencia y Tecnica de la Soladura*, v. 9, Mar-Apr. 1959, 7 p.

(K-general)

450-K. (Spanish.) Welding Standards in Naval Construction. Carlos Pombo. *Ciencia y Tecnica de la Soldadura*, v. 9, Mar-Apr. 1959, 13 p.

(K-general, S22, T22j)

451-K.* Spot Welding of Titanium Alloys. R. K. Nolen, J. F. Rudy, H. Schwartzbart and H. D. Kessler. *Welding Journal*, v. 38, May 1959, p. 219s-221s.

Spot strengths and ductility ratios of cross tension strength to tension shear strength for spot weldable heat treated Ti-6Al-4V, annealed and heat treated

Ti-4Al-3Mo-1V, and annealed Ti-5Al-2.5Sn alloys. (K3n, Q2g; Ti-b, *Al, V, Mo, Sn,* 7-51)

452-K. Welding Properties of Chromium-Nickel-Molybdenum Hardenable Stainless Steels. R. H. Kaltenhauser. *Welding Journal,* v. 38, May 1959, p. 228s-231s.

Weldability of stainless steels AM-350 and AM-355 is similar to that obtained in austenitic steels. Hot cracking resistance and ductility after hardening are good. (K9s, Q23p, Q26; SS, *Mo*)

453-K.* (Polish.) Resistance Heating of Tubing With High-Frequency Current. Tadeusz Zdziennicki. *Hutnik,* v. 26, May 1959, p. 186-190.

Heating method applied to the manufacture of tubing from strip by resistance welding. (K3; ST, 4-53, 4-60)

454-K. Thermit Welding Structural Mill Rolls. Edward B. Russell. *Iron and Steel Engineer,* v. 36, June 1959, p. 123-131.

Process and applications. (K4, W23k; ST)

455-K. Ultrasonic Welding Techniques. J. Byron Jones and W. C. Potthoff. *Ultrasonic News,* v. 3, no. 2, p. 6-7, 17.

Equipment developed to handle both heavier gage materials and their foils. (K6r; Al, 4-56, 4-53)

456-K. Welding of Containment Sphere for Dresden Nuclear Power Station. Perry C. Arnold. *Welding Journal,* v. 38, May 1959, p. 461-468.

(K1a, K9r, T11)

457-K. Roll-Spot Welding for Ballistic Missiles. James K. Dawson. *Welding Journal,* v. 38, May 1959, p. 475-479.

(K3p, K3n, T24e)

458-K. Alloy Steels for Big Shovel Welded by Semiautomatic Submerged Arc. Alfred Tozer. *Welding Journal,* v. 38, May 1959, p. 480-481.

(K1e, T4a; AY)

459-K.* High Strength Adhesives. E. F. Hess. *Materials in Design Engineering,* v. 50, July 1959, p. 104-107.

Use of modified epoxies, thermoplastic-phenolic and elastomeric-phenolic adhesives for metal-to-metal binding and honeycomb construction. (K12; 7-59)

460-K.* Welding Unusual Metals. D. W. Grobecker. *Metal Progress,* v. 76, July 1959, p. 87-90.

Electron beam welding; diffusion bonding; motor-arc welding; combination welding methods; uranium welding and soldering. (K-general, K6; U, Zr)

461-K.* Welding of Medium-Alloy Chrome-Moly Steels. Kenneth R. Notvest. *Welding Journal,* v. 38, May 1959, p. 222s-227s.

Welding crack-sensitive alloy steels to produce sound, tough welds. Test methods, preheating, properties of a cooling weld, postheating, stress relieving and analysis. 15 ref. (K9, J1, Q29n; AY, *Cr, Mo,* 9-72)

462-K.* (Russian.) Modification of the Weld Metal in the Welding of Aluminum. A. A. Alov and G. V. Bobrov. *Svarochnoe Proizvodstvo,* no. 6, June 1959, p. 1-6.

Method of adding into the molten zone modifying compounds containing 2.5-2.30% Zr and fluxes with 0.42-0 0.63% Zr during automatic arc welding. A relationship exists between grain size and the amount of modifier. 8 ref. (K1e; Al-a, RM-q, *Zr,* AD-p)

463-K.* (Russian.) Titanium-Modified Welds in the Automatic Arc Welding of Medium-Carbon Steels. K. K. Khrenov, L. A. Pozhyak, Yu. A. Yuzvenko and M. S. Samotryasov. *Svarochnoe Proizvodstvo,* no. 6, June 1959, p. 6-8.

Ceramic fluxes containing 0.008-0.018% Ti increase resistance of welds to hot cracks and improve mechanical properties, provided precautions are taken to avoid overheating of the flux. (K1e, 9-72, RM-q, CN, *Ti*)

464-K.* (Russian.) New Austenitic Electrodes for Welding Steel 1Kh13N18B2B. A. V. Russiyan. *Svarochnoe Proizvodstvo,* no. 6, June 1959, p. 9-13.

Austenitic electrodes AZh13-18 and AZh13-15 for EI695R and EI694 steels. After heat treatment and aging, welds possessed satisfactory impact strength. Resistance of the fused-on metal to hot cracks was attained by elimination of boron and by the introduction into the weld bath of small quantities of carbon and columbium. 9 ref. (K1a, W29h, 2-64, Q6n; SS-e, 7-51, *C, Cb,* 9-72)

465-K.* (Russian.) Control and Correction of the Ferrite Quantity in the Weld and Base Metals of Austenitic Steel Joints. *Svarochnoe Proizvodstvo,* no. 6, June 1959, p. 13-15.

Proposed method prevents crack formation in welded joints and assures a

fixed amount of ferrite in the weld and base metal. Excessive brittleness during aging is also controlled. 13 ref. (K1a, Q26s, J27d, 9-72; SS-e)

466-K.* (Russian.) Weld Joints in 10KhGN Steel. M. M. Kraichik. *Svarochnoe Proizvodstvo*, no. 6, June 1959, p. 16-19.

10KhGN medium-carbon low-alloy steel has good weldability, possesses good deformation capacity and provides homogeneous strength along the entire welded seam. Welds have high impact strength up to the critical temperature and high resistance to the formation of cracks. 6 ref. (K9s, Q6n; AY, 7-51, 9-72)

467-K.* (Russian.) Problems of Alloying of Welded Strained Aluminum Alloys. S. V. Lashko-Avaryan and N. F. Lashko. *Svarochnoe Proizvodstvo*, no. 6, June 1959, p. 19-23.

Effect of binary, ternary and complex alloy additions to Al alloys on susceptibility to formation of crystalline cracks. Crack development is caused by the amount, ratio and distribution of solid and liquid phases in the structure of the solidifying metal. 4 ref. (K-general, N12, 2-60; Al-b, 7-51, 9-72)

468-K.* (Russian.) Fatigue Strength of Electro-Slag Welds of 08GDNFL. Cast Steel. V. A. Kokh, B. G. Yugelson, V. A. Bykovandgn Vsevolodov. *Svarochnoe Proizvodstvo*, no. 6, June 1959, p. 24-26.

The ultimate fatigue strength of a joint produced by electro-slag welding of low-carbon, low-alloy steel (Mn, Cu, Ni and V) is at least as high as that of the base metal. Omission of heat treatment after welding has no effect on fatigue strength. (K6, Q7a; CN-g, AY)

469-K.* (Czech.) Aluminum-to-Copper Flash Weldments With Large Cross Section. Ladislav Pliva. *Zvaranie*, v. 8, June 1959, p. 169-176.

Welding parameters, joint design and correct positioning of component parts in the welding equipment. 11 ref. (K3r; Al, Cu)

470-K.* (Russian.) Method of Evaluating Porosity in Weld Metal. G. D. Nikiforov. *Svarochnoe Proizvodstvo*, June 1959, p. 26-29.

Prepared samples are weighed in water and air and the density calculated. Technique is very sensitive and enables the detection of porosity which would have been revealed only by microsections. (K9r, 9-68; Al)

471-K.* (Slovakian.) Heat Flow in Electroslag Welding. Augustin Schweighofer. *Zvaranie*, v. 8, June 1959, p. 163-166.

Steel plates 170 mm. thick were electroslag welded without preheating and, for comparison submerged-arc welded after preheating. Heat maxima and cooling rates are given for both processes. (K6, K1e, P11h; ST, 4-53)

472-K.* Heat-Extractive Brazed Bimetals Show Promise for Missile and Industrial Applications. Robert C. Bertossa and Steven Rau. *Welding Journal*, v. 38, July 1959, p. 273s-281s.

Feasibility of applying vacuum-brazing techniques to the protection of refractory metals under short-term exposures to temperatures up to and exceeding 3600° F. The heat-sink clad-metal method involves the brazing of relatively thick high-thermal-conductivity Cu to a thinner Ta sheet. The Ta furnishes high-temperature strength and resistance to abrasion. The Cu serves as a heat sink to conduct heat generated on the exposed Ta surface away from the outer shell. (K8, 1-73; Ta, Cu, 4-53, 7-52)

473-K.* Certain Structural Properties of Ultrasonic Welds in Aluminum Alloys. J. Byron Jones and W. C. Potthoff. *Welding Journal*, v. 38, July 1959, p. 282s-288s.

Ultrasonic welds have higher shear strengths than fusion-type welds in structural Al alloys in thickness up to about 0.071 in. and are reproducible within narrow strength scatter bands and require less-critical sheet-surface preparation. (K6r; Al-b, SGB-s)

474-K.* An Evaluation of the Diffusion-Bonding Characteristics of Zircaloy-2. W. Feduska. *Welding Journal*, v. 38, July 1959, p. 289s-295s.

Experiments aimed at joining Zircaloy-2 components by a diffusion-bonding technique show that Cu, Ni, nickel-phosphorus, Mn and Si are the most promising diffuser elements. 6 ref. (K5k; Zr-b, *Cu, Ni, P, Mn, Si*)

475-K.* Plasma-Energy Transfer in Gas-Shielded Welding Arcs. H. C. Ludwig. *Welding Journal*, v. 38, July 1959, p. 296s-300s.

High-current welding arcs are influenced by the self-magnetic field produced within the discharge acting to compress

or pinch the conducting plasma. The thermal expansion of the plasma opposes the magnetic compression. The geometric form of the discharge is controlled by the interaction of these opposing forces. (K9n, K1d)

476-K.* New Developments in the Welding of Aluminum. R. L. Hackman. *Welding Journal*, v. 38, July 1959, p. 676-684.

The inert-gas consumable-electrode process may be utilized to weld very thin or thick material with equal ease. Both the inert-gas consumable-electrode and tungsten-arc processes may be used for spot welding. Any choice between the two depends upon requirements of the particular application. (K1, K3n; Al)

477-K. Fabrication and Construction of Piping System for the Dresden Nuclear Power Station. G. B. Grable and A. M. Croswell. *Welding Journal*, v. 38, July 1959, p. 657-664.

Materials, forming operations, heat-treating and welding procedures. (K-general, T11, J-general; 4-60)

478-K. (Czech.) Submerged Arc Welding of Pressure Vessels of Thin Sheet. Josef Svercl and Stanislav Vyslouzil. *Zvaranie*, v. 8, June 1959, p. 179-181.

(K1e, T26q; ST, 4-53)

479-K. (Slovakian.) Results Obtained in Studies on Heat Flow in Electroslag Welding. Julius Lombardini. *Zvaranie*, v. 8, June 1959, p. 167-168.

Structure and quality control by correct choice of welding process. (K6, P11h, N8m; ST, 4-53)

480-K. (Slovakian.) Choice and Classification of Structural Steels With Reference to Welding Operations. Alois Zapletalek. Zvaranie, v. 8, June 1959, p. 187-189.

(K-general, S22; SGB-s, AY)

481-K.* Dip Transfer CO_2 Welding of Mild and Low Alloy Steels. *Welding Design & Fabrication*, v. 32, July 1959, p. 54-57.

With dip transfer, metal is transferred entirely by a wiping action at the time of short circuit, rather than being projected through an arc stream. Dip transfer is suited to the welding of sheet 0.253 in. and smaller. Heavier sections can be welded since deposition rates as high as 6 lb. per hr. are achieved in the vertical position using small-diameter wires. (K1d; CN, AY)

482-K.* Welding of Dissimilar Metals. *Welding Engineer*, v. 44, Mid-June 1959, p. 5-13.

Filler metals for welding dissimilar metals require high tolerance for dilution by elements (Fe, Ni, Cr, Cu) without formation of brittle or crack-sensitive alloys, moderate coefficient of thermal expansion, ability to withstand high service temperatures over long periods without suffering harmful effects, good oxidation and corrosion resistance, high strength and ductility at both high and low temperatures. (K-general; SGA-f)

483-K.* Submerged-Arc Welding on the Pipe Line. William B. Handwerk. *Welding Journal*, v. 38, July 1959, p. 672-675.

Process is currently being used to double joint large-diameter pipe, resulting in better uniformity of weld, controlled welding conditions and greater daily construction footage. (K1e, T26r)

484-K.* (French.) Large Aluminum Weldments. D. Slater. *Revue de la Soudure Lastijdschrift*, v. 15, no, 2, 1959, p. 106-109.

Tig welding of large reactor components under simultaneous heating to provide perfect melting and perfect joints. Importance of working sequence, geometry of parts and harmful effect of Cu. (K1g, 3-73, 3-69, T11; Al-b, *Cu, Mg*)

485-K.* (Norwegian.) Steels Suited for Welded Constructions. Erling Braaten. *Teknisk Ukeblad*, v. 16, Apr. 16, 1959, p. 325-330.

Mechanical testing, structure testing and chemical analysis to determine weldability. Standard composition of a steel with good welding properties. 8 ref. (K9s, Q-general, 2-60; CN-p, 7-51)

486-K.* Aluminum Foil Laminating. *Light Metal Age*, v. 17, June 1959, p. 8, 10, 30.

Laminating Al foil to paper or paper board. Coating and printing foil laminates. (K11, L26b; Al, 4-56)

487-K. Some Experiences on the Joining of the Refractory Metals. A. F. Taylor and J. F. Stockdale. *United Kingdom Atomic Energy Authority*, IGR-TN/S-439, 1959, 20 p.

Methods of joining thin sections (up to 0.060 in.) of Ti, Zr, Cb, Ta, Mo and U, with emphasis on variations of the normal argon-arc welding techniques. Satisfactory fusion and spot welds were made

in all metals except Mo, which could only be joined satisfactorily by brazing. 7 ref. (K-general, K1d, K8; Ti, Zr, Cb, Ta, Mo, U, EG-d37)

488-K.* (German-French.) Unionarc-Welding. Karl W. Ramseyer. *Zeitschrift fur Schweisstechnik - Journal de la Soudure*, v. 49, July 1959, p. 193-208.

Process and applications. (K1d, T26q; ST)

489-K.* (Italian.) Welding, Heat Treatment and Polishing Stainless Steels. Plinio Corbellini. *Fonderia*, v. 8, June 1959, p. 253-257.

Directions for gas welding, arc welding and annealing. Rust caused by Fe particles found on the surface after cleaning with steel brushes or as a result of grinding or polishing. (K2, K1, J23, L10; SS, 4-53)

490-K.* (Russian.) Weldability of Low-Alloy Bessemer Steels. A. S. Astaf'ev. *Stal'*, June 1959, p. 553-560.

Low-alloy steels made in bessemer converters by blowing oxygen through ORSK-KHALIL cast iron proved to be suitable for welded structural assemblies, provided proper welding rods are used. (K9s, D3b; AY)

491-K. Modern Spot-Welding Machines for the Wire and Sheet Metal Industries. E. Robe. *Draht (English Edition)*, no. 41, June 1959, p. 67-69.

Equipment for the welding of steel wire and strip. (K3n, 1-52; ST, 4-53, 4-61)

492-K. (French.) Choice and Classification of Steels Used in Welded Constructions. *Revue de la Soudure Lastijdschrift*, v. 15, no. 2, 1959, p. 82-86.

(K-general, S22; ST)

493-K.* (French.) Construction of High-Efficiency Steam Superheaters. P. de-Marneffe. *Revue Universelle des Mines*, v. 15, July 1959, p. 649-661.

Superheater tubes of austenitic stainless steel are bent to small radii under inhomogeneous heating. Fissures and zones of reduced corrosion resistance are avoided in welding by the correct choice of electrodes. 9 ref. (K1a, R2h, G6, W29h; SS-e, 4-60, 9-72)

494-K. (Italian.) Construction of Large Aluminum Tanks. *Alluminio*, v. 28, no. 6, 1959, p. 291-320.

Welding directions, composition and properties of materials. (K-general, T26q; Al)

495-K.* High-Temperature Brazing With Palladium-Containing Filler Alloys. E. R. Perry. *Australasian Engineer*, v. 51, May 7, 1959, p. 53-56.

These alloys possess excellent flowing and wetting properties and are capable of penetrating into the spaces between the parts to be joined to a greater depth than is attainable with alloys which do not contain Pd. Even when the recommended brazing temperatures are greatly exceeded, there is little attack of the parent metals. (K8, 2-62; Pd-b, Ag, Mn, Cu, SGA-f)

496-K. A Gas-Shielded Consumable-Electrode Arc Welding Process for Butt Welding Croloy 2-1/4 Piping. R. M. Hargrove. Babcock & Wilcox Co. *U. S. Atomic Energy Commission*, BAW-1072, Mar. 10, 1959, 36 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Satisfactory results are obtained in horizontally fixed pipe when weld beads are started at the top and end at the bottom, alternating from side to side, with overlapping starts and stops. A mixture of helium and carbon dioxide gases with 3/64-in. diameter wire produces the best results. (K1d; AY, 4-60)

497-K.* (English.) Application of the Thermodynamics of Irreversible Processes to the Welding Arc. Egon F. Hollander. *Czechoslovak Journal of Physics*, v. 9, no. 2, 1959, p. 229-236.

Derivation of a thermodynamic equation for the spontaneous regulation of the arc occurring in the Sigma welding process. 12 ref. (K1d, K9n)

498-K.* (French.) Fatigue Tests of Welds in Pressure Vessels. P. H. R. Lane. *Soudage et Techniques Connexes*, v. 13, May-June 1959, p. 197-202.

Four different kinds of welds connecting tubes to a carbon steel pressure vessel tested under pressure and resulting cracks examined. The majority of fissures originated on the internal surface of the vessel. In some cases fractures started on the extreme side of weld angle and in several cases were extended along the entire surface of internal welds. 4 ref. (K1, T26q, 9-72; CN-b)

499-K. (French.) Construction of Pressure Vessels With Titanium Sheet Linings. F. F. Ates. *Soudage et Techniques Connexes*, v. 13, May-June 1959, p. 231-237.

Steel pressure vessel lined with Ti sheet joined by spot welding in an argon atmosphere. Defects resulting from welding are infrequent. (K3n, T26q; ST, Ti, 4-53)

500-K.* (German.) Gas-Fusion Welding of Aluminum. W. Hegmann. *Aluminium*, v. 35, July 1959, p. 396-400.

Welding gas, heat consumption, distortions, stresses, cracks, fluxes and flame adjustment. (K2m, 9; Al)

501-K. The Phillips Enclosed-Welding Process. J. A. N. Clevers. *Phillips—Serving Science and Industry*, v. 6, no. 1, 1959, p. 14-21.

Method especially applied for the butt welding of profiles with a large cross section. (K1a)

502-K. (French.) From Bare to Coated Wire. Study of Short-Circuit Metal Transfer. J. Pintard. *Soudage et Techniques Connexes*, v. 13, May-June 1959, p. 165-179.

Electrode polarity, arc length and current density in relation to bare and coated electrodes. (K9n, K1)

503-K. (French.) Welding Safety in Oil Tanks. G. Fleury. *Soudage et Techniques Connexes*, v. 13, May-June 1959, p. 180-182. (K-general, A7p, T26q)

504-K.* (English.) Welding Cracks in the Heat Affected Zone of Air Hardening Alloy Steel. H. Sekiguchi and T. Kobayashi. *Lastechniek*, v. 25, July 1959, p. 142-146.

Underbead, toe, transverse and longitudinal cracks appear during martensite formation. Underbead cracks are caused by hydrogen adsorption. Crack prevention by using austenitic electrodes, preheating, simultaneous heating and post heating. 4 ref. (K1a, K9, 9-72, 2-64; AY, *Ni, Cr, Mo*)

505-K. Welding of Type 347 Stainless Steel. V. N. Krivobok. Paper from "Minutes of the Seventh Annual Atomic Energy Commission Welding Conference". U.S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 1-55.

Tensile testing at 1000 to 2000° F. in 100° increments on four weld metal compositions: 19-9 Cb (7% ferrite present standard): 19-13 Cb (0.12% carbon fully austenitic); 19-13 MnCb (5% Mn fully austenitic); 19-10 ELC (4% ferrite Type 308 ELC) Stress-rupture properties; hot ductility tests. 6 ref. (K-general, Q27, Q3q; SS)

506-K. Welding of Uranium. Robert A. Noland and C. C. Stone. Paper from "Minutes of the Seventh Annual Atomic Energy Commission Welding Conference". U.S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 57-76.

Current welding techniques and their application to the fabrication of fuel plates composed entirely of uranium sections. (K-general, T11g; U)

507-K. Zirconium Welding. E. F. Cook. Paper from "Minutes of the Seventh Annual Atomic Emergy Commission Welding Conference". U.S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 145-173.

Suggested procedure joins available widths of Zr sheet to form continuous strip material and cold rolls to foil thickness. The inert-gas tungsten-arc process is applied to fusion butt welding of reactor grade Zr sheet, 0.035 in. thick by 6 in. wide, to form continuous strip material to be used for foil fabrication. 8 ref. (K1g, F23; Zr, 4-53, 4-56)

508-K. Practical Considerations in the Welding of Heavy Aluminum Plate. Willis Groth. Paper from "Minutes of the Seventh Annual Atomic Energy Commission Welding Conference". U.S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 173-180.

Effects of electrical variables on deposit quality, selection of improved filler materials for welding of heat treatable alloys such as 6061 Al. Data on inert-gas process. (K1g; Al-b, 4-53)

509-K.* (German.) Welding and Machining of Clad Sheets for Chemical Plant. H. Dahms. *Schweissen und Schneiden*, v. 11, June 1959, p. 221-223.

Welding and annealing of flame-cut clad sheets. Improper welding and annealing leads to grain disintegration between sheet and cladding followed by fracture. (K-general, G17, T29, J23, 4-53; 8-66)

510-K.* (German.) Examples of Welded Components Made of Nonferrous Metals. R. Kocher. *Schweissen und Schneiden*, v. 11, June 1959, p. 224-227.

Properties and welding techniques applied to Ni-Mo, Ni-Cu alloys and Ti used as materials in cylindrical shells, pressure vessels and heat exchangers. (K1, T26q; Ni-b, *Mo, Cu*, Ti)

511-K.* (German.) Welding Under CO_2 Atmosphere. H. Seifert. *Schweissen und Schneiden,* v. 11, June 1959, p. 228-230.

Welding of carbon or low-alloy steel when the welding wire is the electrode. Economy of the process increases with seam thickness. Arc scattering is controlled by deoxidizing additives in the wire. (K1d; CN, AY)

512-K.* (German.) Welding in the Manufacture of Wheels for Road Vehicles. H. Kotthaus. *Schweissen und Schneiden,* v. 11, June 1959, p. 231-232.

Spot welding techniques replace riveting. (K3n, T21c)

513-K.* (German.) Spot Welding of Agricultural Machine Parts. K. Neumann. *Schweissen und Schneiden,* v. 11, June 1959, p. 233-235.

Current spot welding techniques applied to fabrication of agricultural equipment. (K3n, T3)

514-K.* (German.) Gas Pressure Welding of Reinforcing Steel. K. H. Tiefholz. *Schweissen und Schneiden,* v. 11, June 1959, p. 236-237.

Method applied to bridge construction work. Lengths of about 90 ft. of bar steel can be welded together with only a slight decrease in mechanical properties of the base material. (K2, T26p; ST)

515-K.* (German.) Thermit Fusion Welding of Machine Parts. E. Tull. *Schweissen und Schneiden,* v. 11, June 1959, p. 237-240.

Repair work on piston rod, roll stand and drive spindle. Large cross sections can be welded economically. 15 ref. (K4, T7, 18-74)

516-K.* (German.) Welded 4500-Ton Floating Dock in Sectional Construction. H. Schoof. *Schweissen und Schneiden,* v. 11, June 1959, p. 251-253.

Application of arc welding. (K1, T22k)

517-K. (Russian.) Methods of Evaluating Endurance Strength of Welded Joints. A. V. Stanyukovich and V. N. Zemzin. *Zavodskaya Laboratoriya,* v. 25, June 1959, p. 715-721.

Testing of welded joints must be performed on cross and longitudinal weld sections. In the cross weld area it is possible to detect the minimum strength of a welded component and the susceptibility of the weld zone to strain concentrations. 6 ref. (K9r; SS-e)

518-K. (Book.) Minutes of the Seventh Annual Atomic Energy Commission Welding Conference. Division of Reactor Development. U.S. Atomic Energy Commission, TID-7562, Jan. 1959, 253 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $2.50.

Held in Chicago, Nov. 6-8, 1957. Papers abstracted separately. (K-general, T11)

519-K. (Translation—BWRA.) Choice and Design of Electro-Slag Welding Equipment. P. I. Sevbo, V. E. Paton and M. G. Belfor. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 7-18.

Present-day equipment for electro-slag welding. Basic requirements and design principles. 5 ref. (K6, 1-52, 17-51)

520-K. (Translation—BWRA.) Influence of Electrode Vibration on the Droplet Transfer of Electrode Metal in the Electro-Slag Process. D. A. Dudko and T. N. Rublevskii. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 28-34.

Effect of electrode oscillation frequency and amplitude on size and transfer of droplet. (K_e, K9n; ST)

521-K. (Translation—BWRA.) Effect of Aluminum on the Porosity of Automatic Welds. L. S. Sapiro. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 35-43.

Addition of Al to flux containing varying amounts of hydrogen during submerged arc welding of steel. 10 ref. (K1e; ST, 7-51, 9-68)

522-K. (Translation—BWRA.) Automatic Welding of 1Kh18N9T Steel, Intended for Short Periods of Work at High Temperatures. E. Yu. Yuganson. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 64-70.

Automatic submerged-arc welding of stainless steel using acid fluxes containing Al. Influence of Al on oxidation of Ti and Cr in weld pool. Resistance of welds to high-temperature scaling and acid corrosion. (K1e, R-general; SS, *Al, Ti, Cr,* 7-51)

523-K. (Translation—BWRA.) Local Spectrum Analysis for Investigating the Chemical Non-Uniformity of Resistance Welds. N. V. Bobritskii and N. A. Grinberg. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 77-85.

Spectrographic analysis of chemical heterogeneity of weld zone formed by flash and other resistance welding

processes on rods of mild, medium-carbon and low-alloy Cr-Mn steels. 5 ref. (K3, S11k; CN, AY, *Cr, Mn,* 7-51)

524-K. (Translation—BWRA.) Controlled Penetration Automatic Welding of Spherical Containers. V. R. Ryabov. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 107-112.

Automatic welding of steel containers using tungsten electrode, argon-shielded arc welding of weld root followed by submerged-arc process. (K1d, K1e; ST)

525-K.* Welding of X56 Pipe. Norman F. Blundell. *American Society of Mechanical Engineers,* Paper no. 59-PET-12, 1959, 4 p.

Up to 320 heats of steel used in making X56 pipe were tested for yield strength, ultimate strength, elongation, carbon and Mn content. Test weldments were made with X25 pipe. (K9s, Q27a; CN-p, 4-60)

526-K.* Weld Hardening of High Strength Steels and Prediction of Optimum Welding Conditions. Hiroshi Kihara, Haruyoshi Suzuki and Fumihiro Kanatani. *National Research Institute for Metals, Transactions,* v. 1, no. 1, 1959, p. 39-64.

Measurement of thermal cycles in heat affected zone of arc welds made in low-alloy high-strength steels. Effect of plate thickness and welding conditions on cooling rate. Relationship between cooling rate and maximum hardness. Nomographs for prediction of optimum welding conditions. 16 ref. (K1a, K9n; AY, SGB-a)

527-K. Welding of Stainless Steel Which Contains More than 1% Boron. Nicolas Balai. Paper from "Minutes of the Seventh Annual Atomic Energy Commission Welding Conference". U. S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 15-31.

Useful and economical high-strength corrosion resisting stainless steels containing high percentages of boron were developed as neutron absorbing materials in nuclear reactors. Welding techniques permit the incorporation of the low-ductility 1 and 2.% boron stainless alloys into various EBWR neutron absorbers inside the reactor pressure vessel and in the fuel storage rack. (K-general, T11; SS, *B*)

528-K. Joining of Zircaloy to Austenitic Stainless Steel. Kenneth H. Koopman. Paper from "Minutes of the Seven Annual Atomic Energy Commission Welding Conference". U. S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 32-56.

Diffusion bonding in a vacuum furnace at 1000 to 1020° C. gives good quality joints between Zircaloy-2 and Type 304 austenitic stainless steel which might be usable for joining some pressurized-water-reactor components. Thermal cycling tests between 100 and 550° F. for 4000 to 10,000 cycles indicated that diffusion-bonded joints do not leak or develope cracks. 6 ref. (K5k; Zr-b)

529-K. Fabrication of Thin-Wall Molybdenum Shapes by Welding. W. F. Brown. Paper from "Minutes of the Seventh Annual Atomic Energy Commission Welding Conference". U. S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 155-173.

Fabrication procedure suitable for the production of thin-walled Mo components such as tubes, crucibles, furnace liners, high-frequency furnace susceptors and heat exchangers. Sheet material 0.015 in. thick was used, and welding was done in air using the automatic inert-gas tungsten-arc process. 8 ref. (K-general; Mo)

530-K.* A Laboratory Prototype Electron-Beam Welder. A. Lesnewich. Paper from "Proceedings of First Symposium on Electron-Beam Melting." Alloyd Research Corp., Watertown, Mass., 1959, p. 48-49.

Welder with maximum potential of 15,000 volts and power output up to 7.5 kw. Electron beam control and vacuum systems. Welding stainless steel foil and plate. (K6, 1-52; SS, 4-53, 4-56)

531-K.* A Commerical Electron Beam Welder. Theodore H. Crane. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 84-88.

Electron beam welder; it operation and applications. (K6, 1-52)

532-K.* (Dutch.) Weldments Performed With Copper Bottom and Side Walls. *Metalen,* v. 14, July 15, 1959, p. 200-202.

Hand welding with coated electrodes. Bottom and walls keep the liquid metal in place at the same time as allowing the slag to flow off through a small gap. (K1a, T23q; ST, 4-55, 4-60)

533-K.* (Italian.) Correct Selection of Electric Welding Processes. Oscar Grossi. *Macchine,* v. 14, July 1959, p. 729-735.

Selection is determined by nature of material, thickness, shape and number of parts to be welded. (K1, K3)

534-K.* (Slovakian.) Importance of Welding in the Iron and Steel Industry. Jozef

Cabelka. *Zvaracsky Sbornik*, v. 8, no. 1, 1959, p. 3-28.

Repair of steel mill equipment and products by welding. Process directions and choice of filler materials. (K-general, 18-72, D-general, W-general)

535-K.* (Slovakian.) Non-Oxidizing Ceramic Fluxes for Submerged Arc Welding. K. V. Lubavskij and E. P. L'vava. *Zvaracsky Sbornik*, v. 8, no. 1, 1959, p. 29-36.

High-alloy, stainless and heat resistant steels were welded using ceramic sintered fluxes prepared with a halide base and containing Al_2O_3. Filler metals of favorable shape and low O, N and H contents were obtained. (K1e; AY, SS, SGA-h, RM-g, AD-n32)

536-K.* (Slovakian.) Properties of Electroslag Weldments. Julius Lombardini and Julius Zeke. *Zvaracsky Sbornik*, v. 8, no. 1, 1959, p. 50-63.

Effects of composition and structure of filler metal on mechanical properties. Structure is influenced by welding velocity —the time the liquid metal is given to segregate impurities on the bath surface. Coarse grain is eliminated by modifying the base and filler metals or by previous heat treatments. (K6, Q-general, N3, 2-60, 2-64; ST, 7-51)

537-K.* (Slovakian.) Weld Repair of Steel Mill Rolls, Crane Wheels and Forging Dies. Karol Sniegon. *Zvaracsky Sbornik*, v. 8, no. 1, 1959, p. 64-81.

Methods developed at the Welding Institute, Gliwice, Poland, with special reference to automatic welding with an alloying flux; hand welding with the alloying elements contained in the electrode coating. (K1, 18-72, W23k, W12q, W22a; ST)

538-K.* (Slovakian.) Repair Weldments on Locomotive Spoke Wheels. Pavel Hrbal. *Zvaracsky Sbornik*, v. 8, no. 1, 1959, p. 82-107.

Materials used for wheels were tested after experimental welding. Effects of composition of base and filler metals on mechanical properties, such as impact strength, bend strength and fatigue behavior. (K1a, T23, Q-general, 2-60, 18-72; CN, 7-51)

539-K.* (Slovakian.) Factors Influencing the Shape of the Bead in Submerged Arc Welding. Eduard Pikna. *Zvaracsky Sbornik*, v. 8, no. 2, 1959, p. 194-219.

Effects of amperage, arc voltage, welding velocity, composition and granulation of flux, electrode diameter, inclinations of workpiece and electrode, clearance between parts to be welded, poling temperature of workpiece on shape of the bead. (K1e)

540-K.* (Slovakian.) Weldability Tests With Thin Steel Sheets. Anton Hrabovec. *Zvaracsky Sbornik*, v. 8, no. 2, 1959, p. 220-246.

Low-carbon steel sheets of various quality were gas welded, welded with one or two tungsten electrodes in argon or hydrogen, or welded with a carbon electrode in air or CO_2. Effects of welding processes and conditions on mechanical properties of the weldments. 46 ref. (K1, K2, K9s, Q-general; ST, 4-53, 7-51)

541-K.* (Slovakian.) Effects of Oxygen and Hydrogen in the Welding of Copper. Pavel Slysko. *Zvaracsky Sbornik*, v. 8, no. 2, 1959, p. 247-254.

Gas welding of Cu containing oxygen with an oxidizing and a reducing flame. An oxidizing flame causes a eutectic structure Cu-Cu_2O; with a reducing flame, hydrogen adsorption causes pores, bubbles and cracks. (K2h; Cu, *O*, *H*, 9-68, 9-72)

542-K. Advanced Techniques for the Production of Missile Components. L. E. Laux and C. S. Hill. *Machinery*, v. 95, July 15, 1959, p. 67-73.

New developments for tooling and procedures for assembly of steel honeycomb structures by adhesive bonding and brazing. (K12, K8, T24e; ST, 7-59)

543-K. (German.) Welding in the Repair and Fabrication of Rolling Mill Parts. K. Weber. *Schweissen und Schneiden*, v. 11, June 1959, p. 244-245.

(K-general, W23, 18-72)

544-K. (Russian.) Resistance Welding of Rails. I. Z. Genkin. *Svarochnoe Proizvodstov*, July 1959, p. 12-15.

Equipment and techniques for resistance welding of rails into very large units (12.5 to 25 m.) producing rolling stock of high durability and quality. (K3r, T23q; CN)

545-K. (Russian.) Spot and Seam Welding of Light Alloy Structures. B. D. Orlov and Chuloshnikov. *Svarochnoe Proizvodstvo*, July 1959, p. 16-19.

Welding method employs fillers which increase the corrosion resistance of

welds and in many cases improve the structural strength of the assembly. 10 ref. (K3n, K3p; CN)

546-K. (Russian.) Projection Welding of Hot Rolled Steel. A. S. Gel'man, E. S. Slepak, S. M. Lashchiver and P. V. Mumrikov. *Svarochnoe Proizvodstvo*, July 1959, p. 19-22.

Method is very effective when applied to hot rolled steel structures requiring strong joints and high electrode resistance. (K3q; CN)

547-K. (Russian.) New Impulse Resistance Welders for Spot and Seam Welding of Thin Components. N. L. Kaganov. *Svarochnoe Proizvodstvo*, July 1959, p. 31-34.

Three types of newly developed welders at the Moscow Engineering College. (K3n, K3p, 1-52; CN)

548-K. (Russian.) Resistance Welding in Steel Sheet Production. A. M. Kogos, B. A. Ryss, A. S. Gel'man and N. S. Kabanov. *Svarochnoe Proizvodstvo*, July 1959, p. 34-39.

Equipment and techniques for resistance butt welding of strip steel under mill working conditions. (K3r; CN, 4-53)

549-K. (Russian.) Quality Control of Spot and Seam Welds. S. T. Nazarov. *Svarochnoe Proizvodstvo*, July 1959, p. 39-40.

Ultrasonic inspection with a defectoscope detects nonfusion as well as penetration of the fused metal during welding. (K3n, K3p, K9, S13g; CN)

550-K. (Russian.) New Resistance Welders for Light-Gage (Thin) Materials. D. A. Lyukevich and N. M. Tarasov. *Svarochnoe Proizvodstvo*, July 1959, p. 41-42.

(K3, 1-52)

551-K. (Russian.) Resistance Seam-Butt Welding of Pipes by High-Frequency Current. B. D. Zhukovskii. L. M. Zilbershtein and P. V. Golovein. *Svarochnoe Proizvodstvo*, July 1959, p. 42-44.

(K3n, K3p; 4-60, CN)

552-K. (Russian.) Resistance Spot and Seam Welding of Titanium Alloy OT-4. F. E. Tret'yakov and G. P. Tsar'kov. *Svarochnoe Proizvodstvo*, July 1959, p. 47-48.

Procedure for welding of sheets from 0.6 to 3.0 mm. thick. (K3n, K3p, Ti-b, 4-53)

553-K.* (Czech.) Friction Welding. J. Mandaus and J. Voboril. *Strojirenstvi*, v. 9, Jan. 1959, p. 33-40.

Bend and tensile strength are influenced by the degree of compression reached during welding. Mechanical properties and structure of weldments are influenced by heat treatment. Evaluation of steel friction weldments. (K6; ST)

554-K. Advances in Fabrication Techniques Revealed at Southern Metals Conference. Notes on Papers Presented at the Southern Metals Conference, Sponsored by Savannah River Chapter A.S.M., Augusta, Ga., May 1959. *Metal Progress*, v. 76, Aug. 1959, p. 128, 130-134.

Review of progress in ultrasonic electron beam and plasma jet welding. (K6, K6r)

555-K.* (Czech.) Weldability of Cast Steel With 13% Chromium. V. Pilous and F. Jandos. *Slevarenstvi*, v. 7, May 1959, p. 191-194.

Mechanical properties after casting; microstructure after annealing at 750° C. 6 ref. (K9s, M27, 2-64; SS, *Cr*, 5)

556-K.* (Czech.) Base-to-Electrode Metal Proportions in Submerged-Arc Welds. J. Lukasek. *Strojirenstvi*, v. 9, Feb. 1959, p. 126-129.

Compatability between base metal and electrode material is improved by introduction of additional electrodes connected to the base material. Welding with three consecutive arcs; positioning of electrodes with respect to base material; influence of welding velocity on weld profiles. (K1e)

557-K.* (Czech.) Submerged Arc Welding. A. Krnak. *Strojirenstvi*, v. 9, July 1959, p. 509-516.

Advantages and limitations of the method. Criteria for the selection of optimum seams. (K1e)

558-K.* (German.) Welding of Nickel and Its Alloys. W. Strassburg and Hinde. *Chemische Rundschau*, v. 12, Aug. 1, 1959, p. 412.

Composition and mechanical properties of Ni and Ni alloys. Electrodes and welding processes suited for the individual base materials. (K1; Ni, Ni-b)

559-K. Three-Step Method Bonds Fluorocarbons Firmly. *Iron Age*, v. 184, Aug. 13, 1959, p. 88-89.

Surfaces are treated with a vapor blast; washing and etching dip-tank setup follows and then application of high-temperature polymer coating to areas to be bonded. (K11d; NM-d34)

560-K. Super-Strength Rocket Chambers. *Ryan Reporter*, v. 20, no. 3, n.d., p. 8, 10.

Spot welded Ryan rocket chambers of foil-gage steel withstand test pressures of 305,000 psi. (K3n, T24e; SS, 4-56)

561-K. Ultrasonics Gain Speed in Joining Thin Aluminum. *Steel*, v. 145, Aug. 31, 1959, p. 67.

Ultrasonic seam welder manages Al sheet up to 0.010 in. thick at speeds over 30 ft. per min. (K6r, K3p; Al, 4-53)

562-K.* Arc Welding Tantalum by the Tungsten Inert Gas Process. Pt. 2. Alan F. Busto. *Fansteel Metallurgy*, July 1959, p. 2-3.

Cleaning, fixtures and welding equipment; choice of shielding gas. (K1d; Ta)

563-K.* A Breakthrough for Tantalum Welding. Burton Payne. *Welding Design & Fabrication*, v. 32, Aug. 1959, p. 36-39.

Corrosion resistance, physical and mechanical properties of Ta; resistance, submerged-arc, tungsten-arc inert-gas and electron-beam welding techniques. Ta-lined pressure vessels. (K-general, K6; Ta)

564-K.* Techniques for Torch Brazing Aluminum. Howard E. Adkins and Robert A. Ridout. *Welding Engineer*, v. 44, Aug. 1959, p. 30-32.

Brazability of various wrought and cast Al alloys. Cleaning and brazing procedures. Joint clearances; tip selection; flux removal. (K8g; Al-b)

565-K. (German.) Welding Methods Applied in the Construction of Chemical Industrial Equipment. Paul Richter. *Schweisstechnik*, v. 13, May 1959, p. 57-60.

(K-general, T29m)

566-K.* New Welding Processes. Better Weld Quality for Less Dollars. John J. Chyle. *SAE Journal*, v. 67, Aug. 1959, p. 47-52.

New developments in pressure welding and fusion welding improve weld quality. (K6)

567-K.* (Czech.) New Austenitic Steels for Welded Structures. F. Sicha. *Strojirenstvi*, v. 9, June 1959, p. 449-452.

Plate thickness is limited to 50 mm. Steels have high brittle fracture resistance and good weldability without preheating. (K9s, Q26s; SS-e, SGB-s)

568-K.* (German.) Oxyacetylene Welding of Austenitic Steel. J. Beckstroem. *Journal de la Soudure—Zeitschrift fur Schweisstechnik*, v. 49, May 1959, p. 133-139.

Importance of the ratio C_2H_2 to O_2 which should be equimolecular. The mixture of gases should be as complete as possible. Whenever those conditions are not given, structural defects caused by the formation of oxides or carbides can occur. (K2h; SS-e)

569-K.* (German.) Welding of Manganese Hard Steel. Georg Neuhofer. *Schweisstechnik*, v. 13, May 1959, p. 54-56.

Procedures necessary in the repair welding of a power shovel scoop to avoid cracks. Strain relief by hammering. (K1a, G23n, 2-62; AY, *Mn*, 7-51)

570-K. How to Get the Most From Semi-Automatic Welding Machines. *Welding Engineer*, v. 44, Aug. 1959, p. 33-35.

Wire feed, welding current and wire extension and their relation to deposition rate. (K1g, 1-52)

571-K.* (French.) Sheathing of Fuel Elements With the Help of Heating Dies. M. Gauthron. Paper from "Symposium on Solid State Diffusion". Centre d'Etude Nucleaires de Saclay, Gif-sur-Yvette (S-et-O), France, 1959, p. 95-101.

The Zr sheath is heated by a low-voltage current and pressed to the fuel bar when passing a die. An inert gas atmosphere or a vacuum is maintained between sheath and bar. Subsequent heat treatment at 1000° C. causes the formation of a diffusion zone. (K5k, T11g, 2-64, 1-73; U, Zr)

572-K.* (Italian.) Metallurgical Problems in the Welding of Dissimilar Steels. Karl Bjorkroth. *l'Acciaio Inossidabile*, v. 26, July-Aug. 1959, p. 140-156.

Techniques and materials for welding stainless to carbon or low-alloy steels; use of stainless steel electrodes for welding clad steel sheet. (K-general; SS, AY, CN, 4-53, 8-66)

573-K.* (Italian.) High-Temperature Brazing With Alloys Containing Palladium. E. R. Perry. *Nickel*, no. 79, Apr. 1959, p. 15-20.

Advantages of high-temperature brazing. Properties and applications of alloys containing Pd. (K8; Ag-b, *Pd*, SGA-f)

574-K.* Welding Nimonic. R. Levick and P. A. Morgan. *Aircraft Production*, v. 21, July 1959, p. 251-257.
Fusion and resistance welding processes. (K3; Ni-b)

575-K. (Dutch.) Developments in the Field of Weldable Materials. Pt. 1. H. G. Geerlings. *Metalen*, v. 14, July 31, 1959, p. 210-213.
Survey. (K-general, K9s)

576-K. (Dutch.) Developments in the Field of Weldable Materials. Pt. 2. H. G. Geerlings. *Metalen*, v. 14, Aug. 15, 1959, p. 224-228.
Shape of samples used in impact tests and strength values required for individual materials. Problems of brittle fracture. (K9s, Q6n, Q26s, 2-61; ST, Al)

577-K. (Book.) AWS Training Manual of Arc Welding. A. L. Phillips. 140 p. 1959. American Welding Society, 33 W. 39th St., New York 18, N. Y.
Process analysis, techniques and equipment used in manual metal-arc welding with covered electrodes. (K1a)

578-K.* How to Get Better Stainless Steel Welds. W. L. Wilcox. *Welding Engineer*, v. 44, Sept. 1959, p. 32-34.
Coated stainless steel electrodes; color coding systems; avoiding weld porosity and underbead cracking. (K1a; SS, 9-68)

579-K.* Spot Welding Procedures and Design. Pt. 1. Lester F. Spencer. *Welding Engineer*, v. 44, Sept. 1959, p. 35-39.
Electrode tip diameter and overlap, edge distance and spot weld spacing for ferrous and nonferrous metal. 18 ref. (K3n, 17-51; ST, Al-b, Mg-b, Cu-b, Ni-b)

580-K.* Understanding Weld Distortion and Shrinkage. George W. Gardner. *Welding Engineer*, v. 44, Sept. 1959, p. 40-42.
Examples of distortion in welded assemblies. Welding techniques, joint design, post treatment and other methods of minimizing distortion. (K9, 9-74; ST, SS, 17-51)

581-K.* Dip Brazing With Paste Filler Metal Offers New Possibilities for Brazing Aluminum. A. M. Stapen. *Industrial Heating*, v. 26, June 1959, p. 1115-1116, 1118, 1120, 1122, 1274.
Techniques and advantages of dip brazing Al with new powdered filler alloy applied as an aqueous paste using a molten flux bath. Tensile strength of up to 45,000 psi. has been obtained in joints in 6061 Al. (K8n; SGA-f, Al)

582-K.* Structural Uses of Welded High-Tensile Steel. G. Roberts. *West of Scotland Iron and Steel Institute*, v. 66, 1958-1959, p. 122-130.
Carbon content in these steels is restricted to 0.30% to provide greater ductility. The tensile strength is maintained by increased Mn content or by small Cr additions. Welding characteristics—arc energy, deposit areas, electrode diameter, fillet length, welding current and speed and plate thickness are given for BS 968 steel. (K9s, Q27a, 2-60; AY, *C, Mn, Cr*)

583-K. Baking "the Biggest" Metal Sandwich. *Metalworking Production*, v. 103, Aug. 14, 1959, p. 1244-1245.
Brazing PH15-7Mo stainless steel honeycomb panels. (K8j; SS, 7-59)

584-K. The ABC of Welding 'T-1' Steel. *Steel*, v. 145, Sept. 1959, p. 164-165.
(K-general; AY)

585-K. Nickel-Alloy Lining Slashes Isomerization Unit Costs. John F. De Lorenzo. *Welding Engineer*, v. 44, Sept. 1959, p. 58, 60.
Hastelloy B liner welded inside carbon steel vessel by coated electrode and inert-gas-shielded metal-arc processes. (K1a, K1d; ST, Ni-b)

586-K. (German.) Spotwelder for Use in the Automobile Industry. *Zeitschrift fur Schweisstechnik*, v. 49, Aug. 10, 1959, p. 241-242.
(K3n, 1-52, T21c)

587-K.* Progress Report on Welded Repairs to API 5LX52 Pipe. T. A. Ferguson. *American Society of Mechanical Engineers*, Paper no. 59-PET-34, 1959, 7 p. $.80.
Hydrostatic tests evaluating repairs on three corrosion pitted joints. (K-general, 18-72, Q10b, ST, 4-60)

588-K.* Zirconium Welding. B. L. Baird and E. F. Cook. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 148-158.
General survey of resistance, flash and tungsten arc welding. Recommended techniques and effect of process variables on mechanical and physical properties. 8 ref. (K-general; Zr)

589-K.* New Welding Processes. John J. Chyle. Digest of "Prediction in New Metal Joining Processes". Paper Presented at the Society of Automotive Engineers National Aeronautical Meeting, New York, Mar. 31, 1959. *Metal Progress*, v. 76, Sept. 1959, p. 174, 176.

Lists 15 kinds of pressure welding, 12 kinds of fusion welding and 10 methods of brazing, plus 20 variants related to heat source or protective atmosphere. (K8, K3, K4, K6)

590-K.* Progress in the Fusion Welding of Nonferrous Alloys. J. G. Young. *Sheet Metal Industries*, v. 36, Aug-Sept. 1959, p. 557-566, 576.

Welding processes and equipment for Al, Cu, Pb, Mg, Ni, Ti and their alloys. (K-general; EG-a38, Al, Cu, Pb, Mg, Ni, Ti)

591-K.* Inspecting and Testing Mild Steel Welds. R. N. Robb. *New Zealand Engineering*, v. 14, May 15, 1959, p. 163-168.

Dangerous welding variations in mild steel structures dictate careful use of welding equipment, electrodes and technique of a standard quality. Destructive tests; properties of welds. (K9r, S13; CN, 7-51)

592-K.* The Influence of Selected Fabrication Variables on Metal-to-Metal Bonding. G. Epstein and S. Litvak. *American Chemical Society (Division of Paint, Plastics and Printing Ink Chemistry*, Paper no. 2, v. 19, Sept. 1959, p. 239-246.

Fabrication variables include surface conditions, air entrapment in liquid epoxy-base adhesives, degree of cure of primer and pressure during cure of assembly. Tensile-shear strength of bonds for Ti alloys, steel, Be and Ni with several commercial adhesives. (K12; ST, Ti-b, Be, Ni)

593-K.* Rectification of Important Steel Castings by Welding. G. Mukherji. *Indian Railway Technical Bulletin*, v. 16, May 1959,

Repair of castings used as vital stress bearing members in a railroad coach. The welding of high-tensile steel castings and testing and evaluation of weldability are based on hardness of the steel. (K1, K9s, 18-72; ST)

594-K.* Bonding Rare Metals. R. F. Wegman and M. J. Bodnar. *Machine Design*, v. 31, Oct. 1, 1959, p. 139-140.

Tensile strengths achieved in the bonding of stainless steel to Be, Cb, Cu-Be, Mo, Pd, Re, Ta, W, Zr and 720 alloy and Cr, Au, Ag, Ti and stainless steel 347 to themselves with Epiphen 825 A and Laminac 4116. (K12, Q27a; SS, Be, Cb, Cu-b, Au, Mo, Ta, W, Zr, Cr, Ag, Ti, Pd, Re)

595-K.* (German.) Rectifying Effect on Alternating Current Arc Welding. F. Bollenrath, K. H. Lindackers and E. Roeder. *Schweissen und Schneiden*, v. 11, July 1959, p. 267-270.

A rectifying effect is caused in a-c. arc welding by the temperature differential at the electrode and at the welded material. The rectifying coefficient is dependent on and proportional to the temperature differential. Detrimental effects on the weld result from the rectifying effect. Partial elimination can be achieved by superimposed high frequency; high voltage. (K1, K9n)

596-K.* (German.) Welding and Weld Inspection of the Wilhelmshaven-Cologne Oil Pipe Line. H. Winter. *Schweissen und Schneiden*, v. 11, July 1959, p. 270-279.

Elongation limit of 36.6 kg. per sq.mm. and rupture strength of 50.6 kg. per sq.mm. were required for steel pipe and electrode. Comparative analysis of U. S. and German steels and electrode properties, both used in pipeline welding and construction. Upward and center-line welding were used. (K1, S13, T26r)

597-K.* (German.) Vertical Downward Welding in the Production of Large Storage Tanks. A. Buchholz. *Schweissen und Schneiden*, v. 11, July 1959, p. 285-288.

Experimental weldments produced by the vertical downward welding method proved superior to those resulting from the upward welding technique. Shrinkage and strength data were also superior. (K1g, T26q)

598-K. How Good Is Electron-Beam Welding? *American Machinist*, v. 103, Sept. 21, 1959, p. 113-114.

Compared with other kinds of welding. (K6)

599-K. A New Technique for Welding—Electron Beam. *Australasian Manufacturer*, v. 44, Aug. 22, 1959, p. 44-46, 48-51.

Review article. (K6)

600-K. Submerged-Arc Welding Operations on Exhaust Manifolds. *Machinery*

(*London*), v. 95, Sept. 16, 1959, p. 541-543. (K1e, T21c)

601-K.* Joining Dissimilar Metals. J. G. Young and A. A. Smith. *Welding and Metal Fabrication*, v. 27, July 1959, p. 275-281.

Resistance welding, pressure welding, solid state bonding and brazing. Effects of temperature, corrosive environment, eutectic formation, solution potential, electrode potential, joint geometry, composition and microstructure. (K-general, K6, K8, 2-61, 2-66)

602-K.* Storing Methane at -260° F. *Welding and Metal Fabrication*, v. 27, July 1959, p. 282-283.

Fabrication of cylindrical storage tanks having an outer shell of welded steel plate and an inner tank of NP 5/6 Al alloy plate with insulation between by inert-gas-shielded welding. (K1d, T26q; Al, ST, 4-53)

603-K.* (German.) Arc Welding and Arc Cutting. Herbert Rotter. *Industrieblatt*, v. 59, Aug. 1959, p. 366-371.

Description of the argonarc, sigma, Tig, Mig, submerged arc, Unionarc processes. Wiring and kind of current used for individual materials. Relationship between melting efficiency and current intensity. 8 ref. (K1, G22h)

604-K.* (German.) Adhesive Joining. K. Illmer and W. Mensing. *Industrieblatt*, v. 59, Aug. 1959, p. 376-382.

Bonding of light metals using various bonding materials. Relationship between strength of a metal and bonding strength. Fatigue strength of joints. Importance of surface preparation. Behavior under sudden and steady loads. Influence of service temperature on strength. 18 ref. (K12, Q7a, Q27a, Q6n, Q3m, 2-61; EG-a39, 7-59)

605-K. Growth of the CO_2 Welding Process. David F. Ritchie. *Canadian Metalworking*, v. 22, Sept. 1959, p. 16-18, 20.

Advantages include improved shielding techniques, more versatile wire feed equipment, better arc control, improved wire chemistry and more efficient welding techniques. (K1d)

606-K. "Enclosed" Welding. Can This Concept be Widely Applied? J. A. N. Clevers and G. Zoethout. *Canadian Welder*, v. 50, Sept. 1959, p. 14-15.

The weld deposit from low-hydrogen electrodes contains fewer impurities than the metal deposited with all the types of electrodes used hitherto. By using such electrodes it is possible to deposit a subsequent layer without slag inclusions and without removing any preceding layers. (K1e, W29h)

607-K.* Cracking of Low-Alloy Steel Weld Metal. Pt. 2. T. E. M. Jones. *British Welding Journal*, v. 6, July 1959, p. 315-317.

Principal factors involved are cooling rate of weld, which is affected by the size of the electrode, plate thickness, preheating, impurities such as high hydrogen potential in the electrodes, head size, weld restraint and low ductility of the weld metal. (K9s, 3-69; AY, 9-72)

608-K.* Strength of Components Repaired by Welding. S. Wise. *British Welding Journal*, v. 6, Aug. 1959, p. 345-350.

Effect of different types of weld on the fatigue resistance of engineering components made of mild or high-tensile steel. Fatigue failure may occur owing to the incorrect application of welding during repair work because of the lower fatigue strength of welds or because of changes in the stress distribution in the structure caused by welding. (K-general, 18-74, Q7a; CN, 7-51)

609-K.* Diffusion Bonding of Carbide to Steel. J. F. Kuzmick and G. B. Goodfellow. *Carbide Engineering*, v. 11, Aug. 1959, p. 11-14.

Bonded joint between cemented carbide tip and steel shank of cutting tool formed by heating, under pressure, a sintered wafer of "Plymet" material. (K5k; SGA-j, 6-69)

610-K.* Honeycomb Panels Get Braze in Electric Blanket Setup. R. E. Crump. *Iron Age*, v. 184, Sept. 17, 1959, p. 112-113.

New portable method of brazing honeycomb structures without use of furnace also reduces warm-up time and gives an even braze without problem of conductor expansion. (K8; 7-58)

611-K.* Brazing Graphite to Nilo-K Tubes. B. Stapleton. *United Kingdom Atomic Energy Authority (Industrial Group)*, I. G. Report 140 (RD/CA), 1959, 8 p.

Technique for making leak-tight brazes. (K8; Fe-b, Ni, Co, NM-k36)

612-K. Development of High-Strength Filler Wires for Welding SAE 4130, 4140 and 4340 Steels. H. W. Mishler and R. P. Sopher.

Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131074, Apr. 1957, 76 p. $2.

Filler wires for welding high-strength low-alloy aircraft steels by the inert-gas tungsten-arc and inert-gas consumable-electrode processes. Some filler wires had a composition similar to the base material, while others were of a different composition. Major factors considered were the weld-metal porosity, weld-metal cracking tendency, heat treatment response compared with base metal, strength of heat-treated weld joint, weld-metal toughness, and weld-metal hardening ability. (K1d, W29h; ST, 7-51, 9-68)

613-K.* Will Brazed Molybdenum Replace the "Superalloys" in Jet Engine Parts? G. S. Hoppin. *Welding Design & Fabrication*, v. 32, Sept. 1959, p. 46-48, 78-79.

Metallurgical problems; room and elevated-temperature strength of joints in Mo alloy (0.5% Ti) sheet brazed with Pd, Ni, Fe, Ag or Cu-base filler metals. (K8j, Q27a, 2-62; Mo-b, *Ti*, 7-52; SGA-f)

614-K.* Flash Butt Welding Cuts Jet Ring Costs 65%. H. J. Novak. *Welding Design & Fabrication*, v. 32, Sept. 1959, p. 56-57.

Welding AISI 430, 403 and 410 alloys to make jet engine ring assemblies. (K34; SS)

615-K.* Metallurgy of Bonding in Brazed Joints. Pt. 2. Migration of the Filler Metal Into the Base Metal. Nikoljas Bredzs and Harry Schwartzbart. *Welding Journal*, v. 38, Aug. 1959, p. 305s-314s.

The principal mechanism of transfer of filler metal through the filler metal-base metal interface is by grain-boundary penetration, which is a rapid process. The mechanism of grain-boundary penetration and its interrelationship with other metallurgical phenomena involved are explored theoretically and experimentally. 11 ref. (K8k, N1)

616-K.* Process Welding of Nodular and Gray-Iron Castings. Benjamin Townshend and Ellis O. Porter. *Welding Journal*, v. 38, Aug. 1959, p. 329s-334s.

Sound welds can be produced in restrained joints of nodular or gray cast iron using the shielded metal-arc process with the commercially available 55 Ni, 45 Fe electrodes and a preheat temperature of 600° F. A buttering technique followed by an intermediate heat treatment was found to result in weld joints comparable in strength to the base material. (K1d; CI-r, CI-n)

617-K.* Welding of Reinforcing Bars for Concrete Construction. J. F. Rudy, F. Suyama and H. Schwartzbart. *Welding Journal*, v. 38, Aug. 1959, p. 335s-340s.

Arc welding of reinforcing bars containing 0.21 to 0.84% C, up to 1.67% Mg, up to 0.081% P, and up to 0.067% S. The most successful joint design was a butt weld with edge preparation and weld-deposition techniques chosen to provide 100% penetration, slag-free deposits. (K1; 4-67, CN, NM-f43, SGB-s)

618-K. Reclamation of a 30-Ton Steel Casting. G. Gordon Musted. *British Welding Journal*, v. 6, Aug. 1959, p. 351-353.

Method employed to salvage a 30-ton cast steel drop hammer frame. The casting was made fit for further service by the combined use of oxy-acetylene cutting and heating, metal-arc and submerged-arc welding. (K1, 18-72, G22g; ST, 5-60)

619-K. Reproducibility of the CTS Weldability Test for Low-Alloy Steels. *British Welding Journal*, v. 6, Aug. 1959, p. 354-361.

Controlled thermal severity test is considered to be satisfactory for the scientific investigation of phenomena associated with heat affected zone cracking, and as a comparative test for steels, electrodes and welding procedure. 5 ref. (K9r; AY)

620-K. Powdered Metal Bonds Carbide to Steel. *Tooling & Production*, v. 25, Oct. 1959, p. 52.

Plymet diffusion bonding. (K5k; ST, 6-69)

621-K. Techniques for Resistance Welding Tiny, Dissimilar Metal Parts. *Welding Design & Fabrication*, v. 32, Sept. 1959, p. 44-45.

Joining Ni, W and Cr-Cu components for electron tubes. (K3n; Cr-b, *Cu*, Ni, W)

622-K. Welding of Fuels and Controls for Dresden Nuclear Power Station. C. N. Spalaris and J. W. Weyers. *Welding Journal*, v. 38, Aug. 1959, p. 760-765.

Processes, materials and quality-control methods for fabricating Zircaloy-2 clad, uranium dioxide containing fuel elements and boron-bearing stainless-steel control rods. (K-general, T11g; Zr-b, U, SS)

623-K. Welded Clad Steel Pipe for Reactor Construction. William H. Funk. *Welding Journal*, v. 38, Aug. 1959, p. 766-771.

Uses of gas-shielded tungsten-arc process. (K1d, T11; ST, 8-66)

624-K. Practical Approach to Determine Weld Size Provides Adequate Strength for All Types of Connections and, at the Same Time, Avoids Overwelding. Omer W. Blodgett. *Welding Journal*, v. 38, Aug. 1959, p. 775-782.

Salient features of weld design. (K-general, 17-51)

625-K.* Aluminum Brazing Paste Saves $175,000 at Martin. Don Wernz and Mel Schwartz. *Steel*, v. 145, Oct. 12, 1959, p. 112-114.

"Alumibraze", filler for water-based brazing paste for Al, is used for dip brazing complex parts in salt-bath flux. (K8n; Al)

626-K. Tungsten Inclusions in Welds Made by the Argon-Arc Process on 18/8/1 Stainless Steel. R. W. A. Grocock. *United Kingdom Atomic Energy Authority (Industrial Group)*, I. G. Report 39 (RD/CA), 1959, 8 p.

Satisfactory welds can be obtained without tungsten contamination under wide range of adverse conditions. (K1d, 3-69, W29h; SS, *W*, 9-69)

627-K. (Pamphlet.) How to Weld USS "T-1" Steel. 24 p. n. d. U. S. Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa. Free.

Use of electrodes with "low-hydrogen" coatings for manual arc welding; control of the amount of heat put into the weld; use of the straight-forward stringer bead method. (K1a; 2-64, AY)

628-K. (Pamphlet.) Adhesive Bonding of Aluminum. 19 p. 1959. Reynolds Metal Co., Richmond 18, Va.

Principles and procedures involved in structural adhesive bonding of Al including joint design, types of adhesives and processing of joints. (K12; Al)

629-K. (Russian—Book.) Electric Resistance Welding. A. M. Toker, Editor. 125 p. 1958. Trudrezervizdat, Moscow. (Available from Library of Congress, Washington, D. C.)

Resistance welding methods commonly used in Soviet industry including spot, seam, flash and projection welding. The use of condensers in resistance welding is a recent development in Soviet welding technology. (K3)

630-K.* (Swedish.) Fusion Welding of Aluminum. Evert Rodenius. *Metallen*, v. 15, no. 3, 1959, p. 109-125.

Directions for gas welding, coated-electrode welding, Tig and Mig welding. Pretreatments and post-treatments of welds. Factors influencing weldability, such as melting point and heat capacity, heat conductance, oxidation resistance, tendency to porosity, expansion and hot brittleness. (K2, K1, K9s, P12, P11, R1h, K9, Q26s; Al)

631-K.* Plasma—Substitute for the Oxy-Fuel Flame. James A. Browning. *Welding Journal*, v. 38, Sept. 1959, p. 870-875.

Theory involved in the operation of the plasma-flame torch. (K9n, G13)

632-K.* Spot Welding of a 12%-Cr Martensitic Stainless Steel. E. F. Nippes, W. F. Savage, L. C. Ianniello and W. A. Owczarski. *Welding Journal*, v. 28, Sept. 1959, p. 360s-366s.

Optimum spot welding conditions for 0.007, 0.015 and 0.022-in. type 422 modified stainless steel sheet. 9 ref. (K3n; SS-c, 4-53)

633-K.* Welded Aluminum Transformer Cases Cut Cost 75%. *Western Metalworking*, v. 17, Sept. 1959, p. 49-50.

Welding 5356 Al to 4043 Al. (K2d; Al)

634-K.* (German.) Welding Aluminum With the Use of Protective Gas. Rashofen-Berndorf. *Schweisstechnik*, v. 13, June 1959, p. 65-72.

Advantages of the protective gas arc welding method are oxygen-free welds even with alloys possessing high Mg content while flux-solvent-free welding eliminates weld treatment and cleaning after welding completion. High heat concentration of the arc enables high welding velocities and a narrow heating zone and thus only small structural changes of the parent metal. (K1a; Al-b, *Mg*)

635-K.* (Swedish.) Fusion Melting of Aluminum and Aluminum Alloys. Evert Rodenius. *Metallen*, v. 15, no. 1, 1959, p. 6-14.

Gas welding and arc welding methods. The affinity of Al to acids, the high conductivity for heat, the low specific weight and the high melting point of Al-oxide as factors determining the choice of pretreatments and welding parameters. (K1, K2, 2-66, P11h; Al)

636-K.* (Russian.) Weldability of Heat Resisting Steels With 12% Chromium. M. Kh. Shorshorov, V. V. Belov, V. N. Zemzin

and I. D. Smornova. *Svarochnoe Proizvodstvo,* Sept. 1959, p. 6-10.

Effect of heating and cooling processes occurring in welding on tensile strength, hardness, area reduction, creep strength and structure. 6 ref. (K-general, Q27a, Q29n, Q23p, Q3m, N8, 2-61, 3-67; SS, SGA-h)

637-K.* (Russian.) Arc Welding of Heat Resisting Austenitic Steel EI 572. V. A. Toropov. *Svarochnoe Proizvodstvo,* Sept. 1959, p. 11-15.

Influences of electrode composition, heat treatment and artificial aging on the structure of base and filler metal and on their impact strength and creep strength, both measured at elevated temperatures. 8 ref. (K1a, N8, Q6n, Q3m, 2-60, 2-62; SS, SGA-h)

638-K.* (Russian.) Effect of Ferrite on the Properties of Filler and Base Metal in Weldments Performed With Cr-Ni Austenitic Steels. A. E. Runov and K. V. Lyubavskii. *Svarochnoe Proizvodstvo,* Sept. 1959, p. 15-19.

Testing of steel 1Kh20N12T in the cast state and of 1Kh19N10B type filler metal, both containing various amounts of ferrite. Effect of heat treatment on creep strength, impact strength and quantity of ferrite present. 10 ref. (K1a, Q3m, Q6n, N8, 2-61, 2-64; SS-e)

639-K.* (Russian.) Capacitor Discharge Resistance Welding of Small Sections of 1Kh18N9 Steel. D. M. Shashin and N. Yu. Pal'chuk. *Svarochnoe Proizvodstvo,* Sept. 1959, p. 19-21.

The short heating times of the method allow the realization of weldments showing high corrosion resistance. With tubing, exact centering and perfect geometry of the joint are essential. (K3, R6g, 3-67, T7; SS)

640-K.* (Russian.) Strength of Spot Welded Structural Units From D16AT and B95AT Light Metal Alloys. N. Kh. Andreev. *Svarochnoe Proizvodstov,* Sept. 1959, p. 21-22.

Comparative testing of spot welded, adhesive joined and riveted assemblies by exposing to alternate static loads. (K3n, K12, K13n, Q7b; EG-a39, 7)

641-K.* (Russian.) Welding of Studs to Alloy Steel, Cast Iron and Nonferrous Metals. D. I. Vainboim. *Svarochnoe Proizvodstvo,* Sept. 1959, p. 35-37.

Stud welding performed without a protective medium, in an argon atmosphere, under a flux or using ceramic rings. Use of metal rings providing additions to the weld metal. Brazing with metal caps put on the stud supplying the solder. (K1f, K8; AY, CI, EG-a38)

642-K.* (Russian.) Hard Soldering of Alloys and Steels Containing Chromium. E. A. Kolenko. *Svarochnoe Proizvodstvo,* Sept. 1959, p. 40.

Soldering by heating the assembly, together with a solder containing Cu and Ag, and with a flux of Ni_2O_3, in a hydrogen atmosphere. The Ni_2O_3 is reduced to Ni that diffuses into the filler metal. By this method, vacuum tight and high-strength joints can be achieved. (K7g, Q27a; Cr-b, AY, *Cr,* 7-51)

643-K. Which Welding Process for the New Metals? I. D. Holster, Jr. *Metalworking,* v. 15, Oct. 1959, p. 25-28.

Selection of welding procedure for PH stainless steels, ultra-strength steels, Be, Zr, Mo, Ta and Cb. (K-general; Be, Zr, Mo, Ta, Cb, SS, SGA-h)

644-K.* (German.) Welding of Cast Iron. W. Schumacher. *Industrie-Anzeiger,* v. 81, Sept. 8, 1959, p. 16-19.

Arc welding of type GS 45 cast iron. Strength properties were investigated after heat treatment at 600 to 900° C. and after cooling. The annealing process lowers the mechanical properties of the welding material, mainly the hardness, and increases the weldability. (K1g, 2-64; CI)

645-K.* An Engineer's Guide to Blind Riveting Practices. Charles E. Heilig, Jr. *American Machinist,* v. 103, Sept. 7, 1959, p. 137-144

Hole sizes and grip length for various joint thicknesses. Strength of Al, carbon steel and Monel rivets. Comparative advantages of common fastening and joining methods. Design of blind riveted joints. (K13n, 17-51, Q27a; Al-b, Ni-b, ST, 7-53)

646-K.* (Dutch.) Welding With Contact Electrodes. W. Moerman. *Lastechniek (NVL),* v. 25, Sept. 1959, p. 213-215.

Quantity of metal deposited in welding as a function of current intensity. (K1, W29h)

647-K.* (Dutch.) Testing. C.A.A. v.d. Woude. *Lastechniek (NVL),* v. 25, Sept. 1959, p. 217-220.

Mechanical and nondestructive tests of weldments. Tests and controls performed before, during and after welding. Reasons for failure. (Kgr, Q-general; ST, 7-51)

648-K.* (Dutch.) Repair Welding of Iron Castings. J. L. Linssen and A. Spee. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 220-222.

Arc welding and gas welding with and without preheating, using cast iron welding rods or electrodes with thin coatings containing C and Si, or coated electrodes with a Ni-Fe, Monel or Ni core. (Kla, (K2, 18-72, K9p, W29h; CI, *C*, *Si*, Ni, Ni-b, *Fe*, *Cu*)

649-K.* (Dutch.) Resistance Welding. J. Seldenthuis. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 222-226.

Influence of compression, current density and welding time on structure, amount of impurities and mechanical properties of the weld seam or spot. (K3, 3-74, 3-67, M27c; ST, 4-53, 7-51)

650-K.* (Dutch.) Fully Automatic Weld Deposition of a Layer of Stainless Steel on Very Thick Steel Sheet. P. Tichler. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 229-231.

Automatic sigma-welding process in which the electrode is moved in a zig-zag pattern. Effects of transverse movement and welding speed on bead shape. (K1d, L24, 3-67; ST, 4-53, *SS*)

651-K.* (Dutch.) Welding of a Copper Lined Pressure Vessel. J. H. A. Wennik. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 246-248.

Methods for Cu-to-Cu and Cu-to-steel weldments. (K1, T26q; ST, Cu)

652-K.* (French.) The Possibilities of Flash Welding for Aeronautics. Claude Elghozl. *Technique et Science Aeronautiques*, no. 2, Mar-Apr. 1959, p. 97-114.

Flash welding for structural steels; Al alloys, Ti and refractory alloys. (K3r; Al-b, Ti-b, AY, SGB-s)

653-K.* Joining of Beryllium. N. E. Weare and R. E. Monroe. *Light Metal Age*, v. 17, Aug. 1959, p. 10-12.

Electron-beam welding, fusion welding, pressure welding, brazing and braze welding. Problems involved include brittleness and toxicity of Be and its compounds; high resistivity of BeO, cracking, oxidation and porosity. (K-general; Be)

654-K. Mash Welder Joins Rings in One Operation. Bruce R. Bagley. *American Machinist*, v. 103, Sept. 7, 1959, p. 120. (K3s; ST)

655-K. (Russian.) Kinetics of the Process of Melting and of Metal Transport in Arc Welding. A. A. Erokhin and V. A. Petrunichev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 70-77.

The behavior of a drop of liquid metal traveling from the electrode to the workpiece is investigated by means of motion pictures. 4 ref. (K1, K9n)

656-K. Fabricator Scores Breakthrough in Joining Titanium Clad Steel. *Steel*, v. 145, Oct. 19, 1959, p. 152-153.

Reaction vessels fabricated by welding base metal, coating weld with Ag inlay and capping joint with welded Ti strip. (K6, T26q; ST, *Ti*, Ag, 8-66)

657-K.* Shielded Arc Welding With Argon and Tungsten Electrode. A Schmid. *Brown Boveri Review*, v. 46, Mar. 1959, p. 210-220.

Welding Al and light alloys; effect of process variables. (K1d; Al, EG-a39)

658-K.* Welding of Low-Alloy Steels. Helmut Thielsch. *Canadian Metalworking*, v. 22, Oct. 1959, p. 34-36.

Optimum methods of welding structural, high-strength, high and low-temperature steels. Advantages and disadvantages of MIG welding, submerged arc, resistance and flash welding. (K1e, K1g, K3; AY)

659-K.* Corrosion-Resistant Multiple Brazing. G. D. Cremer and R. S. Mueller. *Design News*, v. 14, Aug. 31, 1959, p. 62-63.

Structures, materials and design factors. The insitu braze technique is explained. (K8; SGA-h, SGA-g)

660-K.* Maintenance Applications of Welding. R. J. Osborn. *Iron and Steel Engineer*, v. 36, Sept. 1959, p. 107-116.

Welding applications at the rolling mills, Steel Division, Ford Motor Co., Dearborn, Mich. Factors in the selection of thermit or arc welding processes. (K1, K4)

661-K.* Cyclic Welding Method Salvages Heavy Mill Equipment. R. L. Rectenwald. *Iron and Steel Engineer*, v. 36, Sept. 1959, p. 117-125.

"Cyclic" refers to repetitive steps of welding and stress relieving with close observance of selection of preheat temperatures, cooling rates and welding temperatures to produce desirable microstructures and physical properties during and following welding. (K-general, W23, 18-72)

662-K.* Metal-Plastic Combination Material. *Iron and Steel Engineer*, v. 36, Oct. 1959, p. 158, 160.

For some applications thermo-setting, laminated plastics combined with metals have properties that are superior to either constituent. In addition to strengthening the metal with which it is combined, a plastic laminate decreases material weight without sacrificing strength, reduces quantity of metals required, improves fabrication characteristics and forms, in effect, a new material with a wider range of properties than either material possesses alone. (K11d)

663-K.* Some Developments in Metal Welding Processes. John J. Chyle. *Machinery (London)*, v. 95, Sept. 2, 1959, p. 377-384.

Principles, equipment and potential application of high frequency resistance, foil seam, magnetic force, percussion, friction, thermopressure, electro-slag and electron beam welding processes. Diffusion bonding and plasma arc heating. (K-general).

664-K.* Fusion Welding of Precipitation-Hardening Steels. R. Meredith. *Welding Journal*, v. 38, Oct. 1959, p. 963-968.

From a weldability standpoint, 17-7, 17-4, AM350 and 15-7 Mo precipitation hardening materials are superior to 4130, 4340 and 4140. Under adequate conditions, very thin-gage large assemblies can be fabricated from precipitation-hardening stainless steels by fusion welding with good aerodynamic surfaces free from distortion. (K1; SS, *Cr, Mo*)

665-K.* Ultrasonic Welding of Aluminum. F. Collins, J. Dowd and M. Brennecke. *Welding Journal*, v. 38, Oct. 1959, p. 969-975.

Ultrasonic welding produces strong joints in Al alloys. Among its advantages are the ability to weld thinner gages, ease of surface preparation and the absence of melted or heat affected zones. Power consumption is low and no power correcting capacitors are needed. Strength is compared with resistance welds. 5 ref. (K6r; Al-b)

666-K.* Dip-Transfer Carbon-Dioxide Welding. R. Tuthill. *Welding Journal*, v. 38, Oct. 1959, p. 976-981.

Significance of dynamic characteristic of power supply and its effects on results in low-current CO_2 gas-shielded consumable-electrode welding of steel. (K1d; ST)

667-K.* Welding of Nickel-Molybdenum Alloys. G. Slaughter, P. Patriarca and R. Clausing. *Welding Journal*, v. 38, Oct. 1959, p. 393s-400s.

Hastelloy, Alloys B and W are weldable by the inert-gas-shielded tungsten-arc process and exhibit no difficulties with regard to cracking and porosity. Effects of age hardening on ductility and tensile strength. 18 ref. (K1d; Ni-b, *Mo*)

668-K.* Electron-Beam Welding. G. Burton and W. Frankhouser. *Welding Journal*, v. 38, Oct. 1959, p. 401s-409s.

Butt-joint weld penetration up to 0.250 in. are possible in Zircaloy-2. Chemical analyses, metallography, corrosion tests and mechanical properties. 6 ref. (K6; Zr-b)

669-K.* Welding of Beryllium. E. Brundige, R. Kirby, G. Hanks and J. Taub. *Welding Journal*, v. 38, Oct. 1959, p. 410s-413s.

Satisfactory fusion welding of Be without the use of filler metal was found to be impractical, due to cracking either in or adjacent to the weld zone. Acceptable welds were made with braze-welding techniques. One process involves the use of the inert-gas-shielded tungsten-arc welding process with pure Ag as the filler metal. In the second process, the inert-gas-shielded metal-arc welding technique was employed, with Al-12% Si alloy as the consumable electrode. (K1d; K6q; Be)

670-K. Extrusions in Tank Fabrication. M. Coen. *Welding Journal*, v. 38, Oct. 1959, p. 982-986.

Extrusions as used for main supporting members in the fabrication of Al vessels subjected to pressure. Inert gas metal-arc welding. (K1d; Al-b, 4-58)

671-K. Utilizing Two Welding Processes in Tandem. E. C. Alexander and J. D. Nicol. Union Carbide Nuclear Co. *U. S. Atomic Energy Commission*, KY-314, Sept. 30, 1959,

9 p.. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Use of two welding processes, semi-automatic shielded-arc magnetic flux and submerged-arc processes in tandem reduces the time required for welding ASTM 285 steel by 50%. (K1e, K1d; AY)

672-K.* (Czech.) Induction Soldering in Furnaces With Shielding Atmosphere. V. Ruza. *Zvaranie*, v. 8, Aug. 1959, p. 230-236.

Advantages of soldering methods within a shielded atmosphere for hard steel soldering where Cu solders are used. Main advantages are possibility of exact soldering temperature, shorter soldering time and complete mechanization of process while no additional surface treatment is necessary. (K7g; ST)

673-K.* (Czech.) Welding of Toros Steel. A. Brebera. *Zvaranie*, v. 8, Aug. 1959, p. 236-238.

Cold twisting of steel Types 10002 P, 10452 and R 40 improves qualities of concrete reinforcing steels. Before twisting, the bars are welded and then introduced into the twisting machines. Since the welds are cold worked after welding, the properties are improved. (K1, 3-68; ST, SGB-s)

674-K.* (French.) Control of Spot Welding in Aircraft Construction. H. Lefebvre. *Soudage et Techniques Connexes*, v. 13, July-Aug. 1959, p. 261-274.

Control procedures before, during and after spot welding of Al and Al alloy components of the "Caravelle" jet airliner. (K3n, T24a; Al)

675-K.* (French.) Improving the Weldability of Aluminum-Magnesium Alloys. R. Chevigny. *Soudage et Techniques Connexes*, v. 13, July-Aug. 1959, p. 296-298.

Addition of 0.10-0.30% Cr to ordinary Al-Mg alloys improves resistance to shrinkage cracking in assemblies subjected to severe post-welding tensions. (K9s, 2-60; Al-b, *Mg, Mn, Cr*, 9-72)

676-K.* (French.) Quality Control of Welded Construction in Piping for Conveying and Distributing Petroleum Products and Combustible Gases. H. Gerbeaux. *Soudage et Techniques Connexes*, v. 13, July-Aug. 1959, p. 299-308.

Nature of steel, quality of electrodes, analysis of site welding operations to insure safety of pipelines. (K1, S13, T26r; ST, 7-51)

677-K.* (Slovak.) New Welding Flux Materials of the VUS Type. S. Horvath and E. Pikna. *Zvaranie*, v. 8, Sept. 1959, p. 261-269.

Standarized annealing was applied to compare the weld properties of the flux and its behavior in relation to the parent metal. Yield point and elongation limit of the fluxes are well within the allowed limits of the parent metal. (K1e, 2-64; RM-q)

678-K.* (Slovak.) The Welding of 10523 Type Steel and Applications in Structural Steelwork. F. Lehar. *Zvaranie*, v.8, Sept. 1959, p. 270-276.

Evaluation of automatic and manual welding properties; mechanical values of different joints. Maximum allowed welding thickness was fixed at 40 mm., with no required preheating. Fatigue stresses and limits were determined for the main structural beams together with dynamic stresses. (K1g; T26p; SS, SGB-s)

679-K.* (Slovak.) Gas Shielded Arc Welding With Argon. J. Novotny. *Zvaranie*, v. 8, Sept. 1959, p. 276-282.

Tig welding with reference to electrodes, use of a-c. current and advantages over other techniques. (K1d; Al)

680-K. Use Normal Joining Methods to Assemble Coated Metals. *Iron Age*, v. 184, Oct. 22, 1959, p. 211-214.

Plastic-coated metals can be joined in the same manner as any unfinished steel part. (K-general; 8, NM-d, ST)

681-K. Fundamentals of Diffusional Bonding. Pt. 4. L. S. Castleman and L. Seigle. Sylvania Electric Products, Inc. *U. S. Atomic Energy Commission*, SEP-253, June 30, 1959, 24 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Interdiffusion in the Al-U system and effects of applied pressure. Kinetics of growth of the UA_3 phase are determined from 400 to 600° C. and at pressures of 1 1/4, 5 and 10 tons per sq. in. The origin of the macroscopic defects occurring in the UA_3 layer during interdiffusion is clarified. 15 ref. (K5k; Al, *U*)

682-K.* Welding as Applied to Steel Castings. F. Cleggett. *Australian Welding Journal*, v. 2, July 1959, p. 7-9.

Selection of electrode and correct procedure in relation to the weldability of

carbon and low-alloy steel castings. (K1d, K9s; CN, AY, 5-60)

683-K.* Resistance Welding of Nickel and High-Nickel Alloys. *Inco Technical Bulletin T33,* Sept. 1959, 34 p.

Spot, seam, flash and projection welding and resistance brazing of Monel "K", Monel, Ni, Duranickel, Inconel and Inconel "X" to themselves and other metals. Cleaning procedures, selection of proper process, process variables and equipment, defects and their causes, testing and inspection methods. 14 ref. (K3, S13; Ni-b, 7-51)

684-K.* Luminous Wall Furnace Gives Fastest Braze Cycle for B-70 Honeycomb Panels. Jack Rose. *Western Metalworking,* v. 17, Oct. 1959, p. 43-46.

Brazing of AM 350 CRES steel and PH 15-7 Moly in sizes up to 10 by 14 ft. to meet specifications of 200,000 psi. yield strength and 2% elongation. (K8, W29m; SS, 7-59)

685-K.* Solved: Welding Problem for Thin-Wall, High Strength Steel Missile Tank. Ellis P. Owen. *Western Metalworking,* v. 17, Oct. 1959, p. 52-53.

Procedure for welding 4140, 4340 and AMS 6434 steel in 3/16 and 5/16-in. thickness. Tank withstood hydrostatic pressure of 3000 psig. for 10 hr. Quenching after welding produced untempered martensite which decreased the weld strength. (K1, 3-74, Q10b; AY, 7-51)

686-K.* Electron Beam Welding. *Machine Production,* v. 18, Oct. 1959, p. 17-18.

New process joins the edges of workpieces by fusion welding, or melting, which is accomplished by a bombardment of a focused beam of electrons produced by an electron gun. The weld area can be controlled by varying electron velocity or the number of electrons gun filament. (K6)

687-K.* Structural Foil for Hot Parts. M. J. Breitenbach and Brooks Lake. *Society of Automotive Engineers,* Preprint no. 99T, 1959, 15 p.

Spotwelded, foil-gage, single-skinned, corrugation stiffened "MiniWate" structure eliminates blind spotwelds, simplifies inspection and yields high-strength structure. 7 ref. (K3n; 4-56)

688-K.* (Czech.) Induction Soldering of Metals. V. Ruza. *Zvaranie,* v. 8, July 1959, p. 211-217.

High heat concentration is achieved by high-frequency induction soldering so that very short soldering times (10 to 60 sec.) are needed and low surface oxidation occurs. Easy and reliable control of the solder and soldered material enables complete mechanization. (K6e)

689-K.* (German.) CO_2 Gas Shielded Welding in the Fabrication of Pressure Vessels. R. Faulstich. *Schweissen und Schneiden,* v. 11, Aug. 1959, p. 319-322.

Edge preparation and grease and rust removal are required before welding. A 30^{o} angle is suggested for V-type welds; nozzle distance from melt is 15 mm.; shorter arc is achieved by maintaining a proper ratio between electrode advance and current density. (K1d, T26q)

690-K.* (German.) Welding of Malleable Cast Iron. H. Hofe. *Schweissen und Schneiden,* v. 11, Aug. 1959, p. 326-327.

Connection weldings were constructed with arc welding and the stress properties, elongation, rupture and yield determined. In cast irons with low pearlitic content no influencing of the structure is apparent. (K1, K9r; CI-s)

691-K.* Simple Outgassing Determinations Aid High Temperature Vacuum Brazing. E. G. Huschke, Jr. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 50-57.

High-temperature brazing of Ti and Al-bearing jet engine materials. Maximum allowable pressures for vacuum brazing these alloys are a function of alloy content; gas evolution of materials heated in vacuum varies greatly with melting practice on both sheet metals and brazing alloy powders; the amount of gases evolved from three different sheet thicknesses of a heat of an alloy were found to be proportional to the surface areas. 7 ref. (K8, 1-73, 2-62, 2-60; Ti-b, Ni-b, *Al*)

692-K.* Design Evaluation Considerations for Vacuum Brazing. Robert C. Gross. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 175-180.

Positive features include the protection for heat-sensitive base metals, freedom from venting in joint design, wetting

(coating) and flow characteristics of filler metals promoted by their lower viscosity in liquidus state, virtual elimination of voids, gaseous inclusions and porosity by purge effects. 9 ref. (K8, 1-73)

693-K.* Dip Brazing Technics in Electrically-Heated Salt Bath Furnaces. L. B. Rosseau. *Metal Treating*, v. 10, Sept-Oct. 1959, p. 2-3, 30, 34-35, 38, 40, 44, 56-57.

Techniques, advantages, limitations and current equipment. (K8n)

694-K.* Diffusion Bonds Zircaloy and Stainless. J. M. Gerken. *Metalworking Production*, v. 103, Oct. 23, 1959, p. 1706-1707.

Diffusion bonding technique for joining tubing of Zircaloy 2 and 18:8 stainless steel. Joint shape and bonding methods for maximum strength under hydraulic pressure test. (K5k; Zr-b, SS, 4-60, 3-74)

695-K.* Eliminating Contamination Is a Prime Consideration When Welding Titanium. T. M. Laurenson. *Welding Engineer*, v. 44, Oct. 1959, p. 46-49.

Thorough cleaning of joints and filler material before welding is very important. For scale-free material, a simple degreasing operation is sufficient to remove dirt and oil, followed by light wire-brushing. Only argon or helium of the highest grade purity should be used, and the gas dew point should not be higher than -60° F. (K1d, L12; Ti)

696-K.* Resistance Spot-Welding of Tantalum Studied at Battelle. J. J. Vagi and R. L. Koppenhofer. *Welding Engineer*, v. 44, Oct. 1959, p. 52-53.

Cast nugget-type structures and solid state bonds with recrystallization where no apparent melting occurs are two kinds of bonds that can be produced. Severe electrode sticking occurs when making the cast nugget-type bond joints. (K3n; Ta)

697-K.* Tig Process Produces Strong, Ductile Welds on Tantalum. Alan F. Busto. *Welding Engineer*, v. 44, Oct. 1959, p. 54-56.

In many cases the use of a welding chamber is impractical because of the weldment's size or shape. In such cases the heated surfaces can be protected by proper gas-backed fixturing. (K1g; Ta)

698-K.* (German.) Welding of Cast Steel. W. Schumacher. *Industrie-Anzeiger*, v. 81, Sept. 18, 1959, p. 1201-1203.

Strength properties of welded Mo containing cast steel determined the optimum annealing properties. Best results were achieved by normalizing, welding, final treatment at 600° C. and cooling. (K1a, J23, Q23b; ST, 5-60)

699-K. How to Weld Zirconium and Its Alloys. L. E. Stark. *Welding Engineer*, v. 44, Oct. 1959, p. 50-51.

Arc welding must be conducted in a high-purity inert atmosphere. When welding is exceptionally critical, a dry-box should be used. Welding Zr outside a dry-box will satisfy many nuclear applications, and almost all nonnuclear applications, if Grade A helium or argon of guaranteed high purity is employed. (K1d; Zr)

700-K. (Russian.) Heating and Cooling of Studs Under Butt Friction Welding. N. N. Rykalin, A. I. Pugin and V. A. Vasilieva. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 15-18.

(K6)

701-K. (Russian.) Power and Heating in Friction Welding of Thick Wall Tubes. A. S. Gelman and M. P. Sander. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 18-20.

(K6, 4-60)

702-K. (Russian.) Energy and Heat Parameters in Friction Welding. R. I. Zakson and V. D. Voznesensky. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 21-22.

(K6)

703-K. (Russian.) Friction Welding as a Means of Restoring Worn Parts. Kh. A. Tyayar. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 23-24.

(K6, 18-72)

704-K. (Russian.) Submerged-Arc Welding of Pipe Branches to Smoke Stacks. F. F. Benua. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 25-26.

(K1e, 4-60)

705-K. (Russian.) Determination of Heated Zone Length Under Resistance Seam-Butt Welding of Pipes. B. D. Zhukovsky. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 29-31.

(K6, 4-60)

706-K. (Russian.) Electrodes for Cold Welding of Cast Iron Compared. S. A. Narsky and M. A. Grishin. *Svarochnoe Proixvodstvo*, Oct. 1959, p. 34-37.

(K5, W29h; CI)

707-K. (Swedish.) Welding of S. G. Cast Iron. Claes Pfeiffer. *Gjuteriet*, v. 49, no. 9, 1959, p. 225-245.
9 ref. (K-general; CI-r)

708-K.* A Practical Approach to Resistance Welding. K. H. McDowell and D. A. Weeks. *British Welding Journal*, v. 6, Sept. 1959, p. 381-395.
Basic principles, various processes and equipment. Factors affecting weldability, and quality of Ti, Al, Ni, carbon, low-alloy and stainless steel weldments. 8 ref. (K3, K9s; CN, AY, SS, Al, Ni, Ti)

709-K.* Automatic Vertical Welding. J. A. Lucey and D. D. Smout. *British Welding Journal*, v. 6, Sept. 1959, p. 396-405.
Development of the Russian electroslag process from submerged-arc welding. Basic principles; process control; properties and quality of welds. 4 ref. (K6, K1e)

710-K. (German.) Correlations Between Welding and Corrosion. E. Rubo. *Chemische Rundschau*, v. 12, Sept. 1959, p. 528.
(K-general, R-general)

711-K. (German.) Welding of Chemical Apparatus. R. Sohngen. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 529.
(K-general, T29)

712-K. Welding Technique for X56 Pipe. Norman F. Blundell. *Petroleum Engineer*, Oct. 1959, p. D30-D32.
Submerged arc welding of 56,000-psi. minimum yield carbon steel. (K1e, T26r; CN)

713-K. (Czech.) Weldability of 5% Cr Steels Alloyed With Molybdenum or Tungsten. V. Pilous. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 895-902.
The behavior of Cr-Mo steels alloyed with tungsten is explained by the decreased stability of austenite in the region of bainitic transformation. (K9s, N8; AY, *Cr, Mo, W*)

714-K. (Italian.) Characteristics and Manufacture of Honeycomb Structural Elements. Sirio Leporatti. *Macchine*, v. 14, Oct. 1959, p. 935-941.
(K12, 7-59)

715-K. New Welding Methods Join Exotic Metals. *Chemical Engineering*, v. 66, no. 21, Oct. 21, 1959, p. 222-226.
High frequency, ultrasonic and electron beam welding of Zircaloy, Al, stainless steel and Ti. (K6, K6r; Zr-b, Mg, SS, Ti, Al, Mo)

716-K. Ultrasonics Improved Quality of Heat-Exchanger Tubing. *Iron Age*, v. 184, Nov. 19, 1959, p. 122-123.
Continuous inspection of weld in carbon-steel tubing. (K9r, S13g; CN, 4-60)

717-K. (French.) Adhesive Joining of Aluminum. Pt. 1. J. J. Meynis de Paulin. *Revue de l'Aluminium*, v. 36, Sept. 1959, p. 965-973.
7 ref. (K12; Al)

718-K. (Translation—Brutcher no. 4516.) Pressure Welding in Vacuum. N. F. Kazakov. *Avtomaticheskaya Svarka*, v. 11, Aug. 1958, p. 6-18.
See item 267-K, 1959. (K5k, K9s, M27, 1-73; SS)

719-K. (Translation—Brutcher no. 4670.) Effect of Electrode Vibration on the Arc Welding Process and Weld Properties. A. A. Alov and V. S. Vinogradov. *Svarochnoe Proizvodstvo*, Sept. 1958, p. 19-22.
(K1)

720-K. (Translation—Brutcher no. 4487.) Study of Effect of Vibrations on Solidification and Structure of Electro-Slag Weld Metal. F. F. Benua, I. V. Vologdin and A. I. Katler. *Svarochnoe Proizvodstvo*, May 1958, p. 1-5.
(K6)

721-K. (Translation—Brutcher no. 4545.) Structural Changes in Metal of the Heat Affected Zone in Magnesium Alloy Spot Welds. N. Kh. Andreev. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Mar. 1959, p. 46-48.
(K3n, M28; Mg-b, 7-51)

SECTION L

CLEANING, COATING and FINISHING

1-L.* Vacuum Deposition of Metals. G. B. Remond and A. R. Johnson. *Metal Finishing Journal*, v. 4, Oct. 1958, p. 393-397.

Process is divided into five operations: preparation and cleaning of the article to be coated; loading work chamber; evacuation of work chamber; evaporation of coating material; protective lacquering and tinting. (L25)

2-L.* Automatic Cadmium Plating. *Metal Industry*, v. 93, Oct. 17, 1958, p. 333-334.

Plating plant employing a completely hydraulic system of operation. Process sequence is under the control of an electronic timer. (L17, W3g, 18-74; Cd)

3-L.* (German.) Descaling in the Salt Bath. The Sodium Hydride and Kolene-15 Processes. Rudolf Kuhn. *Draht*, v. 9, Oct. 1958, p. 390-391.

The sodium hydride process, using a bath of melted NaOH and NaH where the latter is produced by electrolysis, is best suited for descaling chromium and Cr-Ni steels, Ti and Ti alloys. When the scale results from stress annealing, the Kolene-15 process is applicable for the same materials. (L12)

4-L.* (Japanese.) Anodic Oxidation of Titanium. Pt. 3. Kyuya Nagasaki and Haruo Ishida. *Light Metals*, no. 31, July 1958, p. 60-65.

Leakage current of oxide film obtained by anodic oxidation of Ti was measured and its relation to working voltage and formation voltage was analyzed. 4 ref. (L19; Ti-b)

5-L. Effect of Operating Variables on Physical Properties of Copper Electrodeposits From Acid Copper Sulfate Baths. R. Wick. Frankford Arsenal. *U. S. Office of Technical Services*, PB 131579, 18 p. $.50.

Conditions of bath concentration, temperature, and current density to produce maximum ductility and strength in heavy electrodeposits of Cu. Specimens approximately 0.015 in. thick were electrodeposited from the acid copper sulphate baths under 54 combinations of bath concentration, current density, and temperature. Tensile strength increased with increased current density and decreased with increased bath temperatures. Optimum deposits were obtained at 25 to 40° C. and 3 amp. per sq. dm. in a bath 1.0*N* in copper sulphate and 1.5*N* in sulphuric acid. (L17a, 2-61, 2-66; Cu)

6-L. Continuous Galvanizing Line for Steel Strip. *Corrosion Prevention and Control*, v. 5, Aug. 1958, p. 43-45.

Line, 700 ft. long, comprises five main sections—entry, furnace, coating, cooling and delivery. Features include reducing oxide by cracked ammonia gas while annealing or normalizing and controlling temperature to galvanizing bath. (L16, L12j, 1-61; ST, 4-53)

7-L. Two Shipyards Install First U.K. Airless Shot Blast Plants. *Industrial Finishing*, v. 10, Aug. 1958, p. 27-29.

Centrifugal shot-projection units with proper abrasive remove scale and etch surface, insuring permanent bond between metal and coating. (L10c; ST, 18-67)

8-L. Hot Dip Galvanizing Conference. *Industrial Finishing*, v. 10, Aug. 1958, p. 36-40.

Summaries of technical papers presented at Fifth International Galvanizing Conference. (L16; Zn)

9-L. Automatic Polishing, Washing and Plating of Hub Caps at the Basildon Works of the Ford Motor Co. Ltd. *Metal Finishing Journal*, v. 4, Oct. 1958, p. 381-385, 388.

(L10, L12, L17, 18-74, T21c; *Ni*)

10-L. Some Comments on the Theory and Use of Solvent Driers. *Metal Finishing Journal*, v. 4, Oct. 1958, p. 386-388.

(L12h, W4k; NM-k35)

11-L. Hot Dip Galvanizing. *Wire Industry*, v. 25, Sept. 1958, p. 846, 851.

Abstracts of four papers on bath heating. (L16; *Zn*)

12-L. (French.) Sand-Blasting and Pickling. H. Bablik and F. Gotzl. *Metallurgie et la Construction Mecanique*, v. 90, Oct. 1958, p. 773-775.

Importance of surface preparation in hot galvanizing. Formation of coatings; comparison of surface finishes obtained. (L10c, L12)

13-L. (German.) Removal of Skin and Sand Particles From Iron Castings. Rudolf Kuhn. *Giesserei*, v. 45, Oct. 23, 1958, p. 670-671.

Electrolytic cleaning in a salt bath. (L13n; Cl)

14-L.* New Process for Simultaneous Degreasing and Phosphating. W. Rausch. *Industrial Finishing (London)*, v. 10, Nov. 1958, p. 51-53, 55.

Process in which solutions of sodium dihydrogen phosphate are used to give degreasing and formation of a protective phosphate coating. (L14b, L12k; ST)

15-L.* Where Do We Stand in Ceramic Coatings? N. I. Cannistraro. *Metal Progress*, v. 74, Nov. 1958, p. 111-113, 189-190.

Ceramic coatings add heat and corrosion resistant qualities to low alloys, protect against shock, abrasion and fatigue. (L27; SGA-h)

16-L.* (German.) Fundamental Questions Regarding Grinding and Polishing. Werner Wrobbel. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Sept. 1958, p. 370-374.

Economics of automation of grinding and polishing operations. Typical products amenable to 70-100% automatic surface finishing. Items requiring up to ten operators, fully automatic machinery. Transfer lanes are preferred over automatic machines because of greater flexibility. Unit operation times for various materials and sizes are tabulated and calculations of loading times and line speeds explained. Automatic finishing requires more skilled operators, except for loading, and does not allow for correction of defective pieces. (L10, G18, 18-74)

17-L.* (German.) Tumbling of Stamped Parts. M. Dreher. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Sept. 1958, p. 375-380.

Buffing and tumbling of stamped articles compared. Latter process found well suited to polishing of Cu-flashed surfaces, prior to plating. Thickness of Cu coating, particularly near edges, is not reduced, allowing a time saving of up to 30% in plating bath. Excellent results obtained with steel, Cu, Ni or Cd-plated materials, giving high gloss and increased surface hardness. Other applications: surface preparation for paint or varnish, final finishing of tinned kitchenware. (L10d; *Cd, Cu, Ni*, ST, 4-59)

18-L.* (German.) Gold Plated Surfaces the Electron Microscope. K. J. Schulze. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Sept. 1958, p. 381-384.

Rolling alone produces relatively poor surface and requires thick coating. Mechanical polishing reduces coating thickness, particularly near the edges; scratches difficult to eliminate. Best results obtained by additional cold heavy Au plating of a polished gold surface, by tumbling or fine machining with diamond tools. (L10, L17, M27; Au, 8-62)

19-L.* Plasma Arc Torch Ushers in New Fabricating, Coating Methods. *Iron Age*, v. 182, Dec. 4, 1958, p. 136-137.

Metal or substance to be worked is prepared in wire or powder form, passed through an intense arc that is struck inside the torch where temperatures above 15,000°

F. are reached. Heat of the arc converts the material passing through into a fluid or plastic state, which is carried out of the torch by inert gases moving at high velocity and deposited. (L29n, W29d)

20-L.* Plant for Pre-Painted Steel Strip. *Machinery (London)*, v. 93, Nov. 5, 1958, p. 1061-1066.

Production of steel and Al strip which is continuously coated on both sides with paint or lacquer. (L26; ST, Al-b, 4-53)

21-L.* Sprayed and Diffused Metal Coatings. R. E. Mansford. *Metal Industry*, v. 93, Nov. 14, 1958, p. 413-416.

Aluminizing of alloy steels and Cu; hard facing; composite and heat resistant coatings. Compositions of Fe-Cr-Al alloys and properties influencing coating. 11 ref. (L15, L23, L24; SS, Cu, *Al, Ni, Cr*)

22-L.* (German.) Bond Strength of Heavy Zinc Coats on Hard Drawn Wire From Low-Carbon Rimming Steel. Dietrich Horstmann. *Stahl und Eisen*, v. 78, Oct. 16, 1958, p. 1456-1462.

Three openhearth steels and one air-refined special steel were hard drawn and Zn coated. Resistance of coating is increased by N and P while C, Mn, Cu, and Cr showed no influence. A light roughening of the surface produced by anodic or blast cleaning improves adhesion of the coating. Raising bath temperature and longer dipping times were unfavorable. (L16; CN-g, *Zn* 4-61)

23-L. Chromate Conversion Treatments. Pt. 1. D. J. Fishlock. *Product Finishing*, v. 11, Nov. 1958, p. 53-62.

Development and application. 9 ref. (L14c; *Zn, Cd*)

24-L. Electroplating Explained—Course for the Working Plater. Pt. 6. Electricity in the Plating Shop. *Product Finishing*, v. 11, Nov. 1958, p. 80-84.

(L17, 16-61)

25-L. (German.) Grinding and Polishing. Walter Burkart. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Sept. 1958, p. 367-369.

Influence of automation on finishing techniques; greater stress on surface quality in Germany as compared with U. S. research, particularly electron microscope work; special grinding and buffing wheels for automatic machinery. (L10b, G18, W2p, W25c, 18-74)

26-L.* Process Control in the Manufacture of Enamels. A. W. Murdoch. *Industrial Finishing* v. 10 Aug. 1958, p. 31-34.

Present enamels are more opaque and can, therefore, be applied more thinly, have high resistance to corrosion attack, greater color range and stability, and are more resistant to abrasion and scratching than any other finish. These achievements have been made possible by process control of the basic material, frit. (L27, 17-54)

27-L.* Applying Paint to Galvanised Iron. *Industrial Finishing*, v. 10, Aug. 1958, p. 34-35.

Phosphate wash coating insures adhesion of paint to galvanized iron when long exposure is not permitted or convenient. (L14b, L26n; ST, 8-65)

28-L.* Electrodeposition of Titanium on Base Metals. Merle E. Sibert. *Industrial Finishing*, v. 10, Aug. 1958, p. 41-48.

Thin Ti layers are applied to steel by molten $NaCl\text{-}K_2TiF_6$ salt electrolysis. Rapid, inexpensive process since high currents and voltages are employed and only small amount of Ti is involved. Mechanism is basically diffusion of Ti into steel, producing firm bond and corrosion resistant properties. 8 ref. (L17, L15, ST, *Ti*)

29-L.* Some Considerations in Relation to the Hot-Dip Galvanizing of Guard Rails. H. Bablik, F. Gotzl and E. Nell. *Metal Finishing Journal*, v. 4, Aug. 1958, p. 297-300.

Tests show that thickness of coating is independent of Al content in bath when reapplied to prime surface of guard rail; although, when applied to the original surface, Al content must be 0.04% or less to obtain proper coating. (L16; ST, *Zn, Al*)

30-L.* Electropolishing and Related Techniques. A. A. Tomkins. *Metal Finishing Journal*, v. 4, Aug. 1958, p. 305-312, 316.

Basic chemical and electrochemical methods of polishing which may replace mechanical polishing. Metals to consider; solution and operating conditions of bath;

practical application; economy of process. 6 ref. (L12, L13)

31-L.* Properties and Applications of Flame-Sprayed Refractory Coatings. Lloyd Manuel. *Metal Finishing Journal*, v. 4, Aug. 1958, p. 313-316.

Used for abrasion resistant thermal barriers of jet engines, rockets and various types of reaction motors. Alumina and zirconia have low thermal expansion coefficients and their resistance to impact and abrasion can be improved by impregnating phenolics, furanes, silicones or epoxy resins. (L27)

32-L.* (Japanese.) Microscopic Observation of Surfaces of Thick Deposits by the Sargent Bath. Teiichi Hayashi and Shushi Takagi. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Sept. 1958, p. 45-51.

Optical microscopy and electron microscopy of deposits using a Sargent bath (250 g. per l. CrO_3, 25 g. per l. H_2So_4). At low temperature and low current density numerous narrow cracks are found. The higher the temperature the fewer and wider the cracks become. Crackless deposits are found at 70° C. (L17a, M21; Cr, 9-72)

33-L. Non-Metallic Coatings for Corrosion Protection. W. N. B. Armstrong. *Canadian Mining and Metallurgical Bulletin*, v. 51, Nov. 1958, p. 719-720.

Materials used as primers and finishes for steel, Al, Mg, Zn. (L26; ST; Al, Mg, Zn)

34-L. Isolation of the Alloy Layer From the Coatings on Tinplate. K. Bright and S. C. Britton. *Chemistry and Industry*, no. 42, Oct. 18, 1958, p. 1362-1363.

Process involves protecting one face of the tinplate and successively removing the Sn alloy and steel from the other face by a sulphur and bentonite solution. 5 ref. (L12, *Sn*, ST, 8-62)

35-L. Bibliography on Electroplating of Cobalt and Cobalt Alloys. *Cobalt Information Center*, Technical Report no. 1, Feb. 1, 1957, 16 p.

Bibliography covering 1900-1957. (L17; Co, 11-65)

36-L. Lead Pigments in Corrosion-Resistant Paints. *Corrosion Technology*, v. 5, Nov. 1958, p. 353.

Red lead appears to impart better rust-inhibitive properties, compared with other pigments, to paints based on chlorinated rubber and epoxy resins. (L26n, R-general; Pb, NM-g30)

37-L. Nickel Plating in Special Applications. H. C. Castell. *Engineering*, v. 136, Oct. 31, 1958, p. 574-576.

Heavy Ni plating for salvage and protection; electroformed Ni; Ni plate for corrosion and abrasion properties. (L17, L18; Ni)

38-L. Contour Spray Painting. P. C. Bardin. *Industrial Finishing*, v. 35, Nov. 1958, p. 30-32.

(L26n)

39-L. Protective Organic Coatings for Steel. Pt. 2. Louis J. Nowacki and E. R. Mueller. *Industrial Heating*, v. 25, Nov. 1958, p. 2308, 2310, 2312, 2314, 2316.

Finishing systems, including undercoats, topcoats, surface preparation, application of coatings. (L26n, L26p; ST)

40-L. Conveyor Runs Structurals Through Paint Line. R. H. Eshelman. *Iron Age*, v. 182, Nov. 27, 1958, p. 70-71.

Carries random sizes without need for turning or shifting. (L23, W12r; ST, 4-57)

41-L. Use of Sequestering Agents in Metal Cleaning and Deposition. R. L. Smith. *Metal Finishing Journal*, v. 4, Nov. 1958, p. 429-431.

14 ref. (L12g)

42-L. New Black Nickel Plating Process. *Metal Finishing Journal*, v. 4, Nov. 1958, p. 436-437.

Chloride solution used for electrodeposition. (L17a; Ni)

43-L.* Anodized Aluminum Extrusions. Fred G. Shuler. *Precision Metal Molding*, v. 16, Nov. 1958, p. 43, 48.

Sulphuric acid coating method. Best finish and colors are obtained with 1100,

3003, 6053, 6061, 6062, 6063 and 6043 alloys; 6063 and 6463 are most widely used, 6463 gives brightest finish. (L19; Al, 4-58)

44-L.* How to Finish Sinterings in a Barrel. *Precision Metal Molding*, v. 16, Nov. 1958, p. 45.

Special compounds are available for sinterings. For powdered iron parts the compounds also contain lubricant and rust inhibitor. Special compounds have also been developed for nonferrous parts and infiltrated sinterings. (L10d; Fe, 6-72)

45-L.* (German). High Productivity of the U. P. Hard Facing Method as Applied for Guide Rollers in Mining and Agriculture. W. Gunther. *Fertigungstechnik*, v. 8, no. 10, 1958, p. 454-459.

Composition of welding rods, hardness of deposited layer, equipment used. (L24, W29h, T28, T3)

46-L.* Thermal Shock Resistant Nickel Plating on Copper. L. Missel. *Metal Finishing*, v. 56, Sept. 1958, p. 49-51.

Heat generated by air friction of missiles at high velocities causes rapid deterioration of surfaces of Cu parts. Special process produces thin, hard, resistant outer coating which extended useful life of Cu parts. (L17a, T24e; Cu, 8-62, 17-57)

47-L.* Plating Room Layout. G. R. Kentta. *Metal Finishing*, v. 56, Sept. 1958, p. 52-56.

Prime factor is type of operation; still tank, trolley hoist, semi-automatic or full-automatic. Other considerations include process cycle, plating room floors, racks, tank construction and protection, ventilation, heating and control of solutions, waste disposal and water conservation. (L17, W3g, 18-67)

48-L.* Electropolishing—What, How and Why. Pt. 2. John F. Jumer. *Metal Finishing*, v. 56, Sept. 1958, p. 60-63.

Solutions and operating conditions for various metals and alloys: Al, Cu, Ni and alloys, carbon steel, stainless steel. (L13; Al, Cu, Ni, SS, CN)

49-L.* Science for Electroplaters. Pt. 40. Dibasic (Dicarboxylic) Acids. L. Serota. *Metal Finishing*, v. 56, Sept. 1958, p. 67-70.

Bath solutions using oxalic, succinic, citric, and tartaric acids; their uses. Effects of various factors: solution concentration, temperature, current density, pH, voltage, time, etc., on coating thickness and rate of deposition. (L17; Al, Cu, Ni, W, Zn, Sn, Pb, Cu-n)

50-L.* Anodized Aluminum Wire. Paul Smits. *Modern Metals*, v. 14, Aug. 1958, p. 30-34.

Oxide coating created by this process forms a good electrical insulator, even at high temperature. Anodized wire saves space, weight, resists solvents, dissipates heat, gives uniform covering, cuts gloss. (L19, T1; Al, 4-61)

51-L.* (English.) Polishing Special Steels. *Aciers Fins & Speciaux Francais*, no. 29, July 1958, p. 21-22.

Principles and details of polishing operations in working stainless steel. (L10, G19q; SS)

52-L.* Anodizing Bath for Magnesium Alloys. M. W. Davies. *Corrosion Technology*, v. 5, Sept. 1958, p. 281-284.

Protective coatings available for Mg alloy. "New Chrome" process which uses alternating current in a bath containing potassium hydroxide, potassium fluoride, sodium phosphate and potassium chromate to produce extremely hard smooth green coatings. Resistance of New Chrome and H.A.E. treated specimens to corrosion by salt spray or atmospheric exposure. Superiority of New Chrome coatings. (L19q, R3p; Mg-b)

53-L.* Shot-Blasting in the Shipyard. *Corrosion Technology*, v. 5, Sept. 1958, p. 285-287.

Development and operation of shot blasting machine especially designed for use on ships' plates. Suitable coatings for protection of steel surfaces following shot blasting. (L10c, 1-52, L26, R4b; ST, 4-53)

54-L.* Stress in Nickel Electrodeposits. T. P. Hoar and D. J. Arrowsmith. *Institute of Metal Finishing, Transactions*, v. 36, Autumn 1958, p. 1-6.

Stress developed in Ni electrodeposits in earliest stages up to stage of steady

stress production was continuously measured for a plain Watts bath and for baths containing typical stress-reducing agents. Tensile stress developed in plain Watts bath was reduced and finally made compressive as the concentration of stress-reducing agent increased. The instantaneous stress becomes nearly constant with thickness and is not influenced by temperature or current density of deposition. Results interpreted by vacant-site and dislocation theory. 14 ref. (L17a, L17c, Q25h, 2-66; ST, *Ni*)

55-L.* Electrodeposition of Platinum From Chloroplatinic Acid. Ralph H. Atkinson. *Institute of Metal Finishing, Transactions*, v. 36, Autumn 1958, p. 7-16.

Electrodeposition of Pt from aqueous solutions containing chloroplatinic acid (15 to 25 g. per l.) and hydrochloric acid (10 to 390 g. per l.) was investigated at rates of deposition from 0.1 to 1.1 x 10^{-3} in. per hr. and at temperatures from 45 to 75° C. in successful attempt to define conditions for production of ductile plates. Quality of plates assessed by micro-examination, by their hardness and by simple rolling test. (L17, Q23p, 3-67; Pt)

56-L.* Some Observations on Silver Anodes. R. R. Benham. *Institute of Metal Finishing, Transactions*, v. 36, Autumn 1958, p. 22-26.

Effects of grain size, anode current density and presence of impurities on behavior and appearance of anodes. Flaking found to occur to greater degree in high-speed solutions. High-purity anodes of large grain structure satisfactory in the conditions employed by many electroplaters but a pure annealed anode having small equi-axed grains found to give good results over wider range of conditions. (L17, 2-59, 3-69, W3h; Ag)

57-L.* Effects of Impurities in a Bright Nickel Bath on the Covering Power of a Chromium Bath. Robert H. Rousselot and Georges E. Rousselot. *Metal Finishing*, v. 56, Dec. 1958, p. 46-50.

Behavior of impurities, control tests, experimental procedures, results of Cu, Zn, Cr, Fe and Pb impurities. (To be continued.) (L17a, 3-69; *Ni, Cr*)

58-L.* Stripping Metallic Coatings. J. B. Mohler. *Metal Finishing*, v. 56, Dec. 1958, p. 60-63.

General and quantitative stripping of brass, Cd, Cu, Cr, Au, Pb, Ni and many other plates. 4 ref. (L17, L13; ST, Mg, Al, Ag, Ni, Cd, Sn-b, Zn, Cu)

59-L.* (German.) Reconditioning of Stamping, Punching and Drawing Tools by Electric Arc Hard Facing. Werner Schrodl. *Werkstatt und Betrieb*, v. 91, Nov. 1958, p. 687-688.

Deposited weld layer replaces worn edges and provides a hard layer of excellent wear resistance. Volume of current used in relation to the rod diameter. (L24, W24n)

60-L.* (Japanese.) Study on Tungsten Plating Solution. Tadayoshi Inui. *Metal Finishing Society of Japan, Journal*, v. 9, Aug. 1958, p. 288-292.

Variation in the electrical resistance during electrolysis of alkaline, neutral, weak acid or organic acid solutions. Plating W from alkaline solution in which WO_2^{++} ions are formed, deposited at cathode and reduced to metallic state by the hydrogen generated. (L17a; W)

61-L.* (Russian.) Progress in the Field of Electrolytic Polishing. Yu. V. Baimakov and K. P. Batashev. *Khimicheskaya Nauka i Promyshlenost*, v. 3, no. 4, 1958, p. 464-470.

Electrolytes are orthophosphoric, sulphuric and other acids as well as alkaline and cyanide solutions. The greater the electrolytic concentration, the quicker the solution of the protruding uneveness of the metal. Only metals with a homogeneous crystalline structure lend themselves to polishing. (L13p)

62-L.* (Russian.) Number of Crystals Formed in Reverse Electrodeposition of Silver. A. T. Vagramyan and A. P. Popkov. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 1964-1966.

In the deposition of Ag with preliminary anodic polarization of the electrode, the number of crystals formed at the cathode rises sharply as compared with that formed on its direct current polarization. (L17; Ag)

63-L.* (Russian.) Anomalous Temperature Dependence of Electrodeposition Rate of Copper. G A. Emelyanenko. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 2119-2122.

At elevated temperatures cuprous oxide is formed at the Cu-Cu sulphate solution interface. The appearance of anomalous temperature dependence of the rate of electrolysis is connected with this formation. (L17c; Cu)

64-L. Finishing Zinc Base Die Castings. Lester Spencer. *Metal Finishing*, v. 56, Dec. 1958, p. 56-59, 63.

14 ref. (L26; Zn, 5-61)

65-L. Science for the Coatings Technologist. Pt. 11. Paint Additives: Driers and Anti-Skinning Agents. E. S. Beck. *Metal Finishing*, v. 56, Sept. 1958, p. 64-66, 79.

(To be continued.) (L26n; NM-g)

66-L. Science for Electroplaters. Pt. 42. Amines. L. Serota. *Metal Finishing*, v. 56, Dec. 1958, p. 66-69.

(L17a)

67-L. (Russian.) Innovations in the Field of Electrodeposition. A. T. Vagramyan and N. G. Kudryabtsev. *Khimicheskaya Nauka i Promyshlenost*, v. 3, no. 4, 1958, p. 471-476.

Replacement of toxic electrolytes (such as cyanides) with nontoxic; automatic control of quality of deposits. (L17)

68-L.* (Book-German.) Surface Pretreatment of Ferrous and Nonferrous Metals. Willi Machu. 960 p. 1957. Akademische Verlagsgesellshaft Geest & Portik K-G., Sternwartenstrasse 8, Leipzig, Germany. DM56.

Comprehensive treatment of surface cleaning before protective coating, plating or painting. Degreasing with alkaline, alkaline organic and inorganic compounds and with substances of the benzene series. Mechanical and thermal cleaning. Pickling and polishing processes. (L10, L12, L13)

69-L. (Translation—SLA, INSDOC-T-2183.) Possibilities of Securing Improved and More Efficient Pickling Processes in the Steel Industry by Means of Polarization Measurements. K. H. Brakstad. *Jernkontorets Annaler*, v. 140, 1956, p. 612-619.

See item 655-L, 1956. (L12g; ST)

70-L.* Clear Anodizing Magnesium. *Precision Metal Molding*, v. 16, Dec. 1958, p. 45.

New anodic treatment developed by Dow leaves the metal without surface discoloration. Anodic coating is applied in the same bath as the older D-17 treatment but at 40 volts instead of 70 to 90. Parts treated include die castings, permanent mold castings, sand castings, forgings and fabricated sheets. (L19; 5-60, 5-61, 5-63, 4-51, 4-53, Mg-b)

71-L. Heat and Abrasion Resistant Paints for Rocket Launchers. Rock Island Arsenal. *U. S. Office of Technical Services*, PB 131543, Aug. 1957, 19 p. $ .75.

Test materials included ceramic, silicone, dibutyl titanate, epoxy and Teflon coatings. Sprayed-on olive drab ceramic and Teflon coatings appeared superior to silicone types. The ceramic type remained nearly intact on Al panels heated nearly to the melting point. Zinc dibutyl titanate also showed good resistance. (L26p, L27, T2p, 2-62, 17-57)

72-L.* (German.) Porosity of Enamel on Dry Enameled Castings Influenced by Properties of Iron. *Sprechsaal*, v. 91, Aug. 5, 1958, p. 355.

Porosity that usually appears when the cast iron contains an excess of sulphur or inclusions, or after excessive pickling, was observed also on metallurgically intact castings with 3.28% C, 2.92% Si, 0.78% Mn, 0.04% S, 1.15% P. Oxygen thought to be not harmful because it combines with graphite, forming carbon oxides that have the same volume as oxygen. (L27, 9-68; CI)

73-L.* How Welding Combats Chemical Corrosion. F. Schneider and R. J. Walker. *Canadian Metalworking*, v. 21, Dec. 1958, p. 34, 36, 38, 40, 46.

Stainless steel overlay on mild steel plate used in pulp digesters. (L24; ST, SS)

74-L.* (German.) Distribution of Electroplate on the Surface. E. Raub. *Metalloberflache*, v. 12, Dec. 1958, p. 353-360.

Parts with recessed profiles showed a more equally distributed copper plate than nickel plate, provided the profile permits good circulation of liquid. Sometimes stirring is successful. (L17; *Cu, Ni*)

75-L. Shot-Blasting Proves Practical in High-Speed Rod Line. *Iron Age*, v. 182, Dec. 18, 1958, p. 89-91.

Pilot model at John A. Roebling's Sons Corp. (L10c; ST, 4-55)

76-L. Sprayed Electrolytic Zinc Coatings. R. Bourcelot. *Metal Industry*, v. 93, Nov. 28, 1958, p. 453-454.

Application and properties, particularly the use of electrolytic Zn in the tropics. (L23; *Zn-a*)

77-L. Sprayed Aluminium Improves Compressor. Loyd E. Batchelor. *Metalworking Production*, v. 102, Dec. 5, 1958, p. 2137-2138.

Precoat and final coat are applied as the compressor housings are rotated in special metal spraying machine. (L23, W11m; Al-b)

78-L.* (French.) Application of Faraday's Law to the Study of Anodic Dissolution of Metals. Michel Froment. *Corrosion et Anticorrosion*, v. 6, Nov. 1958, p. 412-420.

In electrolytic polishing, important role played by anodic tension and surface condition of metal during anodic dissolution noted. 41 ref. (L13p)

79-L.* (German.) Zinc and Cadmium Coatings as Protection Against Corrosion. J. Elze and W. Wiederholt. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Oct. 1958, p. 419-432.

Zn is more durable in industrial and city atmospheres while Cd is superior in conditions where condensation develops. Both are well suited for coating steel. 5 ref. (L17; ST, *Cd, Zn*)

80-L.* (German.) Protective Painting in Galvanizing and Pickling Shops. K. A. van Oeteren. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Oct. 1958, p. 446-449.

Surface pretreating and protective painting with compounds based on chlorinated rubber, polyvinyl chloride-polyvinyl acetate, synthetic rubber, polyurethane, epoxy resin, silicone, butyl titanate, neoprene, zinc powder, polyesters. (L26)

81-L.* (Italian.) Zinc Plating Baths—Composition, Operation and Control. Pt. 2. C. Quattrone. *Galvanotechnica*, v. 9, Sept. 1958, p. 233-237.

Zn salts furnish Zn ions necessary for metal deposition. NaCN forms complex soluble salts with Zn. NaOH contributes to dissolving of anodes, allows for strong current density, increases anodic and cathodic current output. Beyond limits, it diminishes current output at cathode and penetrating capacity. (L17a; Zn)

82-L.* (Japanese.) Vacuum Coating of Aluminum. H. Hoshi. *Metals*, v. 28, Nov. 1958, p. 828-832.

Vaporization is provided by a high-frequency furnace or a resistance heating crucible. Coating system is either fixed, rotating or roll. (L25; Al)

83-L.* (German.) Brush Plating for Local Metal Deposition. Willibald Machu. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Nov. 1958, p. 467-481.

Development, operation and applications. Usefulness for filling corroded or pitted surfaces, building up of worn parts. 9 ref. (L17)

84-L.* (Italian.) Research on the Electrodeposition of Copper. Pt. 1. Influence of Gelatine on Phenomena of Overvoltage. H. M. Sammour. *Metallurgia Italiana*, v. 50, Sept. 1958, p. 389-396.

Potential-current curves for cathodic deposition of Cu from sulphate, sulphamate, perchlorate and fluoborate baths, in presence and absence of gelatine, for a moderate range of current density. Effect of variables such as gelatine concentration, free acid content, temperature and stirring. Results discussed in light of theory of adsorption and the Hofmeister series of lyotropic action of ions on gelatine. 35 ref. (L17a; Cu)

85-L.* (Italian.) Research on Electrodeposition of Copper. Pt. 2. Microhardness and Structure of Electrolytic Deposits of Copper. H. M. Sammour. *Metallurgia Italiana*, v. 50, Sept. 1958, p. 397-401.

Electrodeposits of Cu on rotating cylindrical Cu cathodes were prepared from acidified copper sulphate and perchlorate baths at low and moderately high current densities. Effect of addition of gelatine, raising the temperature and increasing acid content of solution on microhardness and microstructure. A correlation was found between these properties. 8 ref. (L17, M27, Q29q; Cu)

86-L.* (Spanish.) Chemical Nickel Plating. L. A. Rubio. *Instituto del Hierro y del Acero*, v. 11, July-Sept. 1958, p. 202-210.

Experimental study using acid and alkaline baths to coat Fe, Cu and Al articles. Influence of concentration of Ni ion, hypophosphite, pH and temperature on speed of formation of coatings, their appearance and physical characteristics. In case of Al, quantity of Ni deposited was three times as much as on Fe and Cu under equal conditions, and adherence was poor, especially in areas where non-metallic inclusions were present. 4 ref. (L28; Ni)

87-L. Hot-Dip Galvanizing Cast Iron. Morgan H. Davies. *Foundry Trade Journal*, v. 105, Dec. 4, 1958, p. 685-687.

Principles of galvanizing, methods used for cast iron, gray and malleable. (L16, 1-66; CI, *Zn*)

88-L. Flow Method Puts Quality Coat on Large Parts. E. A. Zahn. *Iron Age*, v. 182, Dec. 25, 1958, p. 50-51.

Low and high-pressure flow coating equipment and method. (L26n)

89-L. Shot Blasting Cuts Costs of Cleaning Hot Rolled Steel. *Metal Forming and Fabricating*, v. 20, Nov. 1958, p. 22-23. (L10c, W2r; ST, 4-53)

90-L. Preflux Solutions From Galvanizers' Sal Skimmings. P. M. Sullivan, D. H. Chambers and P. J. Berney. *Metal Industry*, v. 93, Dec. 12, 1958, p. 493-496.

Water-leaching and acid-leaching procedures; solutions produced by control of pH, specific gravity and chlorine content. 4 ref. (L16, A11d; RM-q, *Zn*)

91-L. Improving Your Wrinkle Painting. Harold D. Kaiser and Thomas G. O'Brien. *Products Finishing*, v. 23, Dec. 1958, p. 24-29.

Controlling baking cycles and methods of application to produce finishes of uniform color and texture. (L26n)

92-L.* Some Developments in Barrel Nickel Plating. B. E. Bunce. *Electroplating and Metal Finishing*, v. 11, Nov. 1958, p. 389-397.

Solutions, equipment and operating data for barrel Ni plating. Various solution compositions, effects of certain brightening and levelling agents and influence of $MgSo_4$ and NaCl on the conductivity. Importance of resistance across barrel panels; barrel designs and electrical cable insulations. 13 ref. (L17, W3b; Ni)

93-L.* Nickel-Chromium Plate Protects Molybdenum. *Industrial Finishing*, v. 10, Dec. 1958, p. 36.

High-temperature Ni plating over Cr base on Mo. (L17, 1-66; Mo, *Ni*, *Cr*)

94-L.* Hydraulic Jet Descaling — a New Method to Remove Scale From Hot Steel. Benjamin G. Harmon and Rovert Proctor. *Iron and Steel Engineer*, v. 35, Dec. 1958, p. 97-108.

Improves product quality, reduces water requirements for descaling. Depends on loosening of brittle scale by differential cooling. (L12h; ST, 4-51)

95-L.* An Engineering Approach to the Selection of Pipe Line Coating. J. A. Schauers. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 62-66.

Soil and water survey, coating selection, preparation and application. Cathodic protection of coated steel pipe line. (L26, R10d; ST, 4-60)

96-L.* Coal Tar Coatings — Both Hot and Cold. Malcolm Mitchell. "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, 142-151.

General characteristics and application of coal tar enamels for protection of underground pipe. (L26a; ST, 4-60)

97-L.* Use of Wax Coating for Protecting Underground Pipe. Ted Kennedy, Jr. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 152-165.

Characteristics and field application of hot and cold wax coatings in general use. Protective wrappers, test to identify and evaluate wax coatings. (L26q; ST, 4-60)

98-L.* (Japanese.) Influence of Purity of Base Metal in Plating. Matsuhei Kishi. *Metal Finishing Society of Japan, Journal*, v. v. 9, Sept. 1958, p. 325-329.

Adhesive properties of Ni plated on Al plates of different compositions with anodized or plain surfaces. Electron-microscope and metallographic observations relating structure and porosity of oxide film formed by anodizing in phosphoric acid bath with adhesion of the Ni plating and with Al purity. 5 ref. (L17c, L19q, 3-69; Al, *Ni*)

99-L.* (Japanese.) One Consideration on Mechanism of Brightening Studies on Bright Copper Cyanide Plating Bath. Pt. 4. Minoru Nakamura. *Metal Finishing Society of Japan, Journal*, v. 9, Sept. 1958, p. 330-334.

Upper limits of range of brilliance coincided with potential of hydrogen gas generation and lower limit coincided with that of brightener crystallization. 7 ref. (L17a; Cu)

100-L.* (Japanese.) Some Investigations on Co-Ni Alloy Bright Plating. Saburo

Ehara, Yoshiyuki Kishi, Kiyoshi Maruyama and Hirotoshi Kase. *Metal Finishing Society of Japan, Journal*, v. 9, Sept. 1958, p. 334-338.

Effectiveness of formate and boric acid as buffers in plating solution. Variation in hardness of bright deposits of Co-Ni alloy with current density and with addition of organic brightener and $MgSo_4$. Electron diffraction examination of Co-Ni alloy deposit. 6 ref. (L17; Co-b, *Ni*)

101-L.* (Japanese.) Study on Cu-Sn Alloy Electrodeposition. Haruo Inagaki. *Metal Finishing Society of Japan, Journal*, v. 9, Sept. 1958, p. 338-341.

Electrodeposition of Cu-Sn alloys from solution containing various ratios of copper cyanide and sodium stannate. Effect of plating solution composition and other plating variables on analysis of deposited alloy. X-ray diffraction determination of phase composition. (L17, M22g; Cu-b, *SN*)

102-L.* (Japanese.) Hot Dip Aluminum Coating on Steel. Masayoshi Tagaya, Shigeteru Isa and Toshiaki Morichika. *Metal Finishing Society of Japan, Journal*, v. 9, Nov. 1958, p. 402-406.

Cold drawing of aluminized steel wires and its effects on tensile strength; other mechanical properties and corrosion resistance. 7 ref. (L16, Q27, 3-68, ST, *Al*, 4-61)

103-L.* Cr-Ni Plate Guards Molybdenum. *Iron Age*, v. 183, Jan. 8, 1959, p. 62-63.

Cr-Ni protects Mo from oxidation at high temperatures. A two-layer electrodeposited coating consists of a layer of Ni over Cr. At 1796° F. the coating protects the base metal for over 1000 hr. (L17; Cr, Mo, Ni)

104-L.* "Zero-Mist" in Hard Chromium Plating. Vicente Massuet Grau. *Metal Finishing Journal*, v. 4, Dec. 1958, p. 467-473.

Tendency to the formation of pits quite different from those produced in certain cases by normal hard Cr baths produces rough coatings with many peculiar large nodules all round the edge on the base of test-pieces. (L17a; *Cr*)

105-L.* Some Aspects of the Mechanism of Metal Deposition and Dissolution. J. O'M. Bockris. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 164-173.

Potential energy, distant relation for steps during metal deposition. Measurements and calculations concerning path of deposition reaction and individual step determining deposition rate in the electrodeposition of Ag and Cu from aqueous solutions and Ti from molten salts. 9 ref. (L17, C23, P15, R2a; Ag, Cu, Ti)

106-L. Centrifuging Removes Excess Tinplate, Improves Finish. *Industrial Finishing*, v. 10, Dec. 1958, p. 33.

(L16, X20k; Sn)

107-L. Sonics Cleans Delicate Parts. *Iron Age*, v. 183, Jan. 8, 1959, p. 64-68.

(L10f, X14)

108-L. Technical Control in Electroplating. *Metal Finishing Journal*, v. 4, Dec. 1958, p. 457-463, 476.

Symposium covering quality control and analysis of electrolytes and deposits. (L17)

109-L. High Temperature Corrosion Resistant Coatings. M. J. Tauschek and W. C. Gleeson. *Thompson Products Engineering Bulletin*, v. 3, Mar. 1958, p. 16-19.

Applications of spray welded techniques. (L24; 8-68, SGA-h, SGA-g)

110-L. Tin-Nickel on Watches and Drawing Instruments. *Tin and Its Uses*, no. 44, Autumn 1958, p. 1-3.

Application of Ni plate of 65% Sn, 35% Ni in finishing watch and instrument parts. (L17; Ni, Sn)

111-L. Improving the Finish of Tinned Wares. *Tin and Its Uses*, no. 44, Autumn 1958, p. 4-5.

Effect of centrifuging time and speed on thickness of Sn coating on kitchenware. (L16, T10a; Sn)

112-L. Tinning of Wire for Soldering. *Tin and Its Uses*, no. 44, Autumn 1958, p. 13-14.

(L15, L17; Cu, Sn, 4-61, SGA-f)

113-L. (Czech.) Lead Coating With Hard Lead. Karel Janecky. *Korose a Ochrana Materialu*, v. 2, no. 5-6, 1958, p. 73-75.

Describes process, etching and cleaning of steel surfaces to be coated, composition of baths. (L16; ST, *Pb-b*)

114-L. (German.) Testing Plating Procedures and Electrolytes in a Hull Bath. J. Elze. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Nov. 1958, p. 482-487.

Proposed German standard DIN 50957. 4 ref. (L17c, S22)

115-L. (German.) Automation of Metal Surface Finishing Processes in the USA. W. Roggendorf. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Nov. 1958, p. 490-497.

Careful degreasing and preparation of surfaces prior to chroming; frequent omission of Cu undercoating stressed. (L12, L17, 18-74; *Cr*)

116-L. (German.) Plating Lead-Tin Alloys From Fluoroborates. Hanns Benninghoff. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Nov. 1958, p. 498-500.

(L17a; Pb-b, *Sn*)

117-L. (Russian.) Automatic Control of Anodic Electrolytic Cleaning. V. V. Kozhevnikov. *Metallurg*, v. 3, Nov. 1958, p. 40-41.

Automatic cleaning and inspection of strip steel doubled production and improved quality. (L13n, S13, 18-74; ST, 4-53)

118-L. (Russian.) Diminution of Tin Coating Thickness in Hot-Tinning of Black Sheet. V.G. Borisenko and V.K. Barzii. *Stal'*, v. 18, Oct. 1958, p. 920-922.

Influence of surface microrelief, small diversity in thickness of sheets coated simultaneously, Sn temperature and speed of strip travel on the thickness of Sn coating shows the possibility of considerable reduction of Sn consumption if the Sn plates are produced under optimum conditions. Coating thickness can be reduced by 6-10%. (L16; ST, *Sn*)

119-L.* Mechanical Descaling for Wire Drawing. G. McH. Sturgeon. *Iron & Steel*, v. 31, Dec. 1958, p. 563-568.

The two main methods of mechanical descaling are deformation of the rod by flexing, twisting or stretching and direct treatment of the surface, of which shot blasting is the only example at present important. The first of these two methods does not remove all of the scale and it is necessary to supplement it with some secondary treatment. Mode of operation of various commercially available descaling machines. 26 ref. (L10, F28; 4-55)

120-L.* Mechanism of Electrolytic Metal Deposition. B. E. Conway and J. O'M. Bockris. *Royal Society Proceedings*, v. 248, Nov. 25, 1958, p. 394-403.

Aqueous solutions of cupric, nickelous and silver ions examined by deriving and comparing the relevant potential energy profiles with the purpose of indicating the rate-determining step. 24 ref. (L17b; Cu, Ni, Ag)

121-L.* (German.) Distribution and Effect of Aluminum in a Zinc Plating Bath for Sheet Metal. Rolf Haarmann and Dietrich Horstmann. *Stahl und Eisen*, v. 78, Dec. 11, 1958, p. 1808-1811.

If Al is added to the bath, the thickness of Zn coating obtained decreases with an Al content up to 0.2% while its uniformity increases. Defects in the coating were observed with higher Al. As the Al in the bath increases, the adhesion improves, which is thought to be a consequence of the counteraction of Al against the formation of Fe-Zn alloy. (L16a, 2-60; ST, *Zn, Al*, 4-53)

122-L.* (German.) Glossy and Thick Rhodium Coatings, R. Levy. *Werkstoffe und Korrosion*, v. 9, Nov. 1958, p. 686-689.

Rh coating used for glossy decorative plating of Ag in thicknesses up to 1 micron; used industrially on Cu, brass, etc., in thicknesses up to 20 microns. Resulting surface dull but hardness similar to Cr plate. Methods explored to retain gloss with thicker coatings. 5 ref. (L17; *Rh*)

123-L.* (Japanese.) Heat Resisting and Chemical Resisting Paints. O. Fujisawa. *Metals*, v. 28, Dec. 1958, p. 922-926.

Al and Zn powder paints are heat resisting, but TiO_2, CrO_2, Fe_2O_3, graphite, Cd-red and Cd-yellow are better. Fading depends on base metal, Cu and galvanized iron being poor. Inorganic paints are more acid and alkali resisting than organic paints. (L26n; NM-g30)

124-L.* (Russian.) Electroplating of Silver During Reversion of Direct Current. H. A. Maichenko, I. N. Levkhovilski and A. N. Buyanova. *Zhurnal Prikladnoi Khimii*, v. 31, Oct. 1958, p. 1511-1520.

Productivity is increased 2 to 2.5 times, at the expense of higher density currents. Deposits are of fine crystalline structure; uniformity is improved; hardness is increased almost 1.5 times. (L17; *Ag*)

125-L.* (Russian.) Precipitation of Copper From Acid Electrolytes With the Aid of Periodically Reversed Current. V. V. Ostroumov and J. F. Plochothichkova. *Zhurnal Prikladnoi Khimii*, v. 31, Oct. 1958, p. 1520-1526.

Possibility of obtaining bright Cu without use of bright forming organic additives. Deposits may be obtained with maximum reflective capacity on substratum of bright Ni. (L17; Cu, *Ni*)

126-L.* Controlled Vibrations Speed and Simplify Parts Finishing. W. E. Brandt. *Iron Age*, v. 183, Jan. 15, 1959, p. 79-82.

Controlled vibratory tumbling to finish interior and exterior surfaces in record time. (L10d)

127-L.* (Polish.) Cleaning 1H13 Steel in Fused Salts. E. Gasior. *Prace Instytutow Ministerstwa Hutnietwa*, v. 9, no. 2, 1957, p. 61-69.

Structure and chemical properties of scale formed on steel (0.12% C, 12.64% Cr) during annealing in air at 900° C. Structure and chemical composition depend on oxidation conditions. Scale is characterized by presence of Cr_2O_3, mainly in forms of Cr spinel which makes acid pickling impossible. 11 ref. (L12n; SS)

128-L. Setting-Up a Metal-Spraying Workshop. M. Lacorne. *Iron and Steel*, v. 31, Dec. 1958, p. 569 - 571.

Reclamation work on coke wagons by sand blasting, infrared heating to prevent oxidation, and metal spraying of Al and Zn. (L23, T23p, 18-72; Al, Zn)

129-L. High-Temperature Coatings—2000°F. Range, and Up! James F. Rice. *Pacific Factory*, v. 90, Nov. 1958, p. 28-29, 51.

PT-404 resin coating withstands +2000° F. (L26p, NM-g33, SGA-h)

130-L. Finishing Office Equipment. *Product Finishing*, v. 11, Dec. 1958, p. 83-87.

Electrodeposition, film-covering processes and painting at Remington Rand Ltd., Weybridge, England. (L-general, T10f)

131-L. (Dutch.) Defects in Vitreous Enamel Coatings on Cast Iron, Caused by Casting Factors. A. Bordes. *Metalen*, v. 13, Nov. 29, 1958, p. 396-401.

Defects caused by gases on the surface resulting from carbon, oxides and hydrogen in the iron; by stresses originating in the cooling of the casting; by unsufficient adhesion of coating. 7 ref. (L27, 9, E-general; CI)

132-L. (Russian.) Influence of Naphthalene Sulphonic Acid on Electroplating of Nickel. A. V. Pamfilov and O. E. Panchuk. *Ukrainskii Khimischeskii Zhurnal*, v. 24, no. 3, 1958, p. 266-273.

Bright Ni plating. 7 ref. (L17; Ni)

133-L.* Non-Electric Gold Plating. Harold Robinson. *Precision Metal Molding*, v. 16, Dec. 1958, p. 43.

Atomex process is affected by ionic displacement. Attacked chemically, the base metal surface sheds atoms into the bath, takes back atoms of Au from the bath. Coatings are thinner, denser, with the same properties as electroplates, but with 35% less Au, and with a firmer bond. (L28; Au)

134-L.* Precision Barrelling. *Automobile Engineer*, v. 48, Dec. 1958, p. 536-540.

Abrasive agents, including preformed chips, tablets; effect of varying load levels and water levels in the barrel; barrelling of fixtures; use of process on a mass production basis. (L10d; NM-j)

135-L.* Offshore Corrosion Costs Cut by Cold Galvanizing. *World Oil*, v. 148, Jan. 1959, p. 234, 238, 242.

Applying an inorganic silicate filled with metallic Zn to sand blasted metal surfaces, followed by a "curing" solution, gives excellent long-wearing protection in highly corrosive areas; better than conventional galvanizing. (L29, R3p, R4b, T28; ST, *Zn*)

136-L. (Translation.) Brightening Effect of Organic Additions to Nickel Plating Baths. E. Bertorelli, I. Bellobono and C. Bordonali. *Industrial Finishing*, v. 10, Dec. 1958, p. 47-48, 50. (From *Galvanotechnica*, v. 8, no. 8.)

See item 85-L, 1958. (L17a; Ni)

137-L.* Hot Lacquers and Factors That Affect Their Use. Fred E. Kern. *Industrial Finishing*, v. 34, Aug. 1958, p. 41-46.

Compared with lacquers sprayed at room temperature; advantages affecting application and finish. (L26n; 1-66)

138-L.* (French.) New Hot Tin Plating Process for Iron. M. C. J. Thwaites. *Metaux-Corrosion-Industries*, v. 33, July-Aug. 1958, p. 335-342.

Direct chloride process developed by Tin Research Institute uses thickish layer of boiling flux on plating bath. Comparison with other processes. Results of adherence tests on Fe objects plated by this method and others. (L16; Fe, *Sn*)

139-L.* (Japanese.) Current Distribution and Its Fluctuation in Electrolytic Polishing. K. Ninomiya and K. Sasaki. *Chemical Society of Japan, Journal*, v. 61, July 1958, p. 816-818.

Behavior of current for different ratios of the distances between cathode and two Fe annodes which are dipped in a Harling cell-type bath with H_2PO_4. In earlier stages the current fluctuates greatly, but after oxide film is formed the current is stabilized. When surface activation agents are added, the current distribution is much improved. (L13p; Cu)

140-L.* (Russian.) Anodic Protection of Titanium in Sulphuric Acid. N. D. Tomashov, R. M. Al'tovskii and A. G. Arakelov. *Doklady Akademii Nauk SSSR*, v. 121, no. 5, 1958, p. 885-888.

Experiments with Ti in H_2SO_4 solution at room temperature. 12 ref. (L19n; Ti-a)

141-L.* (Russian.) Automatic Multi-Electrode Submerged-Arc Hard Surfacing of Parts Following Hard Surfacing With Coated Electrodes. N. P. Emel'yanov and F. D. Lonskii. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 23-27.

Recommends five steel and one Al electrode of equal diameters using a mixture of standard flux and granulated ferro-aluminum. 6 ref. (L24, K1e, W29h; ST)

142-L.* (Russian.) Utilization of Radioactive Isotope in Study of Electrolytic Alloy Formation. S. M. Kochergin and G. P. Pobedimskii. *Zhurnal Prikladnoi Khimii*, v. 31, no. 9, 1958, p. 1432-1434.

During precipitation of Zn-Co alloy from complex ammoniacal electrolytes and from sulphate electrolytes, Zn content is increased with Zn increase in the electrolyte in relation to Co. (L17; *Zn, Co*, 1-59)

143-L. The Scope of Hardfacing. Russell S. Cox. *Australian Welding Journal*, v. 2, Nov. 1958, p. 21-27.

Types of hardfacing weld metal (martensitic, austenitic, chromium carbide, toolsteel, nonferrous) in relation to wear. (L24)

144-L. Precautionary Procedures in Chemical Cleaning. Robert A. Stander. *Corrosion*, v. 15, Jan. 1959, p. 33-35.

Elimination of conditions promoting galvanic corrosion and removal of poisonous gases. (L12, R1a)

145-L. New Developments in 'In Situ' Cleaning. P. B. Wharton. *Corrosion Technology*, v. 5, Oct. 1958, p. 319.

New, cheap, expendable, silica and dust-free mineral grit properly cleans large steelwork structures, tanks, etc., giving long-term corrosion protection from rust and mill scale. (L10c, R10f; ST)

146-L. Painting Structural Steel on a Conveyor Line. *Industrial Finishing*, v. 35, Jan. 1959, p. 22-24.

(L26n, W12r; ST)

147-L. Masked Spray Painting Auto Instrument Panels. Paul J. Dooley. *Industrial Finishing*, v. 35, Jan. 1959, p. 30-32, 34.

(L26n, T21c)

148-L. (German.) Testing of the Rhodium Electrolyte in a Hull-Cell. S. Dorner and M. Froels. *Metallwaren-Industrie und Galvanotechnik*, v. 49, no. 12, 1958, p. 539-543.

Effect of different purifying and wetting agents on an electrolyte contaminated by organic substances. Purifiers with wetting agents as well as wetting agents alone have a harmful influence on the precipitation. 10 ref. (L17a; *Rh*)

149-L. Inexpensive Chromates Give Zinc Surfaces Color Appeal. *Steel*, v. 144, Jan. 12, 1959, p. 74-75.

Zinc chromate conversion coatings provide Zn surfaces with corrosion resistant coating which can be colored evenly. Cost is 1/50 of a cent a sq.ft. and 24 hues are available. (L14c; Zn)

150-L.* Preparation of Steel Surfaces for Repainting. John Hurst. *Corrosion Technology*, v. 5, Oct. 1958, p. 313-315, 342.

Method of cleaning and preparing intact paintwork for further coatings. Cleaning and preparing of contaminated surfaces and use of paint remover. (L10, L12, R10b; ST, 17-52)

151-L.* Metal Spraying in Relation to the Corrosion Process. J. R. Franklin. *Corrosion Technology*, v. 5, Oct. 1958, p. 323-325.

Metallizing protects iron and steel from various corrosive environments. Layout with recommended metallizing systems for corrosion protection against specified conditions. (L23, R10b; Fe, ST, 18-67)

152-L.* Chromizing of Metal Powder Parts. Richard P. Seeling. Paper from "Proceedings of the 14th Annual Meeting".

Metal Powder Assoc., New York, 1958, p. 102-106.

Chromizing of metal powder parts differs in several respects from the treatment of solid metals. In addition to resistance to corrosion, heat and wear, there is a simultaneous increase in strength and ductility. Chromallizing can also produce oxidation resistance in nonferrous sinterings such as heavy metal, carbides and refractory metals. (L15; 6-72, Cr)

153-L.* Electrophoretic Coatings. D. J. Fishlock. *Metal Industry*, v. 93, Dec. 26, 1958, p. 537-538.

Electrophoretic deposition of metallic or nonmetallic coatings on metals, ceramics or graphite. Advantages. (L29p)

154-L.* Molybdenum Coatings. H. W. Schultze, R. R. Freeman and J. Z. Briggs. *Materials in Design Engineering*, v. 49, Jan. 1959, p. 76-81.

Adhesion, hardness, ductility, strength, wear resistance, corrosion resistance and physical properties. Electronic, automotive, aircraft, nuclear reactor and other applications. Summary of major types of Mo coating processes. (L17, L23, L25, L29; Mo)

155-L.* Thermal Insulation Ceramic Coatings. Alan V. Levy. *Society for Automotive Engineers*, Preprint no. 4T, Jan. 1959, 10 p.

Composition, density, thermal properties, thickness, porosity, hardness, resistance to thermal shock, resistance to mechanical vibration of reinforced ceramics and flame-sprayed coatings of alumina or zirconia. Applications utilizing thermal insulating and protective properties. (L27, 2-62; SGA-h)

156-L.* Anodic Oxide Film Formation on Zirconium. Kinetics With and Without Concurrent Oxygen Evolution. George B. Adams, Jr., Tien-Shaey Lee, Samuel M. Draganov and Pierre Van Rysselberghe. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 660-665.

Comparative studies to determine whether differential formation fields measured below O evolution potentials agreed with those measured at high voltages. Results show that Zr is anodically oxidized to the corresponding oxide at unit current efficiency below the reversible O evolution potential. 9 ref. (L19; Zr, *O*)

157-L.* Cathode Potentials During the Electrodeposition of Molybdenum Alloys From Aqueous Solutions. D. W. Ernst and M. L. Holt. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 686-692.

Electrolysis of aqueous ammoniacal citrate solutions containing sodium molybdate and the sulphate of a codepositing metal, Fe, Ni and Co. Reduction of molybdate ion in this type of bath is probably not accomplished in one step with six electrons, but with one, two or three electrons, depending on the codepositing metal and its oxidation state in the bath. 12 ref. (L17; Mo, *Fe, Ni*, Co)

158-L.* Second International Conference on Metal Spraying. *Electroplating and Metal Finishing*, v. 12, Jan. 1959, p. 21-25.

Abstracts of papers on metal spraying procedures in Norway, Spain, France, England, South Africa and Australia. Applications. (To be concluded.) (L23)

159-L.* Plating Process Co-Deposits Oxides or Carbides. A. E. Grazen. *Iron Age*, v. 183, Jan. 29, 1959, p. 94-96.

Finely divided particles of SiC, WC, aluminum oxide, zirconium oxide and similar additives are dispersed in Ni, Cu, Au, Cd and other metals. Either as a plated film or electroform, the composite material forms a tough surface with high wear resistance. (L17, L18; Ni, Cu, Au, Cd, *Si, C, W, C, Zr, O*, NM-a, 8-62)

160-L.* Metal Spraying: Effect of a Molybdenum Deposit on Adhesion and on Fatigue of Ferritic Steels. D. Birchon. *Metallurgia*, v. 58, Dec. 1958, p. 273-285.

A thin layer of Mo sprayed on a steel base is shown to enhance adhesion on fine machined and shot blasted surfaces. Although a marked reduction in fatigue strength occurs on polished specimens, controlled shot blasting in combination with a Mo underlay provides adhesion comparable to that on a rough threaded surface, coupled with superior fatigue properties. 16 ref. (L23, Q7, SS-d, *Mo*, 8-67)

161-L.* Protection of Cargo Tanks With Epoxy Resin Based Coatings. Tseng Yung Yang. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 59-61.

Application of epoxy coatings to internal al surface of railroad cars. Performance. of coating in car carrying petroleum products. (L26p, T26q, R7d; ST)

162-L.* Technical Developments of 1958. Nathaniel Hall. *Metal Finishing*, v. 57, Jan. 1959, p. 38-47, 107-108.

Review of patent and journal literature on cleaning, pickling, polishing, anodizing, electroplating, electroforming, metallizing, vapor coating, conversion coating, testing, and waste treatment. 417 ref. (L-general)

163-L.* Organic Finishing Developments of 1958. Daniel A. Marino. *Metal Finishing*, v. 57, Jan. 1959, p. 48-51.

Application methods, materials for coatings, specialized coatings, wash primers, water thin paints, hazards. 116 ref. (L26)

164-L.* Hard Nickel Plating in Russia. Sulfate-Oxalate Bath. A. J. Steiger. *Metal Finishing*, v. 57, Jan. 1959, p. 52-53.

Deposition of smooth, hard Ni in electrolyte containing nickel sulphate and ammonium oxalate. Influence of bath composition, temperature, current density, and pH on deposition rate and characteristics of deposits. Optimum plating conditions. (L17a, 2-60, 2-61; Ni)

165-L.* Effects of Impurities in a Bright Nickel Bath on the Covering Power of a Chromium Bath. Pt. 2. Robert H. Rousselot and Georges E. Rousselot. *Metal Finishing*, v. 57, Jan. 1959, p. 58-60.

Effect of Sn, Cd and Mo on covering power; maximum allowable concentrations of Cu, Zn, Fe, Cr, Pb, Sn, Cd or Mo in Ni baths. Removal of inorganic impurities by displacement, electrolytic purification or reduction. (Concluded.) (L17a, L17b, 3-69; Cr, Ni, *Cd, Cu, Fe, Mo, Zn*)

166-L.* (German.) Anodizing and Painting Aluminum for Buildings. Pt. 2. G. E. Gardam and A. W. Brace. *Aluminum*, v. 34, Dec. 1958, p. 702-709.

Workshops and equipment for acid finishing, anodizing, containers for dying and sealing. Testing of anodic coatings. (L19, L12g, W4)

167-L.* (German.) Effect of Iron-Saturated Zinc Melts on Steels Containing Titanium. Dietrich Horstmann. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 731-735.

The behavior of steel. Attack of the melt on soft iron represented by the layer of Fe-Zn alloy appears graphically as a straight line within the temperature range around 500° C., and as a parabola in the higher and lower temperature ranges. The Ti content widens the limits of the straight-line range. 10 ref. (L16; ST, *Ti, Zn, Fe*)

168-L.* (German.) Chromized Steel Screws. E. Taubert. *Draht*, v. 9, Dec. 1958, p. 505-507.

In the chromizing process a corrosion resistant case with 35% Cr on the surface and 0.1-0.12 mm. deep is formed. Because of its elasticity and adherence, the case endures deformation. Screws found to be heat resistant. (L15, T7f; ST, *Cr*)

169-L.* (Italian.) Anodic Oxidation of Architectural Aluminum. *Alluminio*, v. 27, Oct. 1958, p. 459-468.

Types of Al alloys suitable for architectural anodization; standards of thickness of anodic films; pretreatment of surfaces; anodic bath specifications; coloring and color fixing; methods of testing anodic coatings; temporary protection during installation; maintenance. 14 ref. (L19n, S21, T26p, 17-57; Al-b)

170-L.* Some Properties and Applications of Chemically Reduced Nickel. A. C. McL. Aitken. *Electroplating and Metal Finishing*, v. 11, Dec. 1958, p. 427-431.

Nickel-phosphorus alloy chemically reduced by the Kanigen process which was developed to deposit metallic Ni containing about 8% by weight of P without the use of an externally applied voltage to suitably prepared surfaces of metallic or nonmetallic materials. Tensile, fatigue and hardness tests on specimens in polished, polished and pickled, and polished, pickled and plated conditions. (L28, Q-general; Ni, *P*, 8-69)

171-L.* Fault-Finding in the Plating Department. P. Green. *Electroplating and Metal Finishing*, v. 11, Dec. 1958, p. 432-435.

Common causes of rejects in pickling and bright dipping prior to plating, polishing, preparation for plating (cleaning and pickling) and afterplating treatment. (L17, L12)

172-L.* Sprayed Coatings for Ships. Use of Zinc and Aluminium for Corrosion Protection. Manley H. Clark. *Iron and Steel*, v. 32, Jan. 1959, p. 11-12.

Coatings of sprayed Al, sealed and cover-coated with Al vinyl paints, give the greatest protection to steel exposed to salt water immersion, alternate immersion and air (tide level conditions), salt air and industrial atmospheres contaminated with S compounds. (L23, R3, R4b; Al, 8-67)

173-L. The Theory of Formation of High Resistance Anodic Oxide Films. L. Young. *Canadian Journal of Chemistry*, v. 37, 1959, p. 276-285.
20 ref. (L19; 14-62)

174-L. The "S" Chemical Brightening Bath. J. G. Simmons. *Light Metals*, v. 22, Jan. 1959, p. 27-29.
Process for Al and its alloys in diluted HF1 and certain salts. (L12; Al-b)

175-L. Anodizing and Coloring Aluminum in Britain. Tom Bishop. *Metal Progress*, v. 75, Jan. 1959, p. 87-89.
Preferred anodic coating for architectural applications is 0.001 in. thick, but for some uses thickness of 0.0006 in. is satisfactory. Procedures for pretreatment, anodizing and coloring to produce a light-fast finish. (L19, T26n, 17-57; Al)

176-L. How to Prevent Underfilm Corrosion. *Steel*, Jan. 9, 1959, p. 66-68.
Premature coating failures can be prevented by a new cold phosphating process that passivates the surface and makes it nonconductive. (L14b, R10c)

177-L. Automated Phosphating Line Pays Off in First Year. *Steel*, v. 144, Feb. 2, 1959, p. 82-85.
Cranes automatically cycle through five dip tanks to phosphate coat large mill bearings. (L14b, T7d, 18-74)

178-L.* Hardfacing by Rod and Metal Powders. E. Wallace. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 5-13.
Advantages of hard facing include longer life of wearing parts, reduced maintenance cost and reduction in use of new parts by using reconditioned components. Typical properties of Co-Cr-W, Co-Cr-Ni-Mo-Fe, Ni-Cr-Co-W, Ni-B-Si and Ni-Cr-B-Si hard facing alloys. 6 ref. (L24; Co, Cr, W, Ni, Mo, Fe, B, Si, 8-68)

179-L.* Selective Electrolytic Etching of Germanium and Silicon Junction Transistor Structures. I. A. Lesk and R. E. Gonzalez. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 469-473.
Electrolytic dissolution of Ge and Si is applied to the selective etching of n-p-n and p-n-p junction transistor structures. By employing the electrical properties of p-n junctions internal to the pellet as well as the electrolytic behavior of the n and p-type Ge or Si, part of the emitter or collector (or both) of a transistor pellet may be etched away, leaving the rest of the pellet intact. (L13q, T1k; Ge, Si)

180-L.* Aluminized Steel, Properties and Uses. K. G. Coburn. *Journal of Metals*, v. 11, Jan. 1959, p. 38-39.
Aluminized steel is manufactured in two grades of coating analysis. Type 1 has a Si-Al alloy coating best suited for high-temperature service or many applications where a combination of heat and corrosion is involved. Type 2 is applied from a bath of commercially pure Al and has excellent resistance to atmospheric corrosion. (L16; ST, *Al*)

181-L.* 30,000 Degrees With the Plasma Jet. *Journal of Metals*, v. 11, Jan. 1959, p. 40-42.
Plasma-type torch produces a stream of intensely hot, ionized gas. Such a jet is formed by passing a gas or a vapor through an electric arc. The arc is struck between a tungsten cathode and (usually) a water-cooled copper anode. Plasma-jet coatings bring the possibility of effectively coating metals and other materials with refractory metals and compounds, such as borides, carbides, nitrides, silicides and oxides. (L29)

182-L.* (French.) Aluminium Surface Finishes, Their Application in U. S. Architecture. R. F. Hafer. *Revue de l'Aluminium*, no. 259, Nov. 1958, p. 1137-1146.
Pickling, anodic treatment, organic finishes, enamel coating for protective and decorative purposes. (L12g, L19, L26; Al-b, SGA-g)

183-L. Development and Practical Application of Shot Blasting in the Shipyard. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 40-43.
(L10c, 1-52; ST, 4-53)

184-L. Temporary Protection for Shot Blasted Steel. K. V. Hodgson. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 44.
(L26n, T22g; ST)

185-L. Bituminous-Epoxy Coating for Marine Protection. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 48.
(L26a, L26p, T22, R11)

186-L. The Painting of Shot Blasted Steel. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 51-52.
(L26n; ST)

187-L. Automation Applied to Barrel Plating. William J. Rein. *Electroplating and Metal Finishing*, v. 11, Dec. 1958, p. 442-447.
A new high-speed bright Cd plating solution is employed and the work is

weighed out into containers on receipt, using a previously prepared chart relating weight to surface area, to insure a uniform barrel loading of 75 sq.ft. of surface. (L17, 18-74)

188-L. Direct Chloride Tinning Process Has Universal Application. E. S. Hedges. *Industrial Finishing (London)*, v. 11, Jan. 1959, p. 28-30.

Relies on shot blasting, followed by tumbling or water barrelling. Zinc chloride, sodium chloride and hydrochloride acid is flux covering bath. (L16; Sn)

189-L. Paint Application by Flow Coating. B. van der Bruggen. *Industrial Finishing (London)*, v. 11, Jan. 1959, p. 36-38, 40. (L26, W4, 17-51)

190-L. Review of French Anodising Patents. V. F. Henley. *Light Metals*, v. 21, Dec. 1958, p. 387-388.

Brief digests and evaluation of some 16 patents. (To be continued.) (L19, 11-59)

191-L. Dipping and Flow Coating Methods. J. Arthur Weed. *Metal Finishing*, v. 57, Jan. 1959, p. 61, 73. (L26n)

192-L. Science for Electroplaters. Pt. 43. Diamines. L. Serota. *Metal Finishing*, v. 57, Jan. 1959, p. 62-64.

Ethylenediamine tetra-acetic acid (EDTA) and its sodium salts as chelating agents. Applications of EDTA in cleaning baths, plating processes and composition analysis. (L12k, L17, S11)

193-L. Tinning of Wire for Soldering. *Wire Industry*, v. 26, Jan. 1959, p. 71, 74.

Compares methods of obtaining Sn coating and properties. (L16, 1-66, K7; Cu-b, Sn, 4-61)

194-L. (German.) Protective Plastic Coatings. *Giesserei-Praxis*, Nov. 10, 1958, p. 428.

Part to be coated is heated to 200-350° C. and the powdered plastic material is sprayed across a gas-air flame, or the coating is applied by dipping the preheated part into the powder. (L26p, 5)

195-L. (German.) Protective Coatings. *Giesserei-Praxis*, Dec. 24, 1958, p. 485-486.

Dipping, electroplating, metal spraying and diffusion of painting, phosphating and pickling. (L-general)

196-L. (German.) Automation of Surface Treatment. Alois Hoch. *Galvanotechnik*, v. 50, Jan. 15, 1959, (L13, L17, W3, 18-74)

197-L. (German.) New Equipment for Automatic Electroplating. Wilfried Sturtzkopf. *Galvanotechnik*, v. 50, Jan. 15, 1959, p. 24-27. (L13, L17, W3, 18-74)

198-L. (German.) Automatic Buffing. Hans Leich. *Galvonotechnik*, v. 50, Jan. 15, 1959, p. 28-31.

Relationship between rpm. and polishing effect. Results with varied wheel diameter. (L10a, W2n, 18-74)

199-L.* (Dutch.) Surface Defects in Enameled Castings Caused by Casting Procedures. A. Bordes. *Metalen*, v. 13, Dec. 31, 1958, p. 432-435.

Thin-walled parts of gray iron should be cast at sufficiently high temperatures to avoid spots of white iron. Defects caused by carbon, sulphur and hydrogen. (L27; CI, 9-71)

200-L.* (German.) Automatic Equipment for Electroplating. Georg Geilert. *Galvanotechnik*, v. 50, Jan. 15, 1959, p. 10-19.

Plant for bright Ni and bright Cr plating. Cu and Zn plating equipment. (L13, L17, W3, 18-74; Cr, Cu, Ni)

201-L.* (German.) Automatic Electrotinning With Subsequent Heating. J. Korpiun and W. Fricke. *Galvanotechnik*, v. 50, Jan. 15, 1959, p. 19-23.

After electroplating, the part is heated until the Sn deposit becomes liquid, which produces a bright surface. (L13, L17, 18-74)

202-L.* Ultrasonic Plating. *Metal Industry*, v. 94, Jan. 9, 1959, p. 27-28.

Effect of ultrasonic agitation of plating solutions on formation of Cd, Cu, Ag, Cr or Ni deposits. (L17a, 1-74; *Cd, Cu, Ag, Cr, Ni*)

203-L.* Barrel Finishing With Specific-Shape Abrasive Media. Donald Mosher, Frank Soper and Thomas Loli. *Tool Engineer*, v. 42, Feb. 1959, p. 81-84.

Selection of size, shape, type and amount of media to obtain cutting action and precision required for finishing specific parts. (L10d)

204-L.* (French.) Manufacture and Welding of Clad Steel Plates. H. Gerbeaux. *Soudage*

et Techniques Connexes, v. 12, Nov-Dec. 1958, p. 441-459.

Covering steel plates with corrosion resistant linings by welding and other methods. 5 ref. (L22, L24; ST, 4-53)

205-L.* (German.) Automation of Electrical Cleaning and Coating. W. Gehring. *Galvanotechnik*, v. 50, Jan. 15, 1959, p. 4-9.

Plant for electrical cleaning; installation for Zn plating small parts in large quantities. (L13, L17, 18-74)

206-L.* (German.) Protection of Steel by Zinc and Aluminum Spraying. T. K. Ross, E. L. Smith and R. E. Mansford. *Werkstoffe und Korrosion*, v. 9, Dec. 1958, p. 755-760.

Properties of coatings obtained by the powder and wire methods. Good protection is achieved against atmosphere and corrosion under water when the metals are used on soft steel. Electrochemical behavior of base metal and coating. 17 ref. (L23; *Zn, Al*)

207-L. (Book.) Analysis of Electroplating and Related Solutions. K. E. Langford. 423 p. Dec. 1958. Robert Draper Ltd., 85 Udney Park Rd., Teddington, Middlesex, England. $9.

Some 300 methods for determination of principal constituents and impurities; sampling, control of cleaners, pickles, dips, etches, phosphating solutions and electrobrighteners; analysis of plating salts and water, physical and physicochemical methods of analysis; preparation of standard solutions for volumetric analysis. (L-general, S11, 11-68)

208-L. (Book.) Metal Finishing Guidebook Directory. 27th Ed. 762 p. 1959. Metals and Plastics Publications, Inc. 381 Broadway, Westwood, N.J. $2.

Information for finishing plant engineering, mechanical surface preparation, chemical surface preparation, plating solutions and operating data, special plating procedures, special surface treatments, organic finishing; control, analysis, testing; tables and data sheets. (L-general, 11-68, 11-67)

209-L. (Translation—BISI, no. 888.) Removal of Scale From Steel Plates. Wilhelm Radeker and M. Wild. *Stahl und Eisen*, v. 78, Jan. 23, 1958, p. 100-103.

See item 231-L, 1958. (L10c, L12g, ST, 4-53, 9-52)

210-L. (Translation—BISI, no. 1068.) Corrosion Resistant Steel Bolts. G. Becker. *Draht*, v. 9, Jan. 1958, p. 13-15.

See item 277-L, 1958, (L15, T7f; ST, Cr)

211-L. (Translation—Brutcher, no. 4450.) Effect of Conditions of Electrolysis on Structure and Wear Resistance of Iron Deposits. Yu. N. Petrov. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 53-56.

Optimum conditions of electrolysis that assure dense, fine crystalline and wear resistant deposits that satisfy needs of maintenance and repair. Organic additives such as sugar, glycerin, gelatin, dextrin and weak citric acid, of various concentrations and varied current density, introduced in chloride electrolyte, produce fine and dense crystalline structures. (L17a, M27, Q9n, Q29n; Fe)

212-L.* The "Spray Fuse" Hard Facing Process for Stellite Cobalt-Base Powders. S. R. Gault and D. A. Ironside. *Machinery (London)*, v. 94, Jan. 28, 1959, p. 189-197.

Components are sprayed with powder and the overlay is then fused. The porous metallized deposit is converted into a sound, homogeneous Stellite coating, securely bonded to the base metal and comparable in its basic characteristics to the hard-facing deposit produced by the arc and oxy-acetylene methods. (L24; Co-b)

213-L.* High-Strength Steel Can Be Cadmium Plated Without Embrittlement. D. J. Cash and W. Scheuermen. *Metal Progress*, v. 75, Feb. 1959, p. 90-93.

Cadmium is plated from a cyanide bath at 70 amp. per sq. ft. to give a porous plate which permits hydrogen to diffuse out of the surface in subsequent bake. A sustained load specimen, of much higher sensitivity, replaces the unnotched tensile test piece. This new specimen is designed so it must fail when plated with the older standardized procedures. (L17c, Q26s; ST, SGB-a, Cd)

214-L.* (French.) Pickling and Pickling Solutions. (Conclusion.) F. Margival. *Peintures, Pigments, Vernis*, v. 34, Oct. 1958, p. 450-459.

Use of emulsified solvents; solutions and procedures for acid cleaning of ferrous metals, Cu, Al, Ni and their alloys, Mg, Pt, Au alloys and Pb; corrosion inhibition additives; ultrasonic cleaning; rinsing and drying; solutions and procedures for removal of Ag, Au, Ni, Cu and Cr plate from metal objects. 60 ref. (L12)

215-L.* (German.) High-Temperature Corrosion Protection by Ceramic Coatings.

Armin Petzold. *Werkstoffe und Korrosion*, v. 9, Dec. 1958, p. 761-765.

Protection of carbon steel up to 700° C. and alloy steel up to 1000° C. against oxidation and intercrystalline corrosion by high-temperature enamels. Heat resistant Al_2O_3, ZrO_2, TiO_2, mullite, porcelain or Ni-MgO-cermet coatings. (L27; ST)

216-L.* (Italian.) Bright Nickel Plating of Leaded Bronze and Brass and Aluminum Bronze Castings. Gianluigi Galli. *Galvanotecnica*, v. 9, Oct. 1958, p. 249-252.

Effects of porosity of castings, passive film resulting from mechanical finishing and content in addition elements on adherence of Ni coating; preliminary Cu plating as aid to adherence; adherence over welds made with Sn or Pb-Sn alloys/ in bronze and brass castings. (L17c; *Ni*, Cu-n, Cu-s)

217-L.* (Italian.) Phosphatizing Sandblasting. T. A. Turco. *Galvanotecnica*, v. 9, Oct. 1958, p. 256-258.

Surface conditions provided by simultaneous sandblasting and coating with phosphate are ideal for application of protective paint. Wood, metal and plastic particles for blast cleaning. (L10c, L14b)

218-L. Plating of Titanium and Its Alloys. T. A. Dickinson. *Metal Finishing Journal*, v. 5, Jan. 1959, p. 24-25, 28.

Techniques used to deposit Cr, Cu and Ni on Ti. (L17; *Cr*, *Cu*, *Ni*, Ti)

219-L. Science for Electroplaters. Pt. 44. Amides. L. Serota. *Metal Finishing*, v. 57, Feb. 1959, p. 71-73.

Plating baths. (L17a)

220-L. Spray Painting Die Cast Toys. *Precision Metal Molding*, v. 17, Jan. 1959, p. 69-70.

Electrostatic system applied to Zn die cast bodies. (L26n; Zn, 5-61)

221-L. Barrel Finishing Tiny Parts. *Precision Metal Molding*, v. 17, Jan. 1959, p. 71.

Races for miniature ball bearings, some so small that 500 can be loaded into a thimble, are finished successfully, on a mass production basis, in precision barrels. (L10d)

222-L. Applications of Composite Electrochemical Materials. J. A. Edwards. *Product Finishing*, v. 12, Jan. 1959, p. 66-69.

Adherent coatings are applied at temperatures below 200° F. and consist of heterogeneous systems of dissimilar metals or metals and nonmetallics. Composite materials include combinations of Ni, Co, Ni-Co-Cu, Fe, brass, Cd, Ag, Au, Pt and Zn with additions of carbides and oxides. (L17; Ni, Co, Cu, Fe, Cu-n, Cd, Ag, Au, Pt, Zn, NM-a35, NM-a34)

223-L. Recent Developments in Phosphate Treatments. H. A. Holden. *Product Finishing*, v. 12, Jan. 1959, p. 76-79.

Current applications. (L14b)

224-L. Processing and Painting of Sheet-Metal Components.. W. Stein and E. Podmore. *Sheet Metal Industries*, v. 36, Jan. 1959, p. 37-47, 61.

Preparation, cleaning and organic finishing of mild steel, bare and pretreated, Al and its alloys and brass. (L12, L26; CN, Al-b, Cu-n)

225-L. (German.) Amino Treated Epoxy Paints in Industry and Shipbuilding. A. J. Wildschut. *Werkstoffe und Korrosion*, v. 9, Dec. 1958, p. 741-746.

(L26n; ST)

226-L. (Japanese.) Study on Tungsten Plating by Fluoride Bath. Tadayoshi Inui. *Metal Finishing Society of Japan, Journal*, v. 9, Dec. 1958, p. 444-447.

(L17a; W)

227-L. (Japanese.) Pretreatment of Aluminum Plates for Lead and Phosphate System Frit. Pt. 5. Toshio Yamada and Shinichiro Tomino. *Metal Finishing Society of Japan, Journal*, v. 9, Dec. 1958, p. 452-455.

Al plates treated with mixed aqueous solution of water glass, sodium perborate, lithium borate and sodium phosphate showed better adhesiveness than those treated with mono-aqueous solution of these salts. (L27; Al-b, *Pb*)

228-L. (Japanese.) Effect of Iron-Aluminum Powder on Aluminum-Diffusion Coating. Shigetomo Ueda. *Metal Finishing Society of Japan, Journal*, v. 9, Dec. 1958, p. 456-459.

Packing, aging and fineness of Fe-Al powder used as diffuser. (L15; Al)

229-L. (Japanese.) Hard Anodizing. Rihei Tomono. *Metal Finishing Society of Japan, Journal*, v. 9, Dec. 1958, p. 460-465.

Alumilite and Hardas processes (temperature of electrolytic solution, current and voltage); pre and after-treatment, wear resistance, thickness and hardness. (L19; Al-b)

230-L. (Japanese.) Titanium Plating. Kaoru Aotani. *Metal Finishing Society of Japan, Journal*, v. 9, Dec. 1958, p. 469-474.

Advantages, difficulties, electrochemical study of the plating analyzed. Water solution bath is inefficient but fused salt bath seems to be suitable. 43 ref. (L17; Ti)

231-L.* Diffusion Coatings for Metals. R. L. Samuel. *Metal Finishing Journal*, v. 5, Jan. 1959, p. 5-11, 28.

Structure and physical properties including corrosion and oxidation resisting properties of Zn diffusion (Sherardizing), Al diffusion (Calorizing), Cr diffusion (chromizing), Si diffusion (siliconizing) coatings. 34 ref. (L15; Al, Cr, Si, Zn)

232-L.* (German.) High-Silicon Cases on Iron and Steel Parts Produced by Gas Diffusion. Rudolf Keilitz. *Freiberger Forschungshefte*, no. B31, 1958, p. 189-216.

Production of wear and acid resistant cases in an inert or reducing atmosphere carrying silicon tetrachloride vapor. 13 ref. (L15; CI, ST, *Si*)

233-L.* (Japanese.) Vibrating Electropolishing Process in Phosphoric Acid Solution. Pt. 2. Takakado Nakayama. *Light Metals*, v. 8, Nov. 1958, p. 41-45.

Best frequency is 120 to about 200 rpm. and current density is 20 to about 40 amp. per sq. dm., when reflectivity is 87 to about 88.5%. The effect of rotating anode is almost similar to that of vibrating anode; effect of stirring is also similar. (L13)

234-L.* (Japanese.) Enameling Aluminum Alloys. Toshio Yamada and Takashi Sugiyama. *Light Metals*, v. 8 Nov. 1958, p. 57-60.

Pretreatment of Al alloys for borosilicate system frit. Chemical and anodic methods compared. Anodic oxidation treatment with metasodium silicate, sodium perborate, lithium borate and kalium borate and the chemical treatment of Alrok method is useful. (L13n, L27; Al-b)

235-L.* (Russian.) Role of Cuprous Oxide in the Establishment of an Anamalous Temperature Relation in the Electrodeposition of Copper. G.A. Emel'yachenko. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 11, 1958, p. 2479-2482.

Dependence of electrolysis ratio on temperature is due to the passivation of many parts of the electrode surface caused by formation of Cu_2O. 4 ref. (L17, 2-61; Cu)

236-L.* Improve Fatique Strength With Abrasive Tumbling. *Iron Age*, v. 183, Feb. 19, 1959, p. 129-131.

By inducing a compressive stress in metal surfaces, it actually boosts fatigue strength. (L10d, G23q, Q7a, 2-64; ST, TS)

237-L.* (German.) Automatic Cadmium Plating in Barrels. W.J. Rein. *Metalloberflache*, v. 13, Jan. 1959, p. 8-11.

Sequence of processes. (L17, 18-74; Cd)

238-L.* (German.) Behavior of Copper Anodes in Solutions of $CuSO_4$ and in Diluted H_2SO_4. P. Bedorf. *Metalloberflache*, v. 13, Jan. 1959, p. 1-4.

Development of anode mud determined by current density, temperature, Cu content of electrolyte, acid content of electrolyte and the removal of Cu salts from the anode surface. Purity, fine-grained structure and surfaces free from inclusions are essential. 4 ref. (L17a, W3h; Cu-a)

239-L.* (Russian.) Polarization and Throwing Power in Acidified Copper Solutions. I.M. Dudareva. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 11, 1958, p. 2500-2506.

Relationship dependence obeys the laws of diffusion kinetics and is related to change in the activity of the Cu^{2+} ions. The distribution of the thickness of the deposit on the cathode is improved with decrease in $CuSO_4$ and increase in the H_2SO_4 contents. The throwing power of an electrolyte of the composition 0.5 $MCuSO_4$ +2.0 MH_2SO_4 is comparable with copper cyanide electrolytes. 6 ref. (L17b; Cu)

240-L.* New Tubing Fights Corrosion. J.B. Ulam. *Iron Age*, v. 183, Feb. 19, 1959, p. 123-125.

"Composite tubing" features dissimilar metals which are metallurgically bonded into an inseparable jacket-and-liner relationship. Developed by combining two well-known techniques (Ulam process for cladding metals and Ugine-Sejournet method of hot extrusion). (L22, Q-general, R-general; CN, SS, 4-60, 9-72)

241-L. Light-Fast Organic Dyes for Anodizing. R.C. Spooner. *Metal Industry*, v. 94, Feb. 6, 1957, p. 107-108.

(Concluded.) 14 ref. (L19)

242-L. How to Choose the Right Cleaning Process. D.J. Fishlock. *Metalworking Production*, v. 103, Feb. 6, 1959, p. 223-227.

(L12, L13)

243-L. Finished in a Barrel. *Precision Metal Molding*, v. 17, Feb. 1959, p. 51.
Case histories of both simple and complex parts that can be barrel finished. Data cover kind of media used, media size, type and amount of compound. (L10d)

244-L.* The Preparation of Metals for Protective Finishes. R.E. Shaw. *Metallurgical Reviews*, v. 3, no. 12, 1958, p. 327-356.
Wire brushing, grit, vapor or shot blasting, pickling, flame cleaning, steam cleaning, degreasing, and phosphate coating of hot rolled steel. Effect of treatments on paint adherence and life. Mechanical or chemical pretreatment of Al, Cu, Mg, Sn, and Zn surfaces. 73 ref. (L10, L12, L14, L19; ST, Al-b, Cu-b, Mg-b, Sn-b, Zn-b)

245-L.* (German.) Developments in Metal Spraying. Pt. 4. H. Reininger. *Metalloberflache*, v. 13, Jan. 1959, p. 17-21.
Wire and powder spray methods using compressed air or compressed gas. Surface preparation before metal spraying by means of sand blasting, degreasing and descaling and by ultrasonic cleaning. (L23, L10f, L12)

246-L.* (German.) Electroplating Tests With a Hull Cell. *Metalloberflache*, v. 13, Jan. 1959, p. 22-25.
Suggestions for the design of a standard tank and its use. Tabular surveys and graphs on the correlations between anode to cathode distance, amperage and cathodic current density. (L17c)

247-L.* Roll Bonding Aluminum-Tin Bearing Alloys to Steel—a Modified Technique Employing Segregated Alloy Billets. P.W. Goad. *Australian Institute of Metals, Journal*, v. 3, Nov. 1958, p. 260-266.
Equipment and power costs are greatly reduced as lower rolling reductions are needed; bonding conditions and bond strength are unaffected by the composition of the bearing alloy; the highest possible bond strengths are obtained with room-temperature bonding. 9 ref. (L22; Al-b, *Sn*, SGA-c)

248-L.* (English.) Polishing of Stainless Steels. *Aciers Fins & Speciaux Francais*, no. 30, Dec. 1958, p. 74-76.
Abrasives, supporting disks and polishing operations used in France. (L10b; SS, NM-j)

249-L.* Electrodeposition of Molybdenum. T.T. Campbell. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 119-123.
Nonaqueous media used, such as liquid ammonia, formamide, acetamide, hydrazine and other organic solvents; preparation of pure anhydrous molybdenum halides. 4 ref. (L17a; Mo)

250-L.* Zirconium Coating of Uranium by the Iodide Process. W.L. Robb. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 126-129.
Process consists of thermally decomposing zirconium iodide vapors on the surface of U metal heated to about 1100° C. in vacuum. Prior to coating, the U metal surface is cleaned by iodizing it and then vaporizing the uranium iodide. 5 ref. (L15; U, 8-74, *Zr*)

251-L.* Electrolysis of Organic Solvents With Reference to the Electrodeposition of Metals. Abner Brenner. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 148-154.
Electrodeposition of metals from nonaqueous media; electrolysis of nonaqueous solvents. 33 ref. (L17a, P15m)

252-L.* Chromatic Conversion Treatments. Pt. 2. D. J. Fishlock. *Product Finishing*, v. 12, Feb. 1959, p. 87-93, 116.
Coating of Zn, Cd, Cu, brass, bronze, Sn, Ag, Cr and ferrous metals. 12 ref. (L14c)

253-L.* (Japanese) Chlorate-Accelerated Phosphate Coating. Masao Mukai, Yoshio Kawai and Shiroh Ueda. *Metal Finishing Society of Japan, Journal*, v. 9, Oct. 1958, p. 371-375.
Bath compositions and properties of phosphate coatings on steel surfaces. Chlorates are preferable to nitrates as accelerating agents. 5 ref. (L14b; ST)

254-L. Automatic Bright Zinc and Cadmium Plating for Corrosion Protection. K. N. Sinclair. *Corrosion Prevention & Control*, v. 6, Jan. 1959, p. 43-44.
(L17c; *Zn, Cd*)

255-L. Swedish Contribution to the Protection of Steel Through Painting. Pt. 1. Summary of Work Done by the Corrosion Committee During the Past 25 Years. Per-Ake Wallgren. *Federation of Paint and Varnish Production Clubs, Official Digest*, v. 31, Jan. 1959, p. 23-51.
8 ref. (L26n; ST, NM-g30, 1-54)

256-L. Electroplating of Aluminum Alloys. *Metal Finishing Society of Japan, Journal*, v. 9, Oct. 1958, p. 361-365.

Bath compositions for the Zn immersion treatment of Al-Si, Al-Cu-Si and Al-Mg alloys. 7 ref. (L17; Al-b, *Cu, Si, Mg*)

257-L. On the Mechanism of Anodic Oxidation of Tantalum. B. Verkerk, P. Winkel and D. G. de Groot. *Philips Research Reports*, v. 13, Dec. 1958, p. 506-508.

A thin layer of radioactive Ta is applied to a Ta sheet. After oxidation the oxide layer is dissolved in successive stages and the activity distribution is measured. Transport of Ta ions is not governed by a pure vacancy mechanism nor by a pure interstitial process. (L19, 1-59; Ta)

258-L. Automation in Sheet-Metal Printing and Lacquering. *Sheet Metal Industries*, v. 36, Feb. 1959, p. 116-118.

Combination of fully automatic, fully continuous feeder, rotary offset printing machine (multiculor) and lacquering machine. (L26b, 4-53)

259-L. Automatic Polishing With Special Reference to the Use of Liquid Polishing Compositions. H. Silman and R. G. Hughes. *Sheet Metal Industries*, v. 36, Feb. 1959, p. 119-133.

Polishing wheels, abrasive belt polishing, polishing compositions, abrasives, composition applicators, liquid compositions, automatic polishing machines, adjustable lathes and semi-automatic machines. (L10b, W2p)

260-L.* (French.) High Polymers for Protection Against Corrosion. A. Bonaldi and L. Jacque. *Corrosion et Anticorrosion*, v. 6, Dec. 1958, p. 431-436.

Temporary and permanent coatings; methods of application; properties of numerous plastics, thermoplastics and plastic-base anti-rust paints. (L26p, R10f, NM-d37)

261-L.* (French.) Recent Progress in the Techniques of Nickel Plating. L. Ades. *Corrosion et Anticorrosion*, v. 6, Dec. 1958, p. 440-443.

Levelling agents; ultrasonic bath agitation; new bath compositions; nickel-on-nickel process; properties of deposits obtained with new methods. 7 ref. (L17; Ni)

262-L.* (French.) Dip Coating in Fluidized Plastic Powder. W. Motz. *Corrosion et Anticorrosion*, v. 6, Dec. 1958, p. 446-450.

Properties of a fluidized powder, of a pseudo-liquid; procedure and apparatus, types of plastics suitable for this process; advantages of this type of coating. (L26p)

263-L.* (French.) Modern Hot Tin Plating Processes. P. Dehais. *Corrosion et Anticorrosion*, v. 6, Dec. 1958, p. 451-456.

Theory of Sn plating; cycles and baths for plating steel and cast iron, including pretreatment; problem of surface graphite in plating cast iron. (L16; CI, ST, *Sn*)

264-L.* (French.) The Role of Rhodium in the Battle Against Corrosion. R. Levy. *Corrosion et Anitcorrosion*, v. 6, Dec. 1958, p. 463-466.

Physical properties of Rh; principal steps in decorative and industrial electrodeposition; properties of deposits; applications of Rh plating. (L17; *Rh*)

265-L. (French.) Galvanizing of Gray Cast Iron. Pierre Deboute. *Fonderie*, no. 156, Jan. 1959, p. 21-24.

Surface preparation and galvanizing processes; causes of defects such as poor adherence of Zn coating. (L16; CI-n, *Zn*, 9)

266-L.* (German.) Electroplating of Zinc Die Castings. W. Roggendorf. *Galvanotechnik*, v. 50, Feb. 15, 1959, p. 71-74.

Directions for consecutive Cu-Ni-Cr plating and for simple Cr plating. (L17; 5-61, *Cr, Ni*, Zn)

267-L.* (German.) Electrodeposition of Titanium From Aqueous Solutions of Potassium-Titanium Fluoride. Willibald Machu and Venice Kamel. *Werkstoffe und Korrosion*, v. 10, Jan. 1959, p. 14-26.

Metal deposition by formation of TiO^{++} ions and their reduction by nascent H. Simultaneous deposition of Ti and passivation of Al and Ti hydroxides on Al cathodes. Effect of additions (gelatin, thiourea) on suppression of the formation of hydroxides and oxides in the deposition. 9 ref. (L17; *Ti*)

268-L.* (Italian.) Electrodeposition of Cadmium. C. Quattrone. *Galvanotechica*, v. 9, Nov. 1958, p. 277-279.

Plating bath components and their functions; process conditions. (L17; *Cd*)

269-L.* (Italian.) Influence of the Underlying Metal on the Adherence of Anti-Rust Paints. T. A. Turco. *Galvanotecnica*, v. 9, Nov. 1958, p. 280-281.

Problems of rust-proofing ferrous and nonferrous metals with paint; vehicles, pigments, primer coats and their function. (L26)

270-L.* Finishing Costs Tumble. Malcolm M. Maynes. *Automatic Machining*, v. 20, Mar. 1959, p. 40-42.

Tumbling barrels, abrasive media, compounds, drying. (L10d; NM-j)

271-L.* Studies of the Current Efficiency in the Electrodeposition of Manganese. Kimi Tiba. *Electrochemical Society of Japan, Journal*, v. 26, no. 7-9, 1958, p. E114-E117.

Current efficiency increased with increasing concentration of manganous sulphate; there is the certain range of ammonium sulphate content adequate to manganous sulphate concentrations in the electrolyte. Current efficiency seemed to be more sensitive to current density than to the content of ammonium sulphate added. By applying an adequate current density at both pH 3 and pH 7 of the catholyte, maximum current efficiency can be attained and a slightly higher current density is applicable at pH 3 than at pH 7. (L17; Mn)

272-L.* Vinyl-Coated Steel Sheets: Color, Pattern, Protection. *Iron Age*, v. 183, Mar. 12, 1959, p. 128-130.

Layer of semi-rigid vinyl sheeting bonded to conventional steel sheet. Liquid vinyl can be roller coated. (L26p, ST, 4-53)

273-L.* Better Finishes Mean New Uses for Aluminum Die Castings. F. M. Metrailer. *Iron Age*, v. 183, Mar. 12, 1959, p. 134-136.

Acid cleaning, ball burnishing, Cr plating. (L-general; Al, 5-61)

274-L.* Anodised Aluminum Windings. *Light Metals*, v. 22, Feb. 1959, p. 55.

Production of insulation on Al strip and foil by anodizing. Resulting windings are heat resistant. (L19, T1b; Al-b, Cu, Zn, 4-53, 4-56, 17-57)

275-L.* (German.) Production of Electrodeposited Hard Cu Layers. H. Spahn and H. Tippmann. *Metalloberflache*, v. 13, Feb. 1959, p. 38-39.

Addition of phenosulphonic acid to the electrolyte to increase hardness of resulting Cu layer. (L17, Q29; Cu)

276-L.* (German.) New Development in Metallizing. Pt. 4. H. Reininger. *Metalloberflache*, v. 13, Feb. 1959, p. 49-52.

Properties of coatings producted by metal spraying of Al, Cu, Zn. (L23; Al, Cu, Zn)

277-L. (German.) Carbonate in Cyanidic Baths. F. Elser. *Metalloberflache*, v. 13, Feb. 1959, p. 52-55.

Small additions of carbonates such as soda or potash increase bath conductivity. 15 ref. (L17a)

278-L.* (German.) Hard Chromium Plating of Tools and Machine Components. Pt. 1. E. Zmihorski. *Metalloberflache*, v. 13, Feb. 1959, p. 56-59.

Influence of deposit thickness, current density and surface roughness of the part on the adherence of Cr layer. Pretreatment, current density and position of part for immersion into the bath. (L17, W25; Cr)

279-L.* How to Choose the Right Cleaning Process. Pt. 2. D. J. Fishlock. *Metalworking Production*, v. 103, Feb. 13, 1959, p. 277-282.

Emulsion, solvent and ultrasonic cleaning methods. (L10f, L12)

280-L.* How a Missile Maker Finishes Magnesium. E. I. Weed. *Modern Metals*, v. 15, Feb. 1959, p. 52-63.

Chromating, varnishing and enameling for electronic components. (L-general, T1; Mg-b)

281-L.* New Process Plates Chromium on Aluminum. *Modern Metals*, v. 15, Feb. 1959, p. 58.

Chrom-Lume process deposits Cr directly on Al to produce a strong adherent bond and a wider measure of ductility for greater stress absorption. (L17; Al, *Cr*)

282-L.* Flow-Brightened Electro-Tin in Electronic Equipment. B. Keysselitz. *Tin and Its Uses*, no. 45, Winter 1958, p. 10-13.

Tin plating radio and TV chassis for tropical service. (L17, T1; Sn)

283-L.* Submerged-Arc Welding Reclaims Blooming Mill Rolls. J. J. Matusek. *Welding Engineer*, v. 44, Mar. 1959, p. 38-39.

High-carbon low-alloy rolls resurfaced for use as roughing rolls. Preheating used to counteract cracking. (L24, K1e, W23k; CN-r)

284-L.* (Italian.) Notes on Blast Cleaning. *Fonderia*, v. 7, Oct. 1958, p. 427-433.

Advantages of shot over sand blasting; compressed air and centrifugal spraying methods; shot peening; types of shot; selection of shot. (L10c, G23n, W2a)

285-L.* Mechanical Blast-Cleaning of Carbon and Alloy Steel Strip. Gilbert D. Dill. *Iron and Steel Engineer*, v. 36, Feb. 1959, p. 149-153.

Cleaning of hot rolled stock before fabricating products or before cold reduction. Blast etching to provide special finishes. Economies. (L10c; ST, 4-53)

286-L.* Processes for Pickling Titanium and Its Alloys. D. J. Fishlock. *Metal Finishing Journal*, v. 5, Feb. 1959, p. 55-58.

Finishing Ti and high-Ti alloys, including 2% Al, 2% Mn; 4% Al, 4% Mn; 5% Al, 2% Sn; and 6% Al, 4% V alloys. (L12g; Ti-b, *Al, Mn, Sn, V*)

287-L.* Colmonoy Sprayweld Process and Its Applications. W. J. Burling Smith. *Welding and Metal Fabrication*, v. 27, Feb. 1959, p. 54-60.

Surface preparation, spraying, fusing alloy to base with oxy-acetylene torch, furnace or induction heating. Typical composition, physical properties, resistance to corrosion, resistance to wear, machinability and applications for sprayed Ni alloys. (L23; Ni-b)

288-L.* (German.) Adhesion of Enamel on Cast Iron. Alexander Hauttmann. *Giesserei*, v. 46, Feb. 26, 1959, p. 105-114.

Influence of chemical composition and grain structure of the cast iron base; influence of the molding sand and facing agents, cooling, descaling; type of enamel and layer thickness. (L27, 2-59; NM-g34, 8-71, CI)

289-L.* (German.) Advantages of Hard-Chromium Plating Over Metal Spraying and Welding. Werner Schmitt. *Werkstatt und Betrieb*, v. 92, Feb. 1959, p. 77-80.

Advantages of electroplated Cr are hardness, wear and corrosion resistance, good adherence, low plating temperature and small variations in thickness. 26 ref. (L17c; Cr, 8-62)

290-L.* (German.) Roll-Bonding Technique and Possible Applications. H. F. W. Suppus. *Werkstattstechnik*, v. 49, Jan. 1959, p. 31-34.

Production methods of roll-bonding. Unbonded areas are inflated. Applications include heat exchangers, beams, vehicle bodies. 4 ref. (L22, 8-66; Al)

291-L. Cleaning Time Halved by Huge Blast Barrel. *Foundry*, v. 87, Mar. 1959, p. 168.

A 72-cu. ft. barrel cleans loads averaging more than 5000 lb. each. (L10d)

292-L. Epoxy Resins for Resistant Surface Coatings. *Industrial Finishing (London)*, v. 11, Feb. 1959, p. 25-27.

Properties and applications as metal finishes and tools. (L26p; NM-d, 17-57)

293-L. Full Body Dip System at American Motors. Vene W. Westfall. *Plating*, v. 46, Mar. 1959, p. 241-246.

Automobile bodies coated with corrosion resistant paint by submerging in tank. (L16, T21a)

294-L.* New High-Purity Aluminum Coatings. J. J. Utz and S. Kritzer. *Materials in Design Engineering*, v. 49, Feb. 1959, p. 88-89.

Electrolytic Al is being considered as a replacement for Cd to protect steel surfaces against corrosion. Adherent coatings have been produced on Cu, Mg, Ag, Au, Fe, Zn and Ni surfaces. Both corrosion resistance and electrical insulation are excellent. (L17; ST, Al-a, Cu, Mg, Ag, Au, Fe, Zn, Ni)

295-L.* Ceramic Coatings for Insulation. Alan V. Levy. *Metal Progress*, v. 75, Mar. 1959, p. 86-87.

Two types of coatings to withstand 3000° F. and above have been developed. One type is a flame-sprayed ceramic oxide; the other is a metal-reinforced ceramic which is applied by troweling a ramming mix into a metallic matrix attached to the structural base metal. (L27, 2-62)

296-L.* Coating for Re-Entry. W. L. Aves. *Metal Progress*, v. 75, Mar. 1959, p. 90-94, 189-190.

A new concept in a laminated coating for high-temperature protection appears to have solved corrosion and erosion problems of re-entry into the atmosphere. Alternate layers of Mo and alumina provide excellent protection from rocket blast at 4500° F. By varying thickness and constitution of the layers, many combinations,

each with unique properties for a specific application, can be devised. (L23, L27; Mo, Al, 2-62)

297-L.* Missile-Maker's Titanium Plating Process. C. W. Handova. *Products Finishing*, v. 23, Feb. 1959, p. 40-42.

Plating Ti with Ni, Cu, Ag and Au to provide a tough, electrically conductive coat. (L17, L16, Ti, *Ag, Au, Cu,* Ni)

298-L.* Electroless Copper Plating in Printed Circuitry. E. B. Saubestre. *Sylvania Technologist*, v. 12, Jan. 1959, p. 6-11.

Deposition of Cu films on plastic printed circuit boards by chemical reduction or "electroless" plating. Reducing agents, sensitizers and coppering solutions. Coppering of unclad laminates. 14 ref. (L28, T1; Cu)

299-L. (Translation.) Metal Smoothing: Radial Heat-Pressure Process for Boosting Wear Resistance. B. M. Askinazi. *Machine Design*, v. 31, Feb. 5, 1959, p. 29-32. (From *Metallovedenie i Obratka Metallov*, Sept. 1958, p. 49-53.)

See item 816-L, 1958. (L13p; ST)

300-L. (Translation—BISI no. 871.) Fundamentals of Acid Copper Plating and of the Cupatier Process. W. Strauss and E. Roth. *Metalloberflache*, v. 11, Sept. 1957, p. 281-285.

See item 29-L, 1958. (L17; Fe, Cu)

301-L. (Translation—Brutcher no 4421.) Universal Electrolyte for the Polishing of Stainless and Heat Resisting Steels, Low-Carbon Steels and Titanium Alloy VT-5. G. I. Parfessa and V. A. Sidlyarenko. *Avtomaticheskaya Svarka*, v. 11, no. 7, 1958, p. 83-84.

Recommended electrolyte compositions; voltages; current densities; cathode-anode distances. (L13p; SS, Ti-b, CN-g, 7-51)

302-L.* Building Up of Metal Components. Marcel Doncourt. *Iron and Steel*, v. 32, Feb. 1959, p. 68-70.

Application of carbon steel and Mo metallization to the repair of rolling mill rolls. Advantages in comparison with building up by arc welding include quick operation, no risk of cracking or flaws and the possibility of using a wide range of metals. (L24, L23; AY, *Mo,* W23k, 18-72)

303-L. Coating of Uranium Dioxide Powders With Metallic Tungsten Films. Joseph H. Oxley, James F. Hannah, John M. Blocher, Jr., and Ivor E. Campbell. Battelle Memorial Institute. *U. S. Atomic Energy Commission, BMI-1297*, Oct. 8, 1958, 10 p. (Available from U. S. Office of Technical Services, Washington 25, D.C.) $.50.

Modified vapor-deposition technique employing the powder to be coated as the bed in a fluidized-bed reactor. Coating is achieved by hydrogen reduction of tungsten hexachloride in a fluidized bed at a reaction temperature of about 400° C. High conversions of tungsten hexachloride to deposited metal are obtained at an excess H ratio of about 125 to 1. (L25; U, W)

304-L. Pickling of the Zircaloys Prior to Corrosion Exposure. S. Kass, D. J. Fontanese, A. E. Oaks and D. B. Scott. Bettis Plant, Westinghouse Electric Corp. *U. S. Atomic Energy Commission, WAPD-TM-141*, Sept. 1958, 61 p. (Available from U. S. Office of Technical Services, Washington 25, D.C.) $1.75.

Since accelerated corrosion is influenced by the incomplete removal of the etchant or permitting the etchant reaction product to dry upon the Zr alloy surfaces, common ion neutralizing and sulphuric acid rinses subsequent to pickling are used to facilitate surface cleaning and minimize acid entrapment. (L12g, R-general; Zr-b)

305-L.* (Italian.) Finishing Operations on Stainless Steels Containing Nickel and Chromium. *Nickel*, Oct. 1958, p. 14-18.

Solutions and procedures for degreasing and pickling with and without dipping; mechanical polishing; solutions for detection of presence of iron or iron oxide particles on steel surface. (L10, L12; SS, *Cr, Ni*)

306-L.* Dissolution of Ferric Hydroxide in Sequestered Alkali. H. F. Ferlin, P. Snikeris and J. V. Karabinos. *Illinois State Academy of Science, Transactions*, v. 51, no. 1-2, 1958, p. 79-82.

Solubility of precipitated ferric hydroxide in sodium hydroxide solutions containing various sequestering agents and under a variety of conditions in relation to the derusting of iron and steel. (L12k, P12e; Fe, ST, *O,* NM-a34)

307-L.* Deposition by Thermal Evaporation of Thin Films of Titanium and Zirconium for Tritium Targets. V. D. Scott and L. W. Owen. *British Journal of Applied Physics*, v. 10, Feb. 1959, p. 91-93.

Equipment and procedure for applying thin films of Ti and Zr as Tr carriers to backings of Cu, Au and Pt. A large proportion of the coatings prepared absorbed high atom ratios of Tr, Ti being more satisfactory in this respect than Zr. 8 ref. (L25; Ti, Zr, 14-62)

308-L.* (German.) New Surface Protection Method for Aluminum. *Chemische Rundschau*, v. 66, Feb. 1, 1959, p. 65.

Change of the aluminum oxide skin into a protective chemical compound by dipping. All alloys except those with high Cu content can be coated in this manner. (L14; Al-b)

309-L.* (Italian.) Surface Treatment of Zinc Alloy Die Castings. Gianluigi Galli. *Galvanotecnica*, v. 9, Dec. 1958, p. 301-308.

Pretreatment to obtain optimum surface conditions for deposition of Cu, bronze or brass plus plus Ni-Cr. Porosity, adherence and corrosion resistance of deposits. 9 ref. (L10, L12, L17; 5-61, Zn-b, *Cu, Ni, Cr*)

310-L.* (Italian.) Electrodeposition of Cadmium. C. Quattrone. *Galvanotecnica*, v. 9, Dec. 1958, p. 309-311.

Preparation of bath; effect of metallic impurities and organic substances in bath; elimination of impurities or mitigation of effects; polishing and stabilizing of deposits; bath control. (L17a, 3-69; Cd)

311-L.* (Japanese.) Bright Copper Plating From a Cyanide Bath in the Presence of Potassium Tartrate. Pt. 2. Effect of Inorganic Addition Agents and Impurities. Teiichi Ito. *Nagoya Goverment Industrial Research Institute, Reports*, v. 8, Feb. 1959, p. 138-142.

Effect of various inorganic addition agents. Potassium ferricyanide increases the bright range of current density. Lead is effective for leveling action. 5 ref. (L17a; Cu)

312-L. Pickling Installations for Wire and Strip. Friedmund Rub. *Draht*, v. 10, Feb. 1959, p. 53-59.

Installation design; pickling methods, including electrolytic pickling; materials flow; safety considerations. (L12g, W3; 4-53, 4-61)

313-L. Aluminum Finishes for Use in Electronics. Walter E. Pocock. *Electronics*, v. 32, Feb. 20, 1959, p. 58-59.

Finishes for Al will protect it against corrosion, alter its resistivity, improve its solderability or change its color. Production methods and application data. (L-general; Al-b)

314-L. Metal Spraying in Northern Latitudes. Sigurd B. Giertsen. *Electroplating and Metal Finishing*, v. 12, Mar. 1959, p. 99-101.

Problems peculiar to cold climates. (L23)

315-L. Blast Descaling. *Production*, v. 42, Oct. 1958, p. 80-81.

Continuous shot blasting line replaces batch pickling operation, descales steel plate and coils. (L10c, 1-61; ST, 4-53)

316-L. Barrel Finishing Stainless Steel Hex Nuts. Charles G. Tuvek. *Products Finishing (London)*, v. 23, Feb. 1959, p. 50.

Procedure for producing high luster and color. (L10d, T7f; SS)

317-L. (Russian.) Hard Surfacing of Cylindrical Products by Automatic Single-Electrode Submerged-Arc Welding. F. F. Benua. *Svarochnoe Proizvodstvo*, Feb. 1959, p. 25-28.

Method for producing weld deposited coatings spirally upon cylindrical surfaces by submerged arc welding. (L24, K1e)

318-L.* Tough New Coating Can Be Tailored to Fit. W. E. Kemp. *Pipe Line Industry*, v. 10, Mar. 1959, p. 48-50.

Poly-epoxy resin, wedded cousin of coal tar and epoxy resin, brings control of flexibility, hardness, abrasion resistance to pipe lines. (L26b, L26p, T26r; ST)

319-L.* Finishing Tinplate in the Flat. J. T. Leonard. *Product Finishing*, v. 12, Mar. 1959, p. 54-61, 76.

Review of methods, equipment and materials for lithography and interior coating. (L26b; ST, 4-53, *Sn*, 8-65)

320-L.* Re-Finishing Oil Drums. *Product Finishing*, v. 12, Mar. 1959, p. 72-76.

Surface preparation, coating with epoxy-phenolic lacquer and drying. (L26n, W12c; ST)

321-L.* (Czech.) Hard Facing of Pilger Rolls. Osvald Pejcoch and Jaroslav Kuznik. *Hutnicke Listy*, v. 14, Feb. 1959, p. 173-184.

Lifetime of carbon steel pilger rolls is increased by hard facing with graphite-coated Cr-Ni steel electrodes. 9 ref. (L24, W23k; CN, SS)

322-L.* (German.) Anti-Corrosion Behavior of Zinc-Rich Paints. Hans Sagel. *Werkstoffe und Korrosion*, v. 10, Feb. 1959, p. 66-70.

Decrease in corrosion of structural steel and sheet exposed to atmospheric conditions is achieved by painting the surfaces with zinc-rich paints composed of zinc dust (60% metallic Zn), polystyrol and solvents. 16 ref. (L26n; ST, Zn, NM-g30, SGB-s)

323-L. Neoprene and "Hypalon" for Large and Small Pipes. *Corrosion Technology*, v. 6, Mar. 1959, p. 71-72, 89.

Lining of large pipes with access to the interior; small pipes which cannot be entered for application and inspection. (L26r; 4-60)

324-L. Sheet Neoprene Linings for Chemical Plant. *Corrosion Technology*, v. 6, Mar. 1959, p. 75-76.

Surface preparation for neoprene coating; chemical properties, applications of the coatings. (L26r)

325-L. Spray and Brush-Applied Neoprene Coatings. P. G. Blackburn. *Corrosion Technology*, v. 6, Mar. 1959, p. 77-78.

(L26r)

326-L. Radyne-Stellite Sprinkle-Fuse Hardfacing Process. *Machinery (London)*, v. 94, Mar. 18, 1959, p. 610.

Suitable for hard facing such parts as valve seats, pump sealing rings and thrust washers. Provides resistance to abrasion, corrosion and heat. (L24)

327-L. Organic Coatings for Metal Products. Robert J. Fabian. *Materials in Design Engineering*, v. 49, Mar. 1959, p. 113-128.

Manual on characteristics and applications of alkyds, ureas, melamines, acrylics, bitumens, cellulosics, coumarone-indenes, epoxies, fluorocarbons, phenolics, polyamides, rubbers, silicones, styrene-butadienes, urethanes and vinyls. 14 ref. (L26, NM-g)

328-L. Electrodeposition of Copper. Survey of Progress, 1958. *Product Finishing*, v. 12, Mar. 1959, p. 89-90.

16 ref. (L17; Cu)

329-L. (Russian.) Corrosion Prevention by Copper and Nickel Plating of Magnesium Alloys. V. I. Lainer and G. S. Konstantinova. *Vestnik Mashinostroeniya*, v. 39, Feb. 1959, p. 62-65.

Techniques and solutions to prevent surface corrosion. 5 ref. (L 17, R-general; Mg-b, *Ni, Cu*)

330-L. (Russian.) Improvements in Electroplating. G. B. Taurit. *Vestnik Mashinostroeniya*, v. 39, Feb. 1959, p. 65-69.

Higher Cu concentration in the solution and an elevated bath temperature raise current density and current yield. (L17; *Cu*)

331-L. (Russian.) Leveling of Ferrous Metal Surfaces by Galvanic Copper and Nickel Plating. N. A. Solov'ev. *Vestnik Mashinostroeniya*, v. 39, Feb. 1959, p. 69-71.

Cu and Ni plating remedies such flaws as porosity, cavities and other surface imperfections. (L17; *Cu, Ni*, 9-71)

332-L. Electroforming of Linear Accelerator Structures. J. A. Pope. Stanford University. (Office of Naval Research.) *U. S. Office of Technical Services*, PB 131944, June 1957, 22 p. $.75.

Electroforming method is preferred over mechanical fabrication techniques because it allows baking the structure at high temperatures for outgassing and sealing off the vacuum-tight accelerator tube. (L18, X27; Cu)

333-L. Cleaning and Passivation of Corrosion-Resisting Steels. L. Lowry and J. Thompson. Naval Gun Factory. *U. S. Office of Technical Services*, PB 131964, n.d., 28 p. $.75.

Removing surface contaminants such as scale, flux, slag, metallic lubricant and iron from the surface of corrosion resisting steels and passivating in nitric acid solutions as a final cleaning operation. (L12g, R10c; SS)

334-L.* (German.) Hot Chromizing. Jan Raczka. *Freiberger Forschungshefte*, v. B30-2, 1958, p. 96-118.

Malleable cast iron hot chromized by powder mixture composed of Cr, C, Mn, Si, P, S, Al, Cu and Fe. Tensile strength and elongation of whiteheart cast iron decreased slightly. Strength of blackheart cast iron also decreased somewhat. 18 ref. (L15, Q-general; CI-s, *Cr, C, Mn, Si, P, S, Al, Cu, Fe*)

335-L.* (German.) Electrolytic Polishing of Aluminum and Iron. E. Lichtenberger-Bajza. *Metalloberflache*, v. 13, Mar. 1959, p. 65-71.

Carbon steel, toolsteel, low-alloy steel and stainless steel treated in four different baths. Resulting surface layers investigated by electrical methods. Data for Al and several Al alloys containing Mg and Zn. 8 ref. (L13p; CN, TS, AY, SS, Al-b, *Mg*)

336-L.* (German.) Surface Enlargement of Aluminum by Etching. G. Hahn. *Metalloberflache*, v. 13, Mar. 1959, p. 72-75.

Surface enlargement of Al foil for electrolytic condensers is not practical by mechanical means. By chemical or electrochemical etching an area increase of 5 to 9 times can be achieved, depending on surface condition and impurities. 6 ref. (L13q; Al, 4-56)

337-L.* (German.) Hard Chromium Plating of Light Metal Cylinders. P. Csokan. *Metalloberflache*, v. 13, Mar. 1959, p. 81-83.

Pickling with a mixture of HF and HNO_3 eliminates necessity of prezincing. A fluoride film prevents oxidizing before the hard Cr plating. (L17, L12g; Al-b, *Cr*)

338-L.* (German.) Practical Results in the Surface Treatment of Aluminum. A. Domony, E. Lichtenberger-Bajza and P. Csokan. *Metalloberflache*, v. 13, Mar. 1959, p. 84-87.

Effect of Al composition, surface roughness and water impurities on layers obtained by the boiling water treatment. Thickness, structure, corrosion resistance and electrical capacitance of these layers. 15 ref. (L14, L19; Al)

339-L.* (German.) Modern Silver Plating. Silvrex Method. W. Metzger. *Metalloberflache*, v. 13, Mar. 1959, p. 91-93.

Hard coatings resistant to corrosion, wear and tarnishing can be obtained with a special electrolyte containing inorganic and organic compounds. Current density can vary within a wide range. (L17; Ag)

340-L.* Preparatory Treatments for Protective Coatings. Pt. 1. Derusting and Descaling. *Corrosion Prevention & Control*, v. 6, Feb. 1959, p. 41-43.

Various mechanical and chemical methods; bath constituents. (L10, L12)

341-L.* With Platinum-Like Properties Tin-Nickel Electroplate Is Used for Watches, Telescopes and Drawing Instruments. *Industrial Finishing (London)*, v. 11, Mar. 1959, p. 27-28.

Alloy of Sn and Ni in the proportion of 65% Sn, 35% Ni. (L17, T9, T10, 17-57; *Sn, Ni*)

342-L.* Effect of Surface Preparation on the Adhesion of Bearing Metal to Steel. C. J. Thwaites. *Metallurgia*, v. 59, Mar. 1959, p. 121-124.

While shot-blasting may provide adequate adhesion, preparation by pickling is to be preferred where maximum bond strength is required. (L10c, L12g, T7d; ST)

343-L.* Oxide Adherence and Nickel Flashing in Vitreous Enameling. H. Crystal and G. Bullock. *American Ceramic Society, Journal*, v. 42, Jan. 1, 1959, p. 30-39.

Influence of iron deposition and nickel flashing on adherence of oxides to enameling-grade sheet steel. 74 ref. (L27, L17; ST, *Ni*)

344-L. Roll-Bonding Hafnium, Titanium, and Zircaloy-2. E. S. Byron and S. W. Porembka. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 14-22. U. S. Office of Technical Services, Washington 25, D. C.

Roll-bonding is a possible method of cladding certain control rod materials. Samples of Hf, Ti and Zircaloy-2 were roll-bonded in various combinations and at various temperatures and percentage reductions. Hf-Ti bonds are the only ones that failed consistently during bend testing, while the Zircaloy-Ti bonds displayed good corrosion resistance, ductility and shear strength. (L22, T11j; Zr-b, Hf, Ti)

345-L.* (Slovakian.) Use of Powder Filled Electrodes in the Facing of Rolls. Ladislav Lakatos. *Zvaranie*, v. 8, Jan. 1959, p. 12-16.

Optimum welding procedures determined by experimental welds. The homogeneity of filler metal was tested by spectral analysis. (L24, W23k, W29h; AY)

346-L. Effect of Halide Addition to the Sulfuric Acid Pickling Bath. M. Haftel and W. L. Reichel. Industrial Test Laboratory, Philadelphia Naval Shipyard. *U. S. Office of Technical Services*, PB 131794, Feb. 1957, 27 p. $.75.

Reduces acid attack on base metal, especially for special treatment steel; concentrations of 0.1% recommended. (L12g, 2-60; ST)

347-L.* Coatings for Vacuum Metallizing on Plastics. M. A. Self and John Scharnberg. *Plastics Technology*, v. 5, Mar. 1959, p. 32-35, 54.

Current application techniques and formations. (L23, 1-73; Al, NM-d)

348-L.* (Japanese.) Studies on Ceramic Coatings: Coatings for High-Temperature Protection of Molybdenum. Hirokichi Tanaka, Ryozo Hayami, Masatane Kadota and Hideo Tanigawa. *Osaka Industrial Research Institute, Bulletin*, v. 8, Oct. 1957, p. 217-225.

Evaluation of frit-type coating with high glass content and chromium-frit type with low glass content. 5 ref. (L27; Mo)

349-L. (Book.) Finishing Handbook and Directory. Christopher S. Woollard, Editor. 509 p. 1959. Sawell Publications Ltd., 4 Ludgate Circus, London, E.C.4., England.

Glossary, bibliography, directories, tables and technical chapters. (L-general, 11-67)

350-L.* Plated Aluminum Die Castings for Washing Machine Agitator Parts. F. M. Metrailer. *Metal Products Manufacturing*, v. 16, Apr. 1959, p. 77-79.

Bright Ni plating of Al alloy. (L17; *Ni*, Al-b, 5-61, 8-62)

351-L.* The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating. Pt. 5. Effect of Polishing on the Durability of Nickel Plated Mild Steel. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*,1958, p. 45-52.

Greased belt polished surfaces cause superior corrosion resistance to dry belt surfaces of comparable surface roughness and, within types of polishing, fine finishes (10 μin.) show better durability than coarse finishes (40 μin.) The highest corrosion rate was observed with the coarse dry belt surface. 10 ref. (L10b, R-general; CN, 8-62, Ni)

352-L. Ion Exchange and the Pickling of Magnesium Sheet. Robert E. Anderson. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 55-59.

Pickling bath contains about 28% acetic acid and 8% sodium nitrate. As the bath is used the acid is converted to magnesium acetate. This change in solution composition gives progressively slower pickling rates and variation in the nature of the surface produced. Ion exchange strips the Mg from the spent pickle solution and returns the re-formed acid to the line for re-use. 9 ref. (L12g, L17a, A11d; Mg, 4-53)

353-L.* Cleaning, Pickling and Preparatory Surface Treatment. William P. Innes. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 81-88.

Degree of cleanliness depends on the finishing operation being performed, the basis metal, the type and condition of the soil and the equipment available. A higher degree of cleanliness is generally required for electroplating than for phosphating, chemical polishing, electropolishing or chromating. 10 ref. (L12)

354-L.* Typical Plating Solution. Cyanide Zinc. Edward F. Foley, Jr. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 89-92.

Equipment, bath composition, make-up, operation and control of the bath. Major contaminants encountered in commercial Zn plating are Cu, Cd, Pb, Cr, Ni and carbonate. Effect of contamination and recommended remedies. (L17, 3-69; Zn, *Cu, Cd, Pb, Cr, Ni*)

355-L.* Alloy Plating Systems for Aircraft Engines. Bruce E. Scott. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 93-96.

Pb-In, Pb-Sn, Ag-Pb, Ni-P, Cd-Sn and Ni-Cd systems in relation to heat and corrosion resistance. 13 ref. (L17, T24b, R-general, 2-62; Pb, In, Sn, Ag, Ni, P, Cd)

356-L.* Hard Anodizing of Aircraft Fuel Metering Components. Harold J. Wiesner and Henry A. Meers. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 105-117.

High Cu-Al alloys such as X-2219, 2024 and 2017 may be satisfactorily hard coated in a solution containing sulphuric acid, oxalic acid at temperatures below 50° F. 10 ref. (L19; Al-b, *Cu*)

357-L.* Pitting in Thick Chromium Deposits. Donald R. Millage and Wilbur E. Hague. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 118-122.

Porosity of the base metal is the basic cause of hydrogen pits in thick Cr plate that has been deposited from a chromic acid solution containing a surface-active agent. If the same base metal is plated in a chromic acid solution that does not contain a surface-active agent, the thick Cr plate will attempt to bridge the defective area of the base metal. 21 ref. (L17; *Cr*, 9-68)

358-L.* Pattern Plating With Electrodeposits. Samuel S. Frey. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society,* 1958, p. 150-156.

Creation of electrodeposits possessing patterns without any masking device. Patterns are developed in a Ni deposit from proprietary Ni baths or a Watts-type bath with a few simple additives. Kraq-o-lite designates the process involved in making these patterns in Ni. The Ni deposit bearing the pattern can be put on a variety of metals and can be coated over with an assortment of electrodeposits. 6 ref. (L17; Ni)

359-L.* (German.) Surface Protection of Steel Drums. B. Hottenroth. *Chemie-Ingenieur-Technik,* v. 31, Jan. 1959, p. 36-43.

Types of corrosive attack; sheet steel properties; inner and outer coatings of phosphate, paints and plastics; production methods; chemical and mechanical testing techniques. 56 ref. (L26, L14b, R10; 4-53, ST)

360-L.* (Swedish.) Enamelling of Cast Iron. Rudolf Marker. *Gjuteriet,* v. 49, no. 2, 1959, p. 33-34, 36, 38.

Effect of composition, melting and casting techniques, molding and mold materials, cleaning and repair welding on the quality of enamel. 5 ref. (L27, E-general; CI-n)

361-L.* Application of New Metal Coating Which Withstands 2000° F. James F. Rice. *Industrial Heating,* v. 26, Mar. 1959, p. 554, 556, 558, 560-561.

High test qualities of the new coating are attained by a special blending of two resins with a ceramic powder compound. From ambient to 1000° F. the resins provide the protection. At about 1000° F. the resins burn out, by which time the ceramics have fused, thus enabling the coating to be protective up to 2000° F. (L27; 8-71, 2-62)

362-L.* Cermets: Two New Forms. William H. Herz. *Materials in Design Engineering,* v. 49, Apr. 1959, p. 98-99.

Cermet coatings produced by flame spraying; spray forming of cermet parts. (L27; 6-70)

363-L.* Recent Developments in Chromium Plating. D. E. Weimer. *Metal Finishing Journal,* v. 51, Mar. 1959, p. 89-97.

Self-regulating catalysts, high-speed solutions, spray suppressants, crack-free deposits. 14 ref. (L17; Cr)

364-L.* Galvanized Sheet for Outdoor Applications. M. H. Davies. *Metal Finishing Journal,* v. 5, Mar. 1959, p. 98-100.

Hot dip galvanizing, painting of galvanized sheet, service life of sheets. (L16, L26n, R3; ST, *Zn,* 4-53, 8-65)

365-L.* Processing and Painting of Sheet-Metal Components. W. Stein and E. Podmore. *Metal Finishing Journal,* v. 5, Mar. 1959, p. 101-112.

Cleaning, precoating and painting. (L12, L14, L26; CN, Al-b, Cu-n)

366-L.* Production of Anodic Finishes in Automatic Plants. A. W. Brace. *Sheet Metal Industries,* v. 36, Apr. 1959, p. 243-253, 256. 5 ref. (L19, 18-74; Al-b)

367-L.* (German.) Chemical Surface Treatment of Steel Strips. Werner Rausch. *Stahl und Eisen,* v. 79, Mar. 19, 1959, p. 349-356.

Surface treatment improves resistance against corrosion during storage; increases adhesive properties for subsequent coating with plastics and varnishes; improves workability during deep drawing. 19 ref. (L14b; CN, 4-53)

368-L.* (German.) Titanium Content of Steel as a Controlling Factor in the Quality of Enamel Layers. Walter Tepohl. *Stahl und Eisen,* v. 79, Mar. 19, 1959, p. 356-361.

The enamel layer applied to steel sheets 2.4 to 3 mm. thick is substantially improved if the steel contains Ti in excess of 0.10%. Similar results can, however, be obtained on thinner sheet without Ti content by pretreatment in a Ni bath. 8 ref. (L27, L17, 2-60; CN-g, *Ti*)

369-L. Vinyl Coated Steel Produced by Continuous Mill Process. *Automotive Industries,* v. 120, Mar. 15, 1959, p. 291, 326, 328, 330.

(L26p; ST, NM-d)

370-L. Design and Engineering Problems in Plating Room Layout and Installation. Hugh V. McGuire. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society,* 1958, p. 128-134.

Layout in relation to safe practice. (L17, A7, 18-67)

371-L. When and How to Select an Organic Coating. H. G. Beck. *Technical Proceedings*

of the 45th Annual Convention, American Electroplaters' Society, 1958, p. 139-140.

Adhesion of organic coatings is a function of the coating material, the substrate to be coated and the interface between the coating and coated surface. Chemical pretreatment of the surface is important in obtaining consistent results in the adhesion of the organic coating to the substrate. (L26)

372-L. Vinyl Plastisols and Organosols as Product Finishes. Fremont L. Scott and William C. Hosford. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 141-144.

Mechanical properties and adhesion of plastisol and organosol films on metallic surfaces. (L26p)

373-L. Stainless Steel Overlay Coats an "Ulcered Stomach". *Welding Engineer*, v. 44, Apr. 1959, p. 82-86.

Mild steel digester for production of wood pulp protected by weld deposition of stainless steel. (L24, K1d, T29r; CN, SS)

374-L.* (German.) Surface Pretreatment for Nickel Plating. *Galvanotechnik*, v. 50, Mar. 15, 1959, p. 118-123.

Directions on pretreatment of various materials to be plated. (L10, L12, L17; Ni)

375-L.* (German.) Kinds of Nickel Baths. *Galvanotechnik*, v. 50, Mar. 15, 1959, p. 123-127.

Specification of various baths. The choice of the bath depends on properties to be given to the coating, such as luster, smoothness, ductility, corrosion, resistance, plasticity, hardness, tensile strength. (L17a, Ni)

376-L.* (German.) Heavy Nickel Plating and Hard Nickel Plating. Hans Benninghoff. *Galvanotechnik*, v. 50, Mar. 15, 1959, p. 127-131.

Since the deposition thickness for Cr is more limited than for Ni it is expedient to first hard nickel coat the surface up to a sufficient thickness. Then machining and final Cr plating are possible. (L17; Ni, Cr)

377-L.* (German.) Elimination of Defects in Nickel Plating. O. A. Stoker, A. Korbelak and S. A. Carrano. *Galvanotechnik*, v. 50, Mar. 15, 1959, p. 132-138.

Causes of defects and specific remedies. 4 ref. (L17; Ni, 9)

378-L.* (German.) Removal of Impurities From Nickel Bath. *Galvanotechnik*, v. 50, Mar. 15, 1959, p. 139-143.

Many defects in nickel plating result from impurities in the bath. Particular kinds of impurities and their effect on the quality of Ni plates with special reference to appearance, adhesion, ductility, hardness and corrosion resistance. (L17a, 3-69; Ni)

379-L.* (German.) Kanigen Process. *Galvanotechnik*, v. 50, Mar. 15, 1959, p. 144-146.

Chemical and currentless nickel plating, because of its amorphous and noncrystalline structure, has the advantage of being more passive against corrosive elements. Absence of porosity at thicknesses from 5 micromillimeters upwards offers favorable corrosion safety. (L28; Ni)

380-L.* (German.) Galvanizing of Cast Iron. *Giesserei-Praxis*, Mar. 25, 1959, p. 102-103.

Nature and thickness of coatings on clean steel and cast iron surfaces depend on bath temperature and process duration. Material which is sand-free and has high Si content and 10% P is optimum for galvanizing. (L16; CI, ST, *Zn*)

381-L.* (French.) Life of Plowshares and Mold Boards Prolonged by Weld Facing With Toolsteel. I. Michels and E. Iovitiu. *Metalurgia si Constructia de Masini*, 1958, p. 68-74.

Description of wear tests. Hardness and wear data for various steels used for plowshares and for toolsteels used in facing. 11 ref. (L24, T3p, CN-b, TS-b)

382-L.* (German.) Galvanizing of Gray Cast Iron. P. Deboute. *Werkstoffe und Korrosion*, v. 10, Mar. 1959, p. 148-151.

Zinc coatings obtained experimentally with dipping times of 2 to 3 min. Effects of surface pretreatment, bath temperatures and composition of castings on quality and thickness of coating. (L16; CI-n)

383-L.* (Spanish.) Metallurgy of Heterogeneous Weldments. Pt. 1. Steel-Copper Clad Structures. F. A. Calvo and A. Revuelta Hidalgo. *Ciencia y Tecnica de la Soldadura*, v. 9, Jan-Feb. 1959, p. 1/1-1/12.

If thermal stress is avoided molten Cu adheres to a clean steel surface and solidifies without the formation of a

fusion zone. In practice, however, fusion zones of the system iron-iron oxide-copper oxide-copper appear while microfissures filled with Cu exist along the grain boundaries of steel. 13 ref. (L22; ST, Cu)

384-L.* Design Characteristics of Hard-Anodize on Aluminum. Jerome Collins. *Electrical Manufacturing*, v. 63, Apr. 1959, p. 161-163.

Characteristics of the process, electrical and corrosion properties of the film. (L19, P15, R-general; A1-b, 8-73, 17-51)

385-L.* (German.) Up-to-Date Rust Prevention in Steel Structures. Erich V. Schmid. *Chemische Rundschau*, Mar. 1959, p. 109-113.

Some new base paints are compared with red lead in linseed oil. Influence of rolling skin and previous rust, brushing, flame cleaning and blasting, and layer thickness on service life. 4 ref. (L26n, L10; ST, 8-70)

386-L.* Preparation of Metal Film Resistors on Laminated Plastics. G. Siddall and G. Smith. *British Journal of Applied Physics*, v. 10, Jan. 1959, p. 35-39.

Plastic laminates bonded with different polymers were coated with films of Ni-Cr alloy by vacuum evaporation and with sandwich films of Au between bismuth oxide layers deposited by sputtering. (L25, T1p; Au, Ni-b, Cr, NM-d, 7-59, 14-62)

387-L.* Finishing Dental and Medical Apparatus. Stanley H. Urlage. *Industrial Finishing*, v. 35, Apr. 1959, p. 22-24, 26, 28, 30.

Enameling Al and Fe castings and sheet steel. (L26n, T10e; Al, ST, 4-53, 5)

388-L.* Good Degreaser for Aluminum. *Modern Metals*, v. 15, Apr. 1959, p. 56-57.

Vapor degreasing of light metals with perchloroethylene. (L12j; Al, EG-a39)

389-L.* (French.) Bright Nickel Plating in Barrels. L. Ades. *Revue du Nickel*, v. 25, Jan-Feb. 1959, p. 8-13.

Process is economical but quality is often affected by lamination, brown stains, ductility and brittleness. Specific remedies suggested. (L17; Ni)

390-L.* (German.) The Evidal Roll Bonding Process and Its Applications. H. F. W. Suppus. *VDI-Berichte*, v. 39, 1959, p. 31-34.

Production of metal plates for heat exchangers by roll bonding Al-Mg sheets of corrosion resistant composition to sheets of Al-Cu-Mg alloy with greater strength. The interfaces have channels printed before bonding which prevents welding on these areas, permitting the subsequent expansion of the plated metal sheet by blowing high-pressure liquid or gas into the printed channels. 4 ref. (L22; 4-53, Al, Cu, Mg)

391-L.* Recent Developments in Materials and Finishes to Resist Atmospheric Corrosion. E. B. Friedl, L. J. Nowacki and W. H. Safranek. *American Society of Mechanical Engineers*, Paper no. 59-MD-8, 1959, 10 p.

Organic coating vehicle; water-thinned coatings; pigments and additives; surface preparation; application; electroplating; bright crack-free Cr, duplex Ni and bronze alloy. Conversion coatings; anodizing; vapor deposition coatings; metal spraying; hot dipped coatings; powder metal coatings. 33 ref. (L-general, R3; ST, Zn, Al, Ni, Cr)

392-L.* Sprayed Metals and Their Properties. Walter B. Meyer. *Society of Automotive Engineers*, Preprint no. 40 R, 1959, 19 p.

Surface preparation and application; wear, corrosion and oxidation resistance; fusible alloys, ceramic coatings. 9 ref. (L23, L27; ST, SS, Cu, Al, Zn, Ni, Mo, NM-g34)

393-L.* (German.) Effect of Heavy Metal Salts on Currentless Nickel Deposition Speed and Coating Brightness. W. Machu and S. El-Gendi. *Metalloberflache*, v. 13, Apr. 1959, p. 97-103.

Effects of cobalt acetate, zinc sulphate, cadmium sulphate and uranium acetate in a basic Ni bath. 7 ref. (L28; Al, Ni)

394-L.* (German.) Hard-Chromium Plating of Light Metal Cylinders. P. Czokan. *Metalloberflache*, v. 13, Apr. 1959, p. 113-116.

Structure of coating is influenced by the current density. Production of a fine network of channels for better lubrication by anodic etching; repair of defective coatings on used cylinders. 31 ref. (L17; EG-a39, Cr)

395-L.* (Japanese.) Electroplating on Aluminum. Matsuhei Kishi. *Government Mechanical Laboratory, Report*, no. 28, Feb. 1959, 57 p.

Effect of pretreatment on adhesion and corrosion resistance. Electrochemical corrosion predominates so that the closer the anode potential of the plating metal is

to that of Al the better is the resistivity. Cr is better than Cu or Ni. (L17; Al)

396-L.* Deposition of New Chromium-Iron Alloy Plate of Banded Structure. L. D. McGraw, J. A. Gurklis, C. L. Faust and J. E. Bridge. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 302-305.

Bath composition and operating conditions used for electroplating of hard, bright alloy coatings. Bath produces plate with similar physical properties as hard Cr bath, but has higher plate rate and cathode current efficiency. 4 ref. (L17a; Cr, Fe)

397-L.* Plating Tests for Solution Control. J. B. Mohler. *Metal Finishing*, v. 57, Apr. 1959, p. 55-61.

Various popular tests show range of current densities, throwing power and covering power and properties of the solutions and electrodes. 18 ref. (L17, 1-54)

398-L.* Anodic Protective Coating on Magnesium. The Cr-22 Process. R. Wick and M. Reed. *Metal Finishing*, v. 57, Apr. 1959, p. 68-70.

Quantity analysis and depletion rate study of baths in Cr-22 process. Characteristics and performance of coatings produced. (L19; Mg-b, *Cr*)

399-L.* (French.) Phosphatizing and Passivation of the Metals. A. Bayon. *Corrosion et Anticorrosion*, v. 7, Mar. 1959, p. 110-113.

The thickness of metal coatings obtained by passivating is about 0.5 microns; in phosphatizing the thickness amounts to 50 microns. The choice of the process depends on the particular application of the metal to be coated. (L14b, R10d)

400-L.* (German.) Continuous Galvanizing of Wide Strip. Kurt Bayer. *Industrie-Anzeiger*, v. 81, Apr. 21, 1959, p. 122-124.

Description of the Sendzimir process. Results of tests for adhesion and deformability of resultant Zn coatings. (L16, 1-61; ST, *Zn*, 4-53)

401-L.* Electroplating on Certain Transition Metals. (Groups IV, V, VI). E. B. Saubestre. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 305-309.

Adherence plate produced by cathodic treatment prior to plating. Treatment eliminates etching and permits better control of dimensional tolerances. Parts heated after plating require special procedure. Procedure used when coating of Ni and Cu on Ti, Zr, Cb, Ta, Mo and W. Study of Cb and Cb-Ti alloys showed advantages of using anodizing procedure. 39 ref. (L17; Ni, Cu, Ti, Zr, Cb, Ta, Mo, W)

402-L.* A Radioisotopic Study of Leveling in Bright Nickel Electroplating Baths. Seward E. Beacom and Bernard J. Riley. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 309-314.

Radioactive addition agent used in bath substantiated a part of leveling theory by preferential deposition or nine points of irregular surface. 19 ref. (L17a, 1-59; Ni)

403-L. Dialysis for Solution Treatment in the Metal Finishing Industry. Robert Dvorin. *Metal Finishing*, v. 57, Apr. 1959, p. 52-54, 62.

Recent development of acid-resistant membranes makes this technique possible. (L-general, A8b)

404-L. Electrolytic Removal of Impurities. *Metal Finishing*, v 57, Apr. 1959, p. 62.

Low current density electrolysis removes Zn and Pb from copper cyanide baths, Sn and Cu from cyanide zinc baths, and Cu, Fe, Pb, Zn from nickel baths. (L17a, 3-69; Zn, Pb, Sn, Cu, Zr, Fe, Ni)

405-L. Science for Electroplaters. Pt. 46. Organic Salts. L. Serota. *Metal Finishing*, v. 57, Apr. 1959, p. 71-74, 76.

Procedures and conditions when various salts are used as buffers, detergents, foaming and complexing agents. (L17a)

406-L. (German.) Equipment for the Mechanical Descaling of Sheet Metal and Profiles. *Industrie-Anzeiger*, v. 81, Mar. 1959, p. 5-6.

(L10, 1-52)

407-L. (German.) Automatic Electroplating of Automobile Bumpers. L. Walter. *Metalloberflache*, v. 13, Apr. 1959, p. 103-105.

(L17, T21c)

408-L. (German.) Developments in Metal Spraying. H. Reininger. *Metalloberflache*, v. 13, Apr. 1959, p. 116-118.

Corrosion protection; selection of material in relation to environment. (To be continued.) (L23)

409-L. (German.) Equipment for Hard-Chromium Plating of Tools and Machine

Parts. Pt. 3. E. Zmihorski. *Metalloberflache*, v. 13, Apr. 1959, p. 118-119. (L17, T7, 1-52)

410-L. Coatings for Protecting Molybdenum From Oxidation at Elevated Temperature. E. S. Bartlett, H. R. Ogden and R. I. Jaffee. *Defense Metals Information Center*, Report no. 109, PB 151064, Mar. 6, 1959. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Coatings based on Cr, Si, Ni, precious metals, ceramic materials and refractory oxides. The usual methods for coating Mo include electroplating, flame spraying, vapor deposition, cladding, enamelling and liquid phase diffusion. Gas-turbine buckets coated with Cr-Ni electrodeposits plus flame-sprayed Ni-Si-B plus Nichrome V cladding plus flame-sprayed Co-Cr-W-B alloy show promise for temperatures from 1800 to 2000° F. 46 ref. (L-general; Mo, Cr, Ni, Si, B, W)

411-L.* (English.) Adherence Between Glass and Metal. Jan Berk and Jan de Jong. *Trabajos de al Tercera Reunion Internacional sobre Reactividad de los Solidos*, v. 2, no. 2-3, 1958, p. 55-70.

Reactions occurring in the enameling of metal parts. Glass adheres to metal by the presence of an oxide layer on the metal, intermolecular adhesion, uninterrupted chemical bond or anchor points on the surface keying the glass mechanically to the metal. 4 ref. (L27)

412-L.* (Japanese.) Cleaning of Rust Resistant Steel Exposed to Radiation. M. Mukai, T. Saji and H. Yamazoe. *Chemical Society of Japan, Journal*, v. 62, Feb. 1959, p. 192-201.

Cleaning effect of H_3PO_4 (DPA) studied by autoradiography. Specimens are dipped in a bath containing a solution of Sr^{90} salt. Radioactivity on a smooth surface can be removed easily up to 80-90%. DPA is superior to H_2SO_4 or HNO_3 in the removal of secondary radioactivity. (L12; ST)

413-L.* (Japanese.) Bright Cadmium Plating. Tadao Hayashi and Takeo Ishida. *Metal Finishing Society of Japan*, Journal, v. 10, Jan. 1959, p. 26-35.

Effect of addition agents on the deformation of bright deposits from Cd-NaCN baths. Addition of metallic salts of Ni, Co, Fe, Cu, Zn and Hg does not change the deposition potential. When both organic and inorganic additives are used remarkably oriented crystal growth and brightness are achieved. (L17; Cd)

414-L.* Electrochemistry of Nickel. Pt. 1. Codeposition of Nickel and Hydrogen From Simple Aqueous Solutions. John Yeager, J. P. Cels, Ernest Yeager and Frank Hovorka. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 328-336.

Electrodeposition of metals in chloride and sulphate solutions and their polarization curves. Effects of current density, pH temperature and salt concentration. 33 ref. (L17; Ni)

415-L.* Electrochemical Kinetics of the Anodic Formation of Oxide Films. Pierre Van Rysselberghe and Herman A. Johansen. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 355-358.

Electrochemical approach involves use of current-overvoltage relationships at metal-oxide and at oxide-solution interphase. Ti, Hf and Ta are analyzed in terms of proposed theoretical treatment. 11 ref. (P15; Ti, Hf, Ta)

416-L.* Radioisotopic Study of Leveling in Bright Nickel Electroplating Baths. Seward E. Beacom and Bernard J. Riley. *General Motors Engineering Journal*, v. 6, Apr-May-June 1959, p. 20-26.

Confirmation is obtained for a theory which partially accounts for leveling action. 5 ref. (L17a, 1-59; Ni)

417-L. Flow Coat Finishing Today. E. A. Zahn. *Metal Progress*, v. 75, May 1959, p. 84-86.

Refinements now enable the process to handle many finishing operations more efficiently than in the past. Less than 10% as many gallons of paint are required in comparison with dipping. Use of vapor tunnels, common with low-pressure flow coating but not often found with dipping, has virtually eliminated top-to-bottom gradient in film thickness. (L26n)

418-L. Preparation of Stable Layers of Uranium, Neptunium, Plutonium and Americium by Electrolytic Deposition. G. I. Khiebnikov and E. P. Dergunov. *Soviet Journal of Atomic Energy*, v. 4, Apr. 1958, p. 494-495.

5 ref. (L17; U, Pu, Am, Np)

419-L.* Specifications for Protective Plating. Pt. 1. E. A. Ollard. *Corrosion Prevention & Control*, v. 6, Mar. 1959, p. 36-39.

Recommendations for protective decorative coating on various parts of consumer goods, including hub caps, irons, car

door handles, ash trays, clocks, instruments, cameras, coffee pots, refrigerators, switchgears and mincers. (L17, T10)

420-L.* Spray Painting Methods. *Corrosion Prevention & Control*, v. 6, Mar. 1959, p. 45-48.

Various spraying methods; advantages. (L26)

421-L.* Use of the Plasma Arc Torch for Applying Refractory Materials. *Machinery (London)*, v. 94, Apr. 29, 1959, p. 963-964.

Description of apparatus and suggested applications. (L29; EG-c31, EG-d, 6-69)

422-L.* Observations on the Process of Nickel Deposition by Thermal Decomposition of Nickel Carbonyl at Low Pressures. L. W. Owen. *Metallurgia*, v. 59, Apr. 1959, p. 165-173.

Influence of temperature, pressure, rate of flow and plating gas composition on deposition process and properties of coating. Control of thickness and distribution on simple shapes. Adhesion, appearance and porosity of coatings. 7 ref. (L25k, 2-61, 3-74; *Ni*)

423-L.* Flow Coating Nike Missile Parts. D. A. Harrington and E. A. Lgare. *Metal Progress*, v. 75, May 1959, p. 87-90.

A system for automatic processing and flow coating is suitable for large missile fins, yet is flexible enough for numerous small parts. Paint utilization is over 95% and quality of coating is good. The application suggests advantages of the flow coat method for finishing in other industries. (L26n)

424-L.* (German.) A Ternary Carbide Formed by the Reaction of Molten Zinc on Iron-Carbon Alloys. Leo J. Hutter and Hans H. Stadelmaier. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 600-601.

A carbide of the composition Fe_3ZnC and of a fcc. lattice was found in the delta1-layer of a Zn coating. 6 ref. (N1; Fe-b, *C*, 8-65, *Zn*)

425-L.* In 90-Second Fiery Blast Into Space, Rokide Coating Will Protect Engine of X-15 Rocket Ship Against Hot Gases and Erosion. Roland J. Westerhold. *Grits and Grinds*, v. 50, Apr. 1959, p. 3-7, 10-12.

Coatings are applied by heating the end of a ceramic rod and projecting the molten particles at high velocity. They are flexible, tough and heat resistant. (L27)

426-L.* Refractory Ceramic Coatings. David J. Larin and E. E. Mueller. *Trend in Engineering*, v. 11, Apr. 1959, p. 19-23.

Spraying, flame spraying, vitreous coating, molybdenum disilicide coating, cermet coating and flame plating for high-temperature applications. 13 ref. (L27; NM-g34, 2-62)

427-L. Laboratory Evaluation of Graphite Crucible Coatings for Vacuum Melting Uranium. Orville R. Magoteaux, Delmer L. Elston and Charles F. Hall. National Lead Co. of Ohio. *U. S. Atomic Energy Commission*, NLCO-759, Mar. 11, 1959, 39 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Flame-sprayed magnesium zirconate ($MgZrO_3$) proved the best coating. Average carbon pickup was limited to 73 ppm. for derby uranium charges; with slug uranium no pickup occurred. The flame spray method provided a uniform coating thickness and virtually eliminated moisture and volatiles in the coatings. (L23, W18h, C5k, 1-73; U)

428-L.* (German.) Hot Tinning of Iron Castings. Ernest S. Hedges. *Giesserei*, v. 46, Apr. 23, 1959, p. 233-236.

Direct chloride process. Pretreatment of the surface by blasting with white cast iron shot and immersion in a solution of chlorides. Temperature of tin baths and preparation of a flux covering the bath surface. (L16; CI, *Sn*)

429-L.* (English.) Industrial Applications of the Electrolytic Polishing of Stainless Steel. *Aciers Fins & Speciaux*, no. 31, Mar. 1959, p. 62-66.

Applications in the automobile industry include perforated and ribbed grills, wheel trim, windshield wipers. Final surface condition required and initial surface condition are significant factors in determining possible applications. (L13p, T21c; SS)

430-L.* Protective Anodising. F. C. Porter. *Corrosion Prevention & Control*, v. 6, Mar. 1959, p. 40-44.

Properties, application, recommendation and test methods for Al and its alloys. 13 ref. (L19; Al)

431-L.* Carbide Deposit Ups Tool Life. R. H. Eshelman. *Iron Age*, v. 183, May 21, 1959, p. 152-153.

Hard surfacing tools by means of spark deposition increases resistance to abrasion. (L24, T6n, T6r; ST, *W*, 6-69)

432-L.* Stainless Steel and Other Product Finishing Problems. Frank H. Slade. *Product Finishing (London)*, v. 12, Apr. 1959, p. 68-77.

Techniques of Cr and Ni plating; corrosion of plated mild steel in comparison with stainless steel. (L17, R-general; SS, Cn, *Cr*, Ni)

433-L. Metal Degreasing and Drying Developments. *Corrosion Prevention & Control*, v. 6, Mar. 1959, p. 59.

New enclosed plant automatically rotates and cleans small parts. New additive for trichloroethylene removes water after aqueous process. (L12)

434-L. Electroplating and Metallizing Printed Wiring. Joseph F. Dytrt. *Industrial & Engineering Chemistry*, v. 51, Mar. 1959, p. 286-287.

(L17, L23, T1)

435-L. (Book.) Technical Proceedings of the 45th Annual Convention of the American Electroplaters' Society. 184 p. 1958. American Electroplaters' Society Inc., 443-445 Broad St., Newark 2, N. J.

Papers, presented at Cincinnati, Ohio, May 19-22, 1958, abstracted separately. (L17)

436-L. (Translation.) Metal Smoothing, Radical Heat-Pressure Process for Boosting the Wear Resistance of Machined-Steel Parts. B. M. Asinazi. *Machine Design*, v. 31, Feb. 5, 1959, p. 29-32. (From *Metallovedenie i Obrabotka Metallov*, v. 4, Sept. 1958, p. 49-53.)

See item 816-L, 1958. (L13p; ST)

437-L. (Translation—BISI no. 1131.) The Adhesive Strength of Zinc Coatings on Heavily Coated, Hard Drawn Wires of Rimmed Low Carbon Steel. Dietrich Horstmann. *Stahl und Eisen*, v. 78, Oct. 16, 1958, p. 1456-1462.

See item 22-L, 1959. (L16; CN-g, Zn, 4-61)

438-L. Metal Substrates. Arnold J. Eickhoff. Paper from "Field Applied Paints and Coatings". National Academy of Sciences, National Research Council, Washington, D. C., 1959, p. 53-64.

Mechanism of corrosion; effectiveness of paint in preventing corrosion of steel. (L26n, R-general; ST)

439-L. High Temperature Applications. Milton A. Glaser and R. E. Caplan. Paper from "Field Applied Paints and Coatings". National Academy of Sciences, National Research Council, Washington, D. C., 1959, p. 75-82.

Evaluation of silicone and silicone aluminum paints. (L26n, 2-62; Al, NM-g30)

440-L. Aluminum-Electrocladding Studies for Proposed OMR Fuel Elements. G. V. Alm and M. H. Binstock. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-2704, Oct. 1, 1958, 44 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Dense, adherent claddings of Al up to 25 mils thick are produced on Ni-plated uranium fuel cores by electrodeposition. A continuously regenerative etheral bath containing lithium hydride and aluminum chloride is used. Metallurgical bonding of Al electrocladdings to Ni-plated uranium is effected by a thermopneumatic pressing process. Date are given on cladding continuity, bond integrity and cladding microstructure. 9 ref. (L22, L17, T11g; U, *Al*)

441-L.* (French.) Cladding With Alloy Steels. H. Lejay. *Genie Chimique*, v. 81, Jan. 1959, p. 1-7.

Cladding of carbon steel plate by forge welding, pretreatment of metals, intermediate layers, post-treatment. Advantages of use of clad metals in petroleum industry, chemical industries in general and atomic energy installations. (L22, K5, T29, T11; CN, AY)

442-L.* (French.) Surface Treatments. Pt. 4. Pickling of Steels. J. Bigeon. *Industrie Chimique*, v. 46, Jan. 1959, p. 2-8.

Formation and nature of mill scale; removal by sand, shot, torch, acids; passivation by inhibitors during pickling; pickling; pickling accelerators. (To be continued.) (L10, L12, R10c; ST)

443-L.* (German.) Surface Melting of Electrodeposited Tin Coatings Using Medium Frequency. F. Alf. *Industrie-Anzeiger*, v. 81, Mar. 24, 1959, p. 17-20.

Corrosion protection and appearance of Sn coatings are improved by surface melting. Various processes and equipment. (L17; ST, *Sn*)

444-L.* (Russian.) Electrochemical Degreasing of Cold Rolled Steel Sheets. V. P. Kochergin, M. E. Prostakov and A. A. Tarasova. *Stal'*, Mar. 1959, p. 252-254.

It is possible to remove fatty films from the surface of rolled metal by the application of oil emulsions and emulsol within the space of 1-3 sec. Temperature

of alkaline solution must not be lower than 80° C. 9 ref. (L12; 4-53)

445-L.* Chromallized Steel. *Design News*, v. 14, Apr. 27, 1959, p. 16-17.

As chromium diffuses into the base metal at high temperatures (1650 to 2000° F.) it forms a continuous, ductile, high-Cr surface alloy which is an integral part of the base metal. The new surface will not spall, chip or flake off. (L15; Cr)

446-L.* Degreasing and Pickling. *Corrosion Prevention & Control*, v. 6, Apr. 1959, p. 52-56.

Processes for scale removal by acid pickling. (L12, L12g)

447-L.* Clad Metals. J. Erskine. *Corrosion Prevention & Control*, v. 6, Apr. 1959, p. 57-60.

Cladding, fabrication, properties and applications of clad plates. (L22; CN, *N, SS*)

448-L. Old Answer for New Corrosion Problems. *Industrial and Engineering Chemistry*, v. 5, Apr. 1959, p. 77A-78A.

Advantages of porcelain enamelled on "glassed steel" equipment. (L27, T29; ST)

449-L. Chemical Surface Treatments for Uranium and Their Application to Uranium Technology. J. K. Gore, R. Seegmiller and J. M. Taub. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission* LA-2190, May 13, 1958, 20 p. (Available form U. S. Office of Technical Services, Washington 25, D. C.) $1.

Methods for cleaning, etching and electropolishing uranium in relation to the preparation of the metal for electroplating, mechanical fabrication and metallurgical examination. (L13, L12; U)

450-L. Cold Metal Surface Treatment Reduces Cost. M. C. Lumley. *Industrial Finishing*, v. 35, May 1959, p. 26-28.

Cold phosphatizing of sheet steel. (L14b, 1-67; 4-53, ST)

451-L. Recent Developments in Enamels and Enamelling. J. Semple. *Institute of Vitreous Enamellers, Bulletin*, v. 9, Apr. 1959, p. 103-109.

(L27)

452-L. The Metal Finishing Conference: Report of the Annual Conference of the Institute of Metal Finishing Held in Brighton on Apr. 8-10. J. Edward. *Metal Finishing Journal*, v. 5, Apr. 1959, p. 131-145, 176.

Conference papers summarized and reviewed. (L-general)

453-L. Improved Ultrasonic Cleaning. J. Grindrod. *Product Finishing (London)*, v. 12, Apr. 1959, p. 82-83.

(L10f)

454-L. High Humidity Applications. Donald E. Wilbur. Paper from "Field Applied Paints and Coatings". National Academy of Sciences, Nation Research Council, Washington, D. C., 1959, p. 71-74.

Use of Zn paint for protection of steel. (L26n; ST, *Zn*)

455-L.* Alloyd Revamps Old Process. *Chemical and Engineering News*, v. 37, May 25, 1959, p. 50.

Vapor phase deposition process yields tough coatings of Cr, W and Mo. (L25; Cr, Mo, W)

456-L.* Rugged Films Due. *Chemical and Engineering News*, v. 37, May 25, 1959, p. 53.

New vacuum deposition makes tough, nonporous Al films. (L25; ST, *Al*)

457-L.* Progress in the Development of a Non-Embrittling Cadmium Electroplating Process. P. N. Vlannes, S. W. Strauss and B. F. Brown. *Plating*, v. 66, May 1959, p. 467-468.

Testing embrittlement caused by codeposition of hydrogen. (L17, Q26s; ST, *Cd, H*, 8-62)

458-L.* New Economic Method of Treatment of Stainless Steels Prior to Cadmium Plating From Conventional Cyanide Solutions. Larissa Domnikov. *Plating*, v. 46, May 1959, p. 481-483.

Flash electroless undercoating with Cu or Ni. (L16, L17; SS, *Cd, Cu, Ni*)

459-L.* Electroplating of Tin Alloy Solderable Coatings on Ferrous and Nonferrous Basis Metals. A. M. Howard and L. R. Rogers. *Plating*, v. 46, May 1959, p. 484-487.

Preparing basis metals, electroplating with Sn alloys, and reflowing electroplates with hot oil. (L17, K7; Sn)

460-L. Plating of Beryllium-Copper Components for Electrical Applications (Gold and Silver). J. J. Glass, J. K. Gore and J. M. Taub. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission,*

LA-2229, Nov. 25, 1958, 55 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Chemical preparation of Be-Cu prior to plating; plating baths and operating conditions; inspection procedures and acceptance sampling for quality control. 9 ref. (L17, T1; Be-b, *Cu*, Au, Ag)

461-L.* (Hungarian.) Developments in Aluminum Surface Finishing. Andras Domony, Endrene Lightenberger and Pal Csokan. *Kohaszati Lapok*, v. 92, Feb-Mar. 1959, p. 92-100.

Formation of films on Al parts by immersion in water containing various compounds provides ample protection for many applications. Protection in relation to the barrier layer thickness of anodic oxide coatings. 15 ref. (L19; Al)

462-L.* Engineering Uses of Plated Coatings. Lester F. Spencer. *Metal Finishing*, v. 57, May 1959, p. 49-54.

Techniques and applications of repairing worn parts and producing dies of Cr and Ni electrodeposits. (L17, L18; Cr, Ni)

463-L.* Pickling and Acid Dipping of Metals. J. B. Mohler. *Metal Finishing*, v. 57, May 1959, p. 63-67.

Suggested chemicals for pickling, etching, cleaning, dipping, brightening and activating various metals. 12 ref. (L12, L13)

464-L.* Pickling Procedures—Adjustments for Various Soils. Harold C. Wilson. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 29-32.

Cleaners recommended for various types of contamination. (L10c, L12; ST, 4-53)

465-L.* Evaluation and Practical Uses of 1400° F. Porcelain Enamels. H. R. Spiers. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 103-105.

Advantages include reduced warpage and spalling, utilization of cold rolled steel and facilitation of the firing of groundcoat and covercoat in the same time-temperature cycle. (L27, 2-63)

466-L.* Protective Coating Systems for Molybdenum. R. I. Jaffee. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 119-133.

Application methods, strength, ductility, resistance to thermal shock and protection against oxidation at elevated temperatures of silicide, Ni, Cr and Ni-Cr, Al, Al-Si-Cr and ceramic coating systems. 34 ref. (L-general, R1d, 2-62; Mo, *Ni, Cr, Al, Si*)

467-L.* Forming of Clad Molybdenum. David C. Goldberg. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 148-168.

Roll cladding of Mo alloy sheet with Inconel or Nichrome. Metallographic examination and bend, tear, oxidation, impact and engine tests on clad sheets. Evaluation of Pd, Cu, Ni, Cr, Ti, Zr, Ta or Monel as diffusion barrier layer between Mo and cladding. 5 ref. (L22, T24b; Mo-b, *Ni*, Cr)

468-L.* Coating Development and Evaluation. M. A. Levinstein. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 186-204.

Coating requirements, laboratory and engine tests of electroplated, metallized and ceramic coatings. (L15, L17, L22, L27; Mo-b, *Ni, Cr, Si, B*, NM-g34)

469-L.* An Ultrasonic System for Eliminating Physical Contaminants From Electron Devices. D. E. Koontz and I. Amron. Paper from "Symposium on Cleaning of Electronic Device Components and Materials". American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 22-31.

Cleaning electronic tube and solid state device components in warm ultrasonically agitated detergent bath. Influence of ultrasonic frequency; location of ultrasonic energy source; disposition of parts; bath flow rate and gas content on cleaning efficiency. (L10f, T1j)

470-L.* Detection, Removal and Control of Organic Contaminants in the Production of Electron Devices. D. O. Feder and D. E. Koontz. Paper from "Symposium on Cleaning of Electronic Device Components and Materials". American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 40-65.

Wettability tests; evaluation of solvent extraction; firing; aqueous oxidation; alkaline cleaning; acid etching; abrasion cleaning and ultrasonic techniques for removal of residual lubricants from surface of nickel sheet specimens. 16 ref. (L10c, L10f, L12; Ni)

471-L.* Cleanness Factors in Mechanical Processes and Etching of Semiconductors. J. W. Faust, Jr. Paper from "Symposium on

Cleaning of Electronic Device Components and Materials''. American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 66-73.

Role of cleanness in cutting, lapping, mechanical polishing, etching and handling of Ge and Si. 9 ref. (L10b, L12g, L12e; Ge, Si)

472-L.* Cathodic Electrocleaning of Molybdenum Wire Prior to Gold Plating. Robert W. Etter. Paper from "Symposium on Cleaning of Electronic Device Components and Materials''. American Society for Testing Materials, STP no. 246, 1958, p. 129-135.

Response of contaminants on Mo wire to sulphuric-acid electrocleaning to hydrogen firing and other cleaning methods. Effectiveness of cleaning and Ni underplating in improving adherence of gold plating. (L13n, L12, L17; Mo, *Ni, Au,* 4-61)

473-L.* Preparation of Ultraclean Electron-Tube Components by Chemical Etching. D. E. Koontz, C. O. Thomas, W. H. Craft and I. Amron. Paper from "Symposium on Cleaning of Electronic Device Components and Materials''. American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 136-145.

Etching of Cu, Mo, W, Ni alloy, Kovar, Si, Ge, AISI 1010 steel and AISI 403 stainless steel with hydrogen peroxide-formic acid-water systems. (L12g, L12f; Ni-b, Mo, W, Cu, ST, SS, EG-j, Ge)

474-L.* Radiotracers in Evaluating Parts Cleaning. Morris N. Slater and D. Joseph Donahue. Paper from "Symposium on Cleaning of Electronic Device Components and Materials''. American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 146-156.

Use of water and methanol rinses, air and hydrogen firing and ultrasonic rinses to remove acetic acid labeled with carbon—14 from electron-tube cathode sleeves. Effect of temperature and number of water dips on removal of radioactive sodium sulphate. 6 ref. (L12e, L10f, 1-59; Ni)

475-L.* (French.) Application of Faraday's Law to the Study of the Anodic Dissolution of Metals. (Conclusion.) Michel Froment. *Corrosion et Anticorrosion,* v. 7, Apr. 1959, p. 134-145.

Anodic dissolution of Al-Ni alloys. Influence of surface condition of metal, bath temperature, bath composition, especially water content, on initial valence. 11 ref. (L13p; Al, Mg, U, Ti, La, Ce, Zn, Be, Al-b, *Ni*)

476-L.* (French.) Hot Galvanizing Practice. R. Haarmann. *Corrosion et Anticorrosion,* v. 7, Apr. 1959, p. 146-152.

Basic procedure, recent technical developments, corrosion behavior of galvanized surfaces. Additional protection is afforded by overcoat of paint. (L16, R-general; ST)

477-L.* (German.) Painting and Cathodic Protection. K. A. van Oeteren-Panhauser. *Metalloberflache,* v. 13, May 1959, p. 135.

Protection of steel structures and tanks by the use of electrodes of a more base metal and by anodes connected to a low-negative voltage. Importance of additional protection afforded by paints. (L26n, R10d; ST)

478-L.* (Hungarian.) Hard Chromium Plating of Aluminum Engine Cylinder Bores. Pal Csokan. *Kohaszati Lapok,* v. 92, Feb-Mar. 1959, p. 82-89.

New method results in excellent wear resistance properties. Data on cleaning, pickling, Cr-plating and honing. 24 ref. (L17, T21b; Al, Cr)

479-L. The Iron Age Metal Cleaning and Finishing Handbook. *Iron Age,* v. 183, June 4, 1959, p. 125-148.

Tables and glossary. (L-general)

480-L. Spray Phosphoric Acid Pickling. H. J. McVey. *Porcelain Enamel Institute, Proceedings,* v. 20, 1958, p. 26-28.

New method of spray phosphoric acid pickling offers continuous sludge-free operation with constant solution composition, a high rate of pickling with uniform and consistent metal loss. (L12; ST)

481-L. Thicker Coatings Add New Dimension to Markets for Vacuum Metallizers. *Steel,* v. 144, June 1, 1959, p. 96-97.

Technique deposits up to 0.004 in. Al or Cd on a variety of metals. Coating is tough, ductile and resists corrosion. It can be anodized, colored, buffed. (L25g; ST, Al, Cd, 17-57)

482-L. (German.) Structure and Protection of Sprayed Metal Coatings. T. Kenderi. *Metalloberflache,* v. 13, May 1959, p. 133-134.

Structure is understood as an irregular cohesion-diffusion lattice. Factors influencing the quality of coating; rules for

subsequent treatment such as sealing of pores, stress relief and improvement of mechanical properties. (L23, M26; 8-67)

483-L. (German.) Developments in Metal Spraying. Pt. 4. H. Reininger. *Metalloberflache*, v. 13, May 1959, p. 147-150.

Literature survey on scaling protection by Al spraying, sprayed-on bearing linings, repair of machinery by metal spraying and inspection methods. 119 ref. (L23, T7d, T7)

484-L. (Japanese.) Ultrasonic Cleaning. Naoyuki Watanabe. *Metals*, v. 29, Feb. 1959, p. 126-128.

(L10f)

485-L.* (Japanese.) Zinc Immersion Treatment of Aluminum Prior to Coating and Its Effect on Surface Roughness. Naoharu Kinoshita, Masao Watanabe and Isoji Toyoshima. *Metal Finishing Society of Japan, Journal*, v. 10, Feb. 1959, p. 48-58.

Al specimens were treated with hot alkali, acid and Zn salts. The final surface roughness of subsequent coating is the same as that of the initial surface. (L12, S15; Al)

486-L.* (Japanese.) Chromizing. *Metals*, v. 29, Feb. 1959, p. 135-136.

Steel parts are placed in air-tight chamber, covered by Cr rich powder and heated in furnace at 800-1200° C. for 4 to 20 hr. Depth of Cr diffusion is from 1/80 to 1/8 mm. and diffusion is remarkably homogeneous. (L15; ST, Cr)

487-L.* (German.) Arc Metal Spraying With Steel Wire. H. Krautmacher and W. Pungel. *Draht*, v. 10, Apr. 1959, p. 132-139.

Coatings produced by autogeneous and arc metal spraying processes with reference to hardness, structure and adherence. (L23; CN)

488-L.* Adhesion of Evaporated Aluminum Films With Underlayers of Nickel, Cobalt and Chromel. C. Weaver and R. M. Hill. *Philosophical Magazine*, v. 4, Feb. 1959, p. 253-266.

Vacuum evaporation of film onto glass slides. Variation of adhesion with aging at 25 or 120° C. and with underlayer thickness. Formation of intermetallic compounds at interface. 10 ref. (L27g, Q10c, 2-65; Al, Ni, Co, Cr, 14-62)

489-L.* Preparation of Smooth Single Crystal Surfaces of Silver by an Evaporation Technique. D. W. Pashley. *Philosophical Magazine*, v. 4, Mar. 1959, p. 316-323.

Electron diffraction study of layers of Ag evaporated onto mica cleavage surface. Relation of Ag film smoothness and orientation with mica substrate temperature, rate of deposition and deposit thickness. 14 ref. (L25g, M26c; Ag-a, 14-61, 14-62)

490-L. Applications and Problems of Metal Spraying. J. F. Attwell. *Electroplating and Metal Finishing*, v. 12, May 1959, p. 176-178.

Process and equipment used in the Union of South Africa. (Conclusion.) (L23)

491-L. Metal Finishers Meet at I.M.F. Annual Conference. *Industrial Finishing (London)*, v. 11, May 1959, p. 22-23, 25-29, 51-52.

Summary of 24 technical papers presented at the Annual Conference of the Institute of Metal Finishing, Brighton, England, Apr. 8-11. (L-general)

492-L.* (Russian.) New Method of Pickling Stainless Steel Tubes. N. V. Bogoyablenskaya and Ya. H. Lipkin. *Stal'*, Apr. 1959, p. 347-351.

Application of 1.5% HF acid with 8-8.5% of HNO_3 acid for pickling is superior to the prevailing practice. A light gray and smooth surface is produced without overpickling, pitting or corrosion fissuring and with a minimum of metal loss. 21 ref. (L12g; SS, 4-60)

493-L.* Observations on the Process of Nickel Deposition by Thermal Decomposition of Nickel Carbonyl at Low Pressures. L. W. Owen. *Metallurgia*, v. 59, May 1959, p. 227-233.

Variables controlling the process and properties of coatings obtained (appearance, microstructure, microhardness, ductility). The adhesion and porosity of the coatings on various metallic bases are assessed together with control of thickness applied and the distribution on various shapes. 18 ref. (To be continued.) (L25; Ni)

494-L.* (French.) Surface Treatments. Pt. 5. J. Bigeon. *Industrie Chimique*, v. 6, Mar. 1959, p. 85-86.

Descaling of stainless steels of various composition with acid baths, the composition of which is determined by the components of the steel and the solubility of their oxides in individual acids. Reduction of

metallic oxides in liquid caustic soda at 350-385° C. Electrolytic polishing in electrolytes composed of H_2SO_4 and phosphoric acid on citric acid of HF. (L12, L13p; SS)

495-L.* Improvements in Plating Zinc Die Castings. *Metal Progress*, v. 75, June 1959, p. 78-81.

A double layer of Ni of the duplex type in place of regular bright Ni gives Cr-plated Zn die castings with improved corrosion resistance. Bright crack-free Cr in place of regular Cr also increases durability of the finish. (L17; Zn, *Ni, Cr*, 5-61)

496-L. Fixturing Aluminum Die Castings in a Tumbling Barrel. John J. Morrison. *Die Casting Engineer*, v. 3, June 1959, p. 11-12.

(L10d; 5-61, Al)

497-L. Rectifiers in the Electroplating Industry. Pt. 2. Still Tank Plating. George Schore. *Metal Finishing*, v. 57, June 1959, p. 82-86.

Automatic operations and conditions for the electroplating of Ni, Cu, Zn, Cd, bronze, brass, Ag, Sn, Au, Al and Mg. (L17; Ni, Cu, Zn, Cd, Cu-s, Cu-n, Ag, Au, Al, Mg)

498-L. Dip Dyeing of Finishes for Vacuum Metallizing. Robert J. Perkel. *Metal Finishing*, v. 57, June 1959, p. 87-89.

(L16)

499-L. Science for Electroplaters. Pt. 48. Electrodeposited Metals. L. Serota. *Metal Finishing*, v. 57, June 1959, p. 90-93, 96.

Mechanism of electrodeposition, cathode film, limiting current, crystal growth, crystal structure and basis metal effect. (L17, N12d)

500-L. New Possibilities With Porcelain Enamel Finishes. *Metal Progress*, v. 75, June 1959, p. 67-77.

Novel features include more colors to choose from; better chemical and heat resistance; one-coat finishes; thinner coating and lower firing frits; continuous productions lines with automatic spraying and dipping. (L27)

501-L. Minimum Paint Film Thickness for Economical Protection of Hot Rolled Steel Against Corrosion. Wouter Bosch. *Official Digest*, v. 31, May 1959, p. 602-609.

6 ref. (L26, R-general; ST)

502-L. (French.) Phosphate Coatings. *Metallurgie et la Construction Mechanique*, v. 91, Apr. 1959, p. 285-287.

Types of coatings and their properties; use as undercoating for paint, protection against corrosion and in minimizing wear between bearing surfaces. (L14b)

503-L. (German.) Surface Roughness and Corrosion Protection by Paints. K. A. van Oeteren-Panhauser. *Deutsche Farben-Zeitschrift*, v. 13, Apr. 1959, p. 138-141.

Thickness of coat is determined by the surface roughness. Instruments for roughness measurements; tabular survey on roughness produced by various working processes. (L26n, R-general, S15)

504-L.* (German.) Electroplating on Soft Soldered Parts. Albert Keil and Hermann Grossmann. *Galvanotechnik*, v. 50, Apr. 15, 1959, p. 197-199.

No differences are observed in the electroplating properties of assemblies produced with Pb, Cd, Zn, and Sn solders provided the metals are properly degreased and cleaned. 5 ref. (L17; Pb, Cn, An, Sn, SGA-f)

505-L.* (German.) Electrolytic Descaling of Iron and Steel in Alkaline Solution. Erich Lutter. *Galvanotechnik*, v. 50, Apr. 15, 1959, p. 200-202.

Process is characterized by rapidity; bright surfaces, no metal loss or dimensional changes, absence of embrittlement. (L13n; ST, Fe)

506-L. (Japanese.) Adhesion of Organic Films to Anodized Surfaces. Matsuhei Kishi. *Metal Finishing Society of Japan, Journal*, v. 10, Apr. 1959, p. 139-143.

Adhesion of acetyl cellulose coating on anodized Al plate under various anodizing conditions. The adhesive strength of the coating on Al plate anodized in phosphoric acid bath at room temperature is several times greater than castings anodized in oxalic acid or sulphuric acid baths. (L19, L26p; Al)

507-L. (Japanese.) Durability of Sprayed Metal Coatings and Sealing Treatments. Yukio Sakae and Yoshio Harada. *Metal Finishing Society of Japan, Journal*, v. 10, Apr. 1959, p. 149-153.

Porosity of sprayed coatings of Zn, Al, Cu, Sn, Pb, brass and 18-8 stainless steel. Coatings as treated by heat curing, and air drying type sealing materials. (L23; 8-67, 9-68, Pb, Cu-n, SS, Sn, Cu, Al, Zn)

508-L. (Japanese.) Adhesion of Sprayed Metal Coatings. Yoshio Harada and Jiroh Mizokawa. *Metal Finishing Society of Japan, Journal*, v. 10, Apr. 1959, p. 154-158.

Adhesion of Al, brass and Cu coatings on steel. Steel base is pretreated by sand or grit blasting or emery paper to make the surface rough. Powder spraying proved superior to either arc or flame spraying. Mo is excellent as a bonding undercoat. (L23; ST, Cu, Cu-n, Al)

509-L. (Japanese.) Vibration Electropolishing Method for Aluminum in Phosphoric Acid. Pt. 4. Takakado Nakayama. *Light Metals*, v. 9, Jan. 1959, p. 64-67.

Relation between current density and bath voltage. (L13p; Al)

510-L. (Japanese.) Electropolishing of Aluminum in Phosphoric Acid by Vibration. Pt. 3. Takakado Nakayama. *Light Metals*, v. 9, Jan. 1959, p. 53-63.

An anode of 99.99% Al vibrating at 0-300 rpm. and a fixed cathode are located in a H_3PO_4 bath and polished at various current densities at several temperatures. Bright surface of the anode is obtained when the bath voltage becomes higher at increasing current density and electrolysis time. (L13p; Al)

511-L.* (Russian.) Physicochemical Phenomena in Metal Spraying. A. F. Krupin. *Svarochnoe Proizvodstvo*, May 1959, p. 17-20.

Metallographic, petrographic and other analyses of oxide inclusions in sprayed metal layers reveal mainly a magnetic oxide (Fe_3O_4). Quantity of oxides decreases in proportion to increase in carbon content or other deoxidizing agents. To reduce oxidation it is essential to use a rod containing deoxidizing agents in an inert atmosphere. 7 ref. (L23; 9-69, CN, AY, 8-67)

512-L. (Book.) Electrolytic Tin Plate. 2nd Ed. D. A. McArthur. 64 p. 1959. Wean Engineering Co., Inc., Warren, Ohio.

(L17; Sn)

513-L. (Book.) Handbook of Practical Electroplating. Thomas M. Rodgers. 333 p. 1959. Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

(L17)

514-L. (Book.) Field Applied Paints and Coatings. 142 p. 1959. Building Research Institute, Pub. 653, National Academy of Sciences, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $5.

A research correlation conference conducted by the Building Research Institute, Dec. 3-4, 1958, Washington, D. C. Pertinent papers abstracted separately. (L26n)

515-L. (Book.) Symposium on Cleaning of Electronic Device Components and Materials. 213 p. 1958. American Society for Testing Materials, STP no. 246, 1916 Race St., Philadelphia 3, Pa. $6.50.

Papers abstracted separately. (L10, L12)

516-L. (Translation—ConBur.) Effect of a Combined Addition of Glue, B-Naphthol and Antimony on the Electrodeposition of Zinc. A. I. Levin, A. V. Pomosov, E. E. Krymakova and V. I. Falcheva. *Journal of Applied Chemistry of the USSR*, v. 31, Apr. 1958, p. 569-576.

Determination of electrode polarization, adsorption conditions, nature of the adsorption layers in presence of the combined additive and of its individual components. 11 ref. (L17a, 2-60; Zn, *Sb*)

517-L. (Translation—ConBur.) The Simultaneous Electrodeposition of Metals. B. I. Skirstymonskaia. *Journal of Applied Chemistry of the USSR*, v. 31, Apr. 1958, p. 624-626.

When Cu and Zn are deposited simultaneously, Zn is depolarized and the polarization of Cu is increased, relative to the polarization of these metals when deposited individually. 7 ref. (L17; Cu, Zn)

518-L. (Translation—ConBur.) The Electrolytic Precipitation of Lustrous Precipitates of Tin Plate From Fused Electrolytes. A. I. Vitkin and T. P. Plotnikova. *Proceedings of the Academy of Sciences of the USSR*, v. 120-121, May-Aug. 1958, p. 77-80.

(L17; Sn)

519-L.* Factors Affecting the Pickling Rate of Hot-Rolled Steel Strip. B. J. Lebas. *Sheet Metal Industries*, v. 36, June 1959, p. 401-406, 414.

Formation of scale, strip and contour scaling, cooling temperature, cooling rate of scale, and pickle-line factors. 5 ref. (L12g, F23, 1-66; ST, 4-53)

520-L.* (French.) Surface Preparation of Lead and Lead Alloy Articles. *Galvano*, v. 28, May 1959, p. 223-225.

Problems involved in electrolytic plating on Pb and Pb alloys. Preliminary cleaning methods; cleaning and pickling solutions. Standard pretreatment cycles

and conditions for electrodeposition of Fe, Ni and Cu. (L17, L12; Pb, *Fe, Ni, Cu*)

521-L. Choosing the Right Process. *Australasian Manufacturer*, v. 44, May 9, 1959, p. 64-68.

Chemical and electrochemical cleaning techniques compared. (L12, L13)

522-L. Why Not Metallize to Prevent Corrosion. H. Thomasson. *Canadian Metalworking*, v. 22, June 1959, p. 42-43.

(L23, R10)

523-L. (Japanese.) Voltage in Barrel Nickel Plating. Takatoshi Kase. *Metal Finishing Society of Japan, Journal*, v. 10, Apr. 1959, p. 159-160.

High concentration of $NiSo_4$ results in low voltage and high current density if the thickness, area of perforation and inclination of the side plate are suitably chosen. (L17; Ni)

524-L. (Russian.) Restoration of Crane Wheels by Hard Surfacing. M. A. Tylkin, V. M. Sivak, I. F. Parten'ev and M. A. Kropp. *Svarochnoe Proizvodstvo*, May 1959, p. 25-27.

Repair of crane wheels consists of trueing the wheel, removing scale, depositing wear resistant steel, annealing, sorbitizing and final annealing. (L24, J23; ST, 18-72)

525-L. (Russian.) Arc Hard Facing of Pieces Subjected to Abrasive Wear. M. A. Tylkin. *Svarochnoe Proizvodstvo*, May 1959, p. 35-36.

(L24)

526-L.* Hot-Dip Galvanizing of Sheet and Strip. J. Hawkins and E. J. Williams. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 49-60.

Basic procedures in a hot strip mill; removal of oxide scale and contaminants; pickling; types of high-speed galvanizing systems. 4 ref. (L16, L12; ST, 4-53, *Zn*)

527-L.* Electroplating of Automobile Components. J. M. Butler. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 61-70.

Layout of a machine designed for automatic plating of Cu, Ni and Cr, in that order, on steel. The complete process sequence; make-up and control of the various solutions used, (L17, T21; ST, *Cu, Ni, Cr*)

528-L.* Priming of Steel. J. R. Rischbieth. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 35-48.

Correct surface preparation and pretreatment of steel before painting. Pigments are classified into five groups—inert, anodic inhibition, cathodic inhibition, anodic pigments and cathodic pigments. Mechanism of corrosion prevention of the pigment vehicle system. 41 ref. (L26n, L12; ST)

529-L.* The Mechanism of Electropolishing. K. J. Lorking. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 22-26.

Macro and micropolishing processes on copper anodes in orthophosphoric acid solutions. Macropolishing is accomplished when the rate of diffusion of ions is greatest from high spots on the anode surface. Micropolishing or removal of irregularities of the order of 10^3 Angstroms or less occurs when a film of oriented polar chains of molecules forms on the surface. The looser packing of the chains at peaks facilitates solution of the Cu and produces the polishing effect. 19 ref. (L13p; Cu)

530-L.* The Nature of Industrially Polished Metal Surfaces. L. E. Samuels. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 1-11.

The primary mechanism of polishing appears to be one of cutting; gross surface flow, even flow by normal plastic deformation, does not seem to make a significant contribution. Quantitative data on the depth of the layer are given for brass specimens finished by a representative range of industrial methods. 35 ref. (L10b; Cu-n)

531-L.* The Preparation of Metals for Electroplating. J. J. Dale and I. J. Howell. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 27-34.

Adhesion depends on the nature of the two metals concerned and the surface condition of the basis metal as affected by its mechanical history, up to and including polishing, and by the chemical and electrochemical effects of cleaning and etching. Optimum procedures. 26 ref. (L10, L12)

532-L.* The Chemical Control of Plating Electrolytes. K. E. Langford. Paper from "Control in Electroplating". Robert Draper Ltd., Teddington, England, 1959, p. 3-19.

Need for control, sampling, frequency of analysis, analytical methods with particular reference to recent developments. (L17b)

533-L.* The Control of Electrodeposition Processes by Examination of the Deposits.

T. E. Such. Paper from "Control in Electroplating". Robert Draper Ltd., Teddington, England, 1959, p. 23-47.

Testing techniques and instruments for current density, covering power, pitting, adhesion, porosity, smoothness, brightness, ductility, hardness and stress. 23 ref. (L17b, L17c)

534-L.* Trouble-Shooting in the Plating Shop. C. F. Corfe. Paper from "Control in Electroplating". Robert Draper Ltd., Teddington, England, 1959, p. 51-69.

Pretreatment, rinsing and passivating dips; use of Hull cell in assessment of condition in bright Cd, bright Zn, brass, Ag, Cu, bright Ni, Cr and barrel Cr plating solutions. (L17a, L17b; Cd, Zn, Ag, Cu-n, Cu, Ni, Cr)

535-L. Practical Aspects of Protective Coating Specifications. J. R. Allen and G. Mackey. *American Society of Mechanical Engineers*, Paper no. 59-MPE-3, 1959, 7 p. $.80.

Development of coating system specifications; coating application and inspection. (L26n; ST)

536-L. Dip Coating. P. C. Bardin. *Industrial Finishing*, v. 35, June 1959, p. 20-22, 24, 26.

Equipment and methods. (L16, W3a)

537-L. A Vacuum-Deposited Coating That Withstands Exterior Exposure. *Products Finishing*, v. 23, June 1959, p. 162-164.

Process for producing thick protective Al films. (L25g; Al)

538-L. Metallic Finishes for Services' Equipment. D. W. Smith. Paper from "Control in Electroplating". Robert Draper Ltd., Teddington, England, 1959, p. 73-92.

Finish requirements and inspection with reference to climatic conditions, vapor corrosion, layer corrosion and thickness testing. (L-general, R3, S14; 8-62)

539-L. (Russian.) Sludgeless Method for Parkerizing Tubes. A. Z. Grebenshchenkova and P. K. Stalevich. *Stal'*, May 1959, p. 443-444.

Method makes it possible to obtain enough of a phosphorus coating for working through two passes without copperizing and pickling; reduces the consumption of ZnO, N_3PO_4 and HNO_3 and eliminates sludge cleaning. (L14b; ST, 4-60)

540-L.* (German.) Electrolytic Polishing of Metals. Robert Weiner. *Industrieblatt*, v. 59, May 1959, p. 195-199.

Comparison between electrolytic and mechanical polishing with reference to quality, surface smoothness, resistance to wear and corrosion and brightness. (To be continued.) (L10b, L13p)

541-L.* (German.) Electrolytic Polishing of Stainless Steel, Copper and Aluminum and Their Alloys. *Industrieblatt*, v. 59, May 1959, p. 204.

The "Rostapol I", "Rostapol II" and "Kupol" processes of electrolytic polishing. (L13p; SS, Cu, Al)

542-L.* Vacuum Coatings for Metals. Philip J. Clough. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 392-404.

Application of sputtering, vapor phase reduction, thermal decomposition and evaporation. 14 ref. (L25, 1-73)

543-L. Double Chromium Plate Gives Lasting Protection, No Burn. *Iron Age*, v. 183, June 25, 1959, p. 96-98.

Duplex plating for automotive trim and Zn-base die castings. (L17, T21c; Cr, Zn, 5-61)

544-L.* (French.) Aluminum Plated Steel. *Technique Moderne*, v. 51, May 1959, p. 259-261.

Electroplating process using a salt bath composed of $AlCl_3$ and NaCl compared with the Bethlehem Al bath process. Corrosion resistance, thermal cycling resistance and mechanical properties of Al plated Armco steel. (L17; ST, *Al*, 8-62)

545-L.* Tin in Electroplating. Robert M. MacIntosh. *Plating*, v. 46, June 1959, p. 617-620.

Properties of tin plate and development of various baths. 7 ref. (L17; ST, *Sn*, 8-62)

546-L.* Chromate Treatment of Zinc and Other Metals: Pt I. Accelerated Testing of Chromate Coatings. K. S. Rajagopalan and P. L. Annamalai. *Scientific and Industrial Research, Journal*, v. 18A, Apr. 1959, p. 171-175.

Critical conditions for coating formed by Cronak process. Correlation of temperature, time, humidity and salt concentration. 11 ref. (L14c; Zn)

547-L.* (French.) Selection and Use of New Descaling Materials in Regard to Surface Passivation and Preparation for Surface Treatment. Claude Hesse. *Corrosion*

et Anticorrosion, v. 7, May 1959, p. 178-184.

Degreasing with the aid of potassium hydroxide, caustic soda, sodium ortho and metasilicate; electrolytic degreasing in solutions of sodium silicates; dissolution of oxides in diluted HCl, H_2SO_4 or in salt baths composed of NaOH, sodium nitrite or sodium nitrate. (L12g, L12k, L13n)

548-L.* (German.) Electropolishing of Carbon Steels. Simeon Acimovic. *Werkstoffe und Korrosion,* v. 10, June 1959, p. 373-375.

Experimental polishing of commercial steels in untreated condition, after martensitic hardening, after normalizing or after sorbitic annealing, to find optimum parameters and composition of electrolyte. (L13p, 2-64; .CN)

549-L.* Observations on the Process of Nickel Deposition by Thermal Decomposition of Nickel Carbonyl at Low Pressures. L. W. Owen. *Metallurgia,* v. 59, June 1959, p. 295-301.

Variables controlling the process and properties of the coatings obtained, such as appearance, microstructure, microhardness, ductility. Relation of temperature, pressure, rate of flow and vapor composition to each other and to properties of the coatings. 18 ref. (L25g, Q-general, 2-62, 3-74; Ni, 8-72)

550-L.* The Story of Nickel Plating. George Dupernell. *Plating,* v. 46, June 1959, p. 599-616.

History and development of power supplies and baths; operating conditions. 203 ref. (L17, A2; Ni)

551-L.* Precious Metals. Edward A. Parker. *Plating,* v. 46, June 1959, p. 621-627.

Development of various baths for electrodeposition of Au, Ag, Pt, Pd, Ru, Rh, Ir. 68 ref. (L17; Au, Ag, Pt, Pd, Ru, Rh, Ir)

552-L.* Copper Plating During the Last Fifty Years. Frank Passal. *Plating,* v. 46, June 1959, p. 628-638.

Developments and trends in acidic and alkaline plating systems. 91 ref. (L17, A2; Cu)

553-L.* Zinc in the World of Electroplating. Ernest W. Horvick. *Plating,* v. 46, June 1959, p. 639-645.

History and development of electrogalvanizing. Review of the Meakes, Bettanizing, Herman, Marino, Hubbell and Corronizing processes. (L17, A2; Zn)

554-L.* Metal Finishing Developments in the U.S.A. D. Gardner Foulke. *Product Finishing,* v. 12, June 1959, p. 62-67.

Review of chemical conversion plating, electroplating, metal spraying, anodizing and electrophoretic plating techniques. 53 ref. (L14, L17, L19, L23, L29p)

555-L.* Metal Finishing Trends in the United Kingdom. H. E. Zentler Gordon. *Product Finishing,* v. 12, June 1959, p. 74-88.

Preparation of metallic surfaces before electroplating; polishing; electrolytic polishing; chemical brightening; barrel finishing; electroplated coatings and organic finishing. (L-general)

556-L.* (German.) Protection of Iron and Nonferrous Metal Surfaces. A. Baierle. *Industrie Anzeiger,* v. 81, June 12, 1959, p. 717.

Superiority of plastic coatings of natural and synthetic rubber and hard rubber over lacquer with respect to protection against corrosion and porosity. (L26r, L26n, R-general; Fe, EG-a38)

557-L. Recent Russian Work on Electroplating. W. G. Cass. *Industrial Finishing,* v. 11, June 1959, p. 38, 40.

(L17)

558-L. How to Anchor Sprayed Metals. Walter P. Meyer. *SAE Journal,* v. 67, June 1959, p. 76-77.

Better surface preparation by improvements in techniques: rough threading, groving and narrowing and electric bonding. (L23)

559-L. (French.) Protection of Marine Equipment by Neoprene. H. Tixier. *Corrosion et Anticorrosion,* v. 7, May 1959, p. 221-225.

(L26p, T22)

560-L. (French.) Surface Treatments. *l'Industrie Chimique,* v. 46, May 1959, p. 138-142.

Descaling processes applied to steel with special reference to pickling. (L12g, ST)

561-L. (German.) Clad Steel. E. Berg. *Chemische Rundschau,* v. 12, June 1, 1959, p. 316-317.

Low-alloy steel clad with stainless steel. (L22; AY, *SS*)

562-L. (German.) Protection of Underwater Steel Structures by Flame Spraying With Zinc. Zbigniew Kowalski. *Werkstoffe und Korrosion,* v. 10, June 1959, p. 357-363.
Directions for application. 23 ref. (L23; ST, *Zn*)

563-L. (German.) Cathodic or Electrochemical Protection? Hans Hebberling. *Werkstoffe und Korrosion,* v. 10, June 1959, p. 376-377.
Effectiveness of commercial paints. (L26n, R10d)

564-L.* Impedance Characteristics of Isolated Aluminum Oxide Films. D. F. MacLennan. *Corrosion,* v. 15, June 1959, p. 283t-285t.
Effect of hot water or steam sealing treatments on impedance of thick oxide films prepared by anodizing Al in sulfuric acid solution. 9 ref. (L15n, P15g; Al, 8-73)

565-L.* Wash Primer Development and Characteristics. L. R. Whiting. *Corrosion,* v. 15, June 1959, p. 311t-314t.
(L26n, L14)

566-L.* (French.) Porosity of Chromium Plate Due to Internal Stress. I. Firou. *Centre d'Information de Chromage Dur-Bulletin de Documentation,* May 1959, p. 1-10.
Experiments performed with a flexible cathode show that the stress developing in electrodeposited Cr is a function of cathodic current density, temperature and chromic acid concentration. 12 ref. (L17, Q25, 9-68; Cr)

567-L.* (French.) Chromium Plating in a Self-Regulating Bath. V. Semin. *Centre d'Information du Chromage Dur-Bulletin de Documentation,* May 1959, p. 17.
Sulphate content of a bath composed of chromic acid, potassium fluosilicate and strontium sulphate. The fluosilicate and the sulphate are added in quantities exceeding their solubility in order to keep the concentration of foreign anions constant by gradual dissolution. (L17a; Cr)

568-L.* (German.) Problems and Trends in Present-Day Electroplating. E. Raub. *Metall,* v. 13, June 1959, p. 521-525.
Electroplating as a means of corrosion prevention. Factors affecting deposition are shape of object, type of electrolyte, micro and macro-distribution of galvanic bath, concentration-polarization and additives. 45 ref. (L17)

569-L.* (German.) Electrodeposition of Aluminum From Hydride Electrolytes. J. Elze, G. Lange, D. Meyer. *Metall,* v. 13, June 1959, p. 541-545.
Separation and deposition is dependent on both temperature, cathode current and composition of electrolyte. 13 ref. (L17; Al)

570-L.* (German.) Control of Tinning Baths. B. Keysselitz. *Metall,* v. 13, June 1959, p. 559-564.
Processes taking place during the immersion of metals into molten Sn. Impurities and their removal from the bath. 5 ref. (L16; Sn)

571-L. Which Vinyl Coating Process for Metal Parts. F. J. Nagel. *Product Engineering,* v. 30, July 1959, p. 70-72.
(L26p)

572-L. Tungsten Coils for Vacuum Metallizing. Ralph P. Ranger and Wilfrid G. Matheson. *Sylvania Technologist,* v. 12, Apr. 1959, p. 37-40.
Tungsten heat sources used in the evaporation of Al; design factors influencing performance and life. (L23, 1-73, 1-52; Al)

573-L. (French.) Use of Isotopes in the Composition Control of Chromium Baths. L. Eisler. *Centre d'Information du Chromage Dur-Bulletin de Documentation,* May 1959, p. 11-14.
4 ref. (L17a, 1-59; Cr)

574-L.* Choosing Surface Finishes for Small Tubing. James H. Black. *Materials in Design Engineering,* v. 50, July 1959, p. 101-103.
Advantages of a pickled finish. A number of bright smooth finishes are also available, the so-called "bright finish" being the most popular and widely used. (L-general, L12g; 4-60)

575-L.* Double Plate Method of Chrome Plating. M. R. Caldwell. *Precision Metal Molding,* v. 17, July 1959, p. 47-49.
Improved corrosion resistance of plate by undercoating from two types of nickel baths which produce different grain structure. (L17; *Ni, Cr*)

576-L. (Book.) Control in Electroplating. 92 p. 1959. Robert Draper Limited, Kerbihan House, 85 Udney Park Rd., Teddington, Middlesex, England. 15s.

Papers and discussions from symposium held Nov. 1958 by London Branch of the Institute of Metal Finishing. Papers abstracted separately. (L17b, L17a)

577-L. (Translation—Brutcher no. 4573.) Chromizing and Boronizing of Steel During High-Frequency Induction Heating. A. N. Minkevich and G. N. Ulybin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, April 1959, p. 48-51.

For the chromizing of no. 20 steel at 1050 to 1200° C. a paste consisting of 75% powdered Cr + FeCr and 25% cryolite, bonded with hydrolized ethyl silicate produced a diffused Cr coating in 2 min., instead of 8 hr. Boronizing of U10 and no. 45 steels at 1200 C. for 2 min. with a paste of 50% boron carbide and 50% cryolite, bonded with hydrolized ethyl silicate, produced a diffused boron coating 0.12 mm. deep with a hardness of 1000 HV_{10}. 9 ref. (L15, 1-69; CN)

578-L. (Translation—Brutcher no. 4572.) Surface Impregnation of Steels With Boron in a Gas Atmosphere. A. F. Zhigach, I. S. Antonov, M. A. Pshelkina, G. I. Yukin, A. C. Dobrodeev and V. N. Matveev. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, April 1959, p. 45-47.

Impregnation of steels by a boro-ethane (B_2H_6) gas mixed with hydrogen at 800-850° C. for 5 hr. Boron impregnated surfaces have a high micro-hardness of 3000. (L15; CN, *B*)

579-L.* The Influence of Cathode Film Thickness of Leveling. Seward E. Beacom. *Plating*, V. 46, July 1959, p. 814-818.

Shadowgraphic method determined effects of solution temperature, current density and addition agents in Ni plating solution. Current density is directly proportional and temperature inversely proportional to film thickness. 19 ref. (L17b; Ni)

580-L.* The Nature, Cause and Effect of the Porosity in Electrodeposits. Pt. 3. Microscopic Detection of Porosity. Fielding Ogburn and D. W. Ernst. *Plating*, v. 46, July 1959, p. 831-833.

Successive parallel sectioning to base metal determined size and shape of pores or other defects. 6 ref. (L17, 9-68)

581-L.* (German.) Protective Efficiency of Copper Flash Produced With Acid or Cyanide Electrolytes on Steel Before Nickel Plating. Heinz W. Dettner. *Metalloberflache*, v. 13, July 1959, p. 193-194.

Corrosion tests on Ni plated samples with Cu flashes produced with different electrolytes. Corrosion is promoted by cavities under the Cu plating resulting from surface defects. These cavities are filled with Cu when an acid electrolyte is used. 4 ref. (L17, R-general; ST, Ni, *Cu*)

582-L.* (German.) Smooth Chromium Deposits From Electrolytes With Chromic Acid. Bruno Galler. *Metalloberflache*, v. 13, July 1959, p. 221.

Smooth Cr plate up to 240 microns thick by addition of a new type of wetting agent. (L17a; Cr)

583-L.* (German.) Chromium Baths. Jesse E. Stareck. *Metalloberflache*, v. 13, July 1959, p. 221.

A constant concentration of strontium sulphate and of an alkali metal fluosilicate is controlled by the addition of alkali metal compounds. (L17a; Cr)

584-L.* (German.) Titanium, Zirconium, Hafnium, Tantalum, Columbium, Chromium, Molybdenum and Tungsten Electroplating With a Salt Bath. Merle Eugene Sibert. *Metalloberflache*, v. 13, July 1959, p. 222.

Composition of a new type salt bath for electroplating. The graphite crucible holding the bath serves as an anode. A neutral atmosphere eliminates the penetration of O, N or C into the bath. (L17a; Mo, W, Ti, Zr, Hf, Ta, Cb, Cr)

585-L.* (Russian.) Electrolytes for Electrochemical Polishing of Steels. G. P. Maitak and G. S. Tret'yakova. *Zhurnal Prikladnoi Khimii*, v. 22, May 1959, p. 1062-1064.

Plain carbon and stainless steels are successfully polished at 18-25° C. in electrolytic baths consisting of varying proportions of H_2SO_4 and H_3PO_4. These electrolytes are preferable to H_2SO_4-H_3PO_4-H_2CrO_4 acids. 8 ref. (L13p; CN, AY)

586-L.* (French.) Corrosion Resistance by Chromium Plate Without Fissures. P. Morisset. *Centre d'Information du Chrome Dur—Bulletin de Documentation*, v. 104, June 1959, p. 31.

Production of plate 1-2 microns thick by means of baths with the ratio CrO_3: SO_4H_2 = 125 to 200 and at temperatures of 50-55° C. (L17b; Cr)

587-L.* (French.) Repair Metallization Followed by Hard Plating. R. De Buyer.

Centre d'Information du Chrome Dur—Bulletin de Documentation, v. 104, June 1959, p. 31.

Repair of a shock absorber piston and a large casting by metal spraying, mechanical polishing of the deposited metal and Cr plating. (L23, L17; ST, CI, *Cu, Cr*)

588-L. Spiral Setup Plates Wire Fast. *Iron Age,* v. 184, July 9, 1959, p. 98-99.

Fast electroplating of steel wire with Cu, Ni or other metals produces wire having high tensile strength and good conductivity. Process is based on a spiral handling system. (L17, P15g; ST, 4-61, *Ni, Cu*)

589-L. Automatic Additions of All Chemicals to the Nickel Plating Baths. Mitchell G. Osman. *Plating,* v. 46, July 1959, p. 819-822.

Control of stresses and physical properties of plate through regulation of salt concentration, impurities and pH. (L17b; Ni)

590-L. Lead Anodes for Chromium Plating. Henry R. Friedberg. *Plating,* v. 46, July 1959, p. 834-836,

Effects of shape and type of construction of lead anodes on bath performance. (L17, W3L, 3-73; Cr, Pb)

591-L. (Russian.) Causes of Brightness of Electrolytic Nickel Deposits. A. V. Pamfilov and P. M. Morgart. *Zhurnal Prikladnoi Khimii,* v. 22, May 1959, p. 1066-1071.

Brightness is caused by leveling of the submicroscopic roughness and is not due to grain structure. 11 ref. (L17; Ni)

592-L.* (French.) Anodic Oxidation of Aluminum Containing Silicon. H. Richaud. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, June 1959, p. 30-34.

Anodic oxidation in a H_2SO_4 bath. The surface color allows conclusions to be drawn as to the thickness of the oxide layer, which varies according to Si content, deformation degree and heat treatment. (L19n, 2-60, 3-68, 2-64; Al-b, *Si*)

593-L.* (French.) Porosity Tests With Protective Paint Coats. G. Blet. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, June 1959, p. 41-46.

Sheet iron was phosphate coated, primed and then painted. Porosity tests by examining the insulation properties of the paint. (L26n, L14b, 9-68; Fe)

594-L.* Experiences With Corrosion-Resistant InKrom Steel Screws. E. Taubert. *Draht (English Edition),* no. 41, June 1959, p. 60-62.

The InKrom process takes place at high temperature through the halogen compounds of Cr. The surface zone merges gradually and the Cr is firmly interlaced in the lattice structure of the basic metal, thus preventing defoliation. Mechanical effects, such as blows or bending, do not in any way impair the corrosion-protective properties. (L15, T7f; *Cr,* ST, SGA-g)

595-L.* Control of Electrodeposition Processes by Examination of the Deposits. T. E. Such. *Electroplating and Metal Finishing,* v. 12, July 1959, p. 256-259.

Methods for testing ductility, hardness and stress of electrodeposits. Effect of thickness and contamination of coating. (L17c, Q23p, Q25, Q29n; 8-62)

596-L.* Electroforming Waveguides. J. R. Balmer and T. W. A. Bailey. *Electroplating and Metal Finishing,* v. 12, July 1959, p. 267-270.

Methods of interior finish of waveguides. The function of mandrels and electroplating in plating waveguide interiors. Effect of impurities in deposits and variations in cathode current density on electrical resistivity. (L18, 3-69; Ti)

597-L.* (French.) Protection of Metals by Paints. Georges Nedey. *Nature,* no. 3288, Apr. 1959, p. 172-177.

Paints for protection against atmospheric corrosion, waste water, chemicals, sea water and organisms. (L26n, R-general)

598-L.* Metallizing in the Process Industries. Walter B. Meyer. *American Society of Mechanical Engineers,* Paper no. 59-SA-47, 1959, 9 p. $.80.

Metal spraying, chemical and physical properties, adhesion, corrosion characteristics and practical applications of sprayed metal deposits. Ceramic coatings. (L23, L27, R-general; 8-67)

599-L.* Barrel Finishing of Castings. L. D. Stevens. *Foundry,* v. 87, Aug. 1959, p. 65-67.

Barrel finishing reduces costs by cutting man-hour requirements. It can be used to remove surface imperfections, deburr, polish, radius, burnish and grind. (L10d; 5)

600-L.* Chemically Deposited Nickel Coating. *INCO*, v. 27, Apr. 1959, p. 32-35.

Mechanical properties, corrosion resistance, appearance and application of Kanigen coating. (L28; Ni)

601-L.* (German.) Effects of Process Final Annealing on the Adherence of Zinc Plate to Steel Wire. Dietrich Horstmann. *Stahl und Eisen*, v. 79, no. 14, July 9, 1959, p. 1002-1005.

Adherence decreases when process annealing precedes galvanizing. Zn plate on wire galvanized after drawing (with or without final annealing) shows good adherence properties which improve with increased phosphorus and nitrogen content. (L16, Q10c, 2-64, 2-60; ST, 4-61, 8-65, *Zn*)

602-L.* Hardfacing With Cobalt-Base Alloys. G. Grainger. *Cobalt*, no. 3, June 1959, p. 3-15.

Composition, properties of Stellite alloys and various methods of application. 5 ref. (L24; Co-b)

603-L.* A New Highly Efficient Bath for Nickel Plating. Rudolf Misurec and Zora Sovikova. *Czechoslovak Heavy Industry*, no. 7, 1959, p. 14-19.

Leveling action bath for bright nickel-plating developed in Czechoslovakia. The leveling action is caused probably by the varying thickness of the diffusion layer at various points of the cathode (i. e., on peaks and in recesses), as well as by the different concentration of the leveling agent in the diffusion layer of the cathode owing to the precipitation of the addition agent from the bath by adsorption or by simultaneous deposition on the coating. (L17a; Ni)

604-L.* Chromizing in a Vacuum. Frantisek Princ and Vaclav Navara. *Czechoslovak Heavy Industry*, no. 7, 1959, p. 20-27.

Process is especially economical when components made of brass are replaced by chromized components made of steel. The cost of chromized steel components is about 60-70% of that of brass. (L15, 1-73; ST, *Cr*)

605-L.* Flame-Sprayed Coatings. Frantisek Princ. *Czechoslovak Heavy Industry*, no. 7, 1959, p. 28-35.

Review of preliminary surface treatment processes, spraying techniques and equipment and chemical treatment and sealing of coatings. (L23)

606-L.* Surface Finishing Stainless Steels. Lester F. Spencer. *Metal Finishing*, v. 57, July 1959, p. 48-53, 58.

Operation sequence and procedures for producing desired grade of finish on various types of stainless. (L10; SS)

607-L.* Plating on Inconel. Ed Calderon. *Metal Finishing*, v. 57, July 1959, p. 64, 69.

Method for Ag plating directly on Inconel-X turnbuckles which prevented galling and seizing of threads. (L17; Ni-b, *Ag*)

608-L.* Science for Electroplaters. Pt. 49. Copper Plating. L. Serota. *Metal Finishing*, v. 57, July 1959, p. 72-74, 81.

Composition of baths, alkalies and acids; throwing power and various additives. (L17; Cu)

609-L.* Industrial Metal Finishing With Paints and Organic Coatings. J. J. Stordy and G. J. Appleton. *Metal Finishing Journal*, v. 5, June 1959, p. 223-236.

Pretreatment, painting and various spray coating processes. (L26)

610-L.* Zinc Coatings on Iron and Steel. Pt. 1. The Problem of Corrosion and Its Prevention. A. K. Parker. *Metal Finishing Journal*, v. 5, June 1959, p. 241-242, 245.

Electrochemical process of corrosion and protection given by galvanizing. (L16, R1a; ST, Fe, *Zn*, 8-65)

611-L.* (French.) Chemical Polishing. *Galvano*, v. 28, June 1959, p. 289-295.

Choice of polishing bath as determined by material composition. (L12f, 2-60)

612-L.* (Hungarian.) Determining Lowest Specific Energy Consumption in the Electrolysis of Zinc. Pt. 1. Zoltan Horvath. *Kohaszati Lapok*, v. 42, Apr. 1959, p. 135-142.

Computations show that bath voltage is reduced when electrolyte has good conductivity. Best results are obtained with high temperature, high H_2SO_4 concentration, low Zn content and low current densities. (L17; Zn)

613-L.* (Hungarian.) Electrolytic Polishing of Aluminum Floodlight Mirrors. Endrene Lichtenberger. *Kohaszati Lapok*, v. 42, Apr. 1959, p. 155-160.

Reflecting properties of Al alloy mirrors are greatly raised by the use of

electrolytic polishing rather than conventional mechanical methods. 22 ref. (L13p, P17a; Al-b)

614-L. Acid Pickling. G. F. Whitmore. *Institute of Vitreous Enamellers Bulletin,* v. 9, June 1959, p. 127-136. (L12g)

615-L.* (German.) Electrolytic Polishing of Metals. R. Weiner. *Industrieblatt,* v. 59, June 1959, p. 254-259.

Current distribution, bath control, current supply, quality of materials to be polished in relation to Au, Ag, Cu, Al, Fe and steel alloys. 9 ref. (L13p; Au, Ag, Cu, Al, Fe, AY)

616-L. Better Buffing Thru Better Buff Design. Pt. 2. Stanley P. Sax. *Metal Finishing,* v. 57, July 1959, p. 54-58.

Recommended operation procedures and buffing wheel size, speed, and materials. (Conclusion.) (L10a, W2b, 17-51)

617-L.* The Formation of Hard Films on Zinc and Zinc Alloy Surfaces by Electrolytic Processes. H. Fry. *Metal Finishing Journal,* v. 5, May 1959, p. 181-189.

Technique produces coatings on high-purity Zn and Mazak 3 alloy by means of a Ni cathode for anodizing in silicate-borate-tungstate solution and Zn counter-electrode for electrolyses with a.c. (L19; Zn)

618-L.* New Thermo-Chemical Techniques. Pt. 2. Powder Metallurgical Applications. P. Galmiche. *Metal Finishing Journal,* v. 5, May 1959, p. 191-195, 204.

Protection against wear by heating powder metal parts in granulated Cr with small additions of ammonium fluoride. Protection of sintered Fe and steels and dynamically free metal powders by means of Cr. Purification by Onera process of plastic Cr powder and dense machinable sintered products. 12 ref. (L15; 6-72, ST, Fe, *Cr*)

619-L.* Descaling Wire Rods by Shot-Blast. K. J. Sorace. *Metal Progress,* v. 76, July 1959, p. 98-100.

A continuous line for drawing wire at 300 ft. per min. depends on a shot-blast method for descaling. Costs are comparable to conventional methods and the pollution problem (from acid pickling baths) is avoided. (L10c, F28, 1-61; ST)

620-L. Removal of Tritium Contamination From Surfaces of Metals. A. E. Symonds, Jr. E. I. du Pont de Nemours & Co. *U. S. Atomic Energy Commission,* DP-367, Apr. 1959, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Heat treatments greatly enhance the removal of tritium contamination from metals that were exposed to heavy water used as a reactor moderator. Heat treatment for 30 min. at 300° C. is effective in removing general contamination. Quench treatments following the heating significantly improve the decontamination process. 7 ref. (L12, 2-64)

621-L.* (English.) Effects of Fe-Al Powder in Aluminum Diffusion Coating. Shigetomo Ueda. *Waseda University, Castings Research Laboratory, Report,* no. 9, Nov. 1958, p. 65-70.

Effects of packing, aging and fineness of Fe-Al powder as a diffusion agent. When the packing ration is 2-3 g per cc., the coating characteristics are not affected. Power of the agent decreases rapidly with number of repetitive uses. (L15; Fe, Al, 6)

622-L.* (German.) Current Practice in Anodizing. G. Elssner. *Aluminium,* v. 35, July 1959, p. 374-382.

Effect of bath concentration and temperature, current density and anodizing time on the thickness and hardness of anodized coatings; coloring and sealing techniques. (L19; Al-b)

623-L.* (German.) Sealing of Anodized Aluminum by Means of Boiling Water. F. Modic. *Aluminium,* v. 35, July 1959, p. 382-383.

Two processes can be used to avoid undesirable effects of abrasiveness on the surface of anodized films after water sealing. Either a post-treatment with a mild polishing or by dipping the anodized parts in a 20 to 30% solution of nitric acid at 20-25° C. (L19; Al-b)

624-L.* (German.) Regeneration of Chromating Baths by Ion Exchange. H. Keller. *Aluminium,* v. 35, July 1959, p. 384-385.

Changes in thickness, color and corrosion resistance derive from chemical reactions between metal surfaces and bath solution since Al ions enter the solution and form foreign metal ions. Defects are avoided by continuous ion exchange produced by an H-ion exchanger. 8 ref. (L14c)

625-L.* (German.) Electroless Nickel Plating. L. Bosdorf. *Aluminium*, v. 35, July 1959, p. 391-393.

Currentless Ni plating of Al surfaces can be obtained by forming a metallic intermediate layer. Ni plating of anodized Al surfaces is also possible. 6 ref. (L28; Al, *Ni*)

626-L. "Microstoning" Generates Precise Finishes. Rupert Le Grand. *American Machinist*, v. 103, July 27, 1959, p. 96-98.

Process generates controlled micro-inch finish on practically any material and corrects geometrical errors caused by previous machining. (L10h)

627-L. Better Durability for Electroplated Zinc Die Castings. W. H. Safranek, H. R. Miller and C. L. Faust. *Automotive Industries*, June 15, 1959, p. 70-74, 114.

Greater resistance to corrosion is achieved by using Duplex Ni and bright crack-free Cr. 5 ref. (L17, R-general; Zn, *Ni, Cr*, 5-61)

628-L. A Review of Barrelling and Abrasive Blasting. *Corrosion Prevention & Control*, v. 6, June 1959, p. 61-67.

Applications of barreling and shot and vapor blasting processes. (L10c, L10d)

629-L. Clad and Laminated Metals and Their Design Potentials. *Electrical Manufacturing*, v. 63, June 1959, p. 78-83, 135.

Methods of cladding Au, Ag or Pt on a base metal. (L22; *Au, Ag, Pt*)

630-L. Protection With Cold Galvanizing. *Industrial Finishing*, v. 11, July 1959, p. 16, 18.

(L16, 1-67)

631-L. Aluminizing Resists Refinery Corrosion. C. F. Tisinai and C. H. Samans. *Petroleum Refiner*, v. 38, June 1959, p. 153-160.

Aluminizing carbon steel or low-alloy steel is an inexpensive method of protection against refinery sulphidation and oxidation. (L15, R7; CN, AY, *Al*)

632-L. (Translation—BWRA.) Electrical Impulse Hard Facing by Metal Deposited in Liquid. M. S. Baranov. *Avtomaticheskaya Svarka*, v. 66, Jan. 1959, p. 86-98.

Hard surfacing carbon steel in an electrolyte solution using resistance-arc or resistance-spark processes. Electrical discharge characteristics and their control. Influence of welding conditions on quality of deposited metal. (L24, K1; CN)

633-L.* Bright, Non-Brittle Acid Copper Deposits. Larissa Domnikov. *Metal Finishing*, v. 57, Aug. 1959, p. 66-67, 71.

Cu plating of low-carbon steel in baths containing $CuSO_4$ and thiourea. Effect of bath composition and plating parameters on brightness and quality of deposit. 20 ref. (L17; CN-g, *C*)

634-L.* Science for Electroplaters. Pt. 50. Copper Plating. Pt. 2. L. Serota. *Metal Finishing*, v. 57, Aug. 1959, p. 72-73, 75.

Effect of surface leveling produced by additions of phenol-sulphonic acid, glue, thiourea or dextrin plus a wetting agent, to the Cu bath. (L17a; Cu)

635-L.* Direct Chrome-to-Aluminum Plating. *Precision Metal Molding*. v. 17, Aug. 1959, p. 49.

The Chrom-Lume process in which a Cr deposit is bonded directly to Al without the use of intervening metals, such as Cu, Ni or Zn. Coating has strong adhesion and good resistance to abrasion, bending and torsional and impact loading. (L17; Al, *Cr*)

636-L. Growth of Chromium Coatings From Liquid Metallic Solutions. S. T. Wlodek and J. Wulff. Massachusetts Institute of Technology. *U. S. Office of Technical Services*, PB 151126, Oct. 1957, 81 p. $2.25.

Deposition of Cr coating on Mo by selective freezing from molten alloys of Cu-Cr or Sn-Cr. Influence of bath composition, homogenizing temperature, cooling rate and forced convection. Theoretical analysis of nucleation, growth and morphology of coatings. Solubility of solid Mo in liquid Cu and Sn and solid Cr in liquid Sn. (L16, N12e; Mo, *Cr*)

637-L.* (German.) Study on Porcelain Enamel Coated Aluminum. Pt. 1. M. Ishihara, F. Mochizuki and Y. Kawarasaki. *Light Metals*, v. 9, Mar. 1959, p. 67-73.

Enameling process using a Pb-base frit. (L27; Al)

638-L.* (Japanese.) Vibratory Electrolytic Polishing in Phosphoric Acid. Pt. 5. Takakado Nakayama. *Light Metals*, v. 9, Mar. 1959, p. 38-54.

Vibration applied to the anode prevents gas bubbles adhering to the anode surface, which makes the electrolytic action non-uniform and prevents the anode from becoming overheated. (L13p)

639-L. Electrodeposition of Chromium Alloys. Charles Levy. *Metal Finishing*. v. 57, Aug. 1959, p. 59-62.
Literature review on Cr-Fe, Cr-Ni, Cr-Co, Cr-W, Cr-Mo and other binary and ternary alloy deposits. 67 ref. (L17; Cr-b, *Fe, Ni, Co, W, Mo*)

640-L. Analysis of Sulfuric Anodizing Solutions. J. B. Mohler. *Metal Finishing*, v. 57, Aug. 1959, p. 63-65.
(L19n)

641-L. Patents. *Metal Finishing*, v. 57, Aug. 1959, p. 76-81.
Review of recent patents in the field of metal finishing. (L-general, 11-59)

642-L. New Developments in High Temperature Ceramic Coatings. Frederick D. Shaw. *Metal Treating*, v. 10, July-Aug. 1959, p. 2-3, 34-35.
Coatings are now utilized on low-carbon or low-alloy steels, stainless steels of either American Iron and Steel 300 or 400 series and premium temperature alloys. (L27; 2-62, CN-g, AY, SS, SGA-h)

643-L. Electroplating on Titanium. Nelson F. Murphy. *Products Finishing*, v. 23, Aug. 1959, p. 68, 70, 72.
(L17; Ti)

644-L. Glass-Bonded Refractory Coatings for Iron or Nickel-Base Alloys. T. E. Cook and B. W. King. *Defense Metals Information Center*, DMIC Memo. 16, Apr. 25, 1959, 17 p.
Recommended coatings for some 25 Fe and Ni-base alloys. Coating compositions: procedures for metal preparation and application. 40 ref. (L27; Fe-b, Ni-b, NM-f42)

645-L.* Porcelainized Cast Aluminum. E. J. Tangerman. *Product Engineering (Design Issue)*, v. 30, Aug. 17, 1959, p. 47-50.
Low-temperature frits can now be applied to permanent-mold castings as well as to sheet Al and may soon work on die castings as well. Most acceptable alloys are 3002, 3003, 6061, 43 cast alloys and some lots of 6063. (L27; Al, 4-53, 4-63)

646-L.* (Japanese.) Characteristics of Chromizing. Shigetamo Ueda. *Metal Finishing Society of Japan, Journal*, v. 10, May 1959, p. 187-189.
Determination of hardness of 12-13% Cr coatings produced by diffusion processes on low-carbon steel. (L15, Q29; *Cr*, CN-g)

647-L. What to Look for in Anodizing Equipment. Gilbert Tramer. *Modern Metals*, v. 15, July 1959, p. 48, 50, 54.
(L19, 1-52)

648-L.* (German.) Reactions Between Nickel Electrolyte and Nickel Anode. O. Storing. *Galvanotechnik*, v. 50, July 15, 1959, p. 348-361.
Solubility of Ni is influenced by anions (mainly Cl), organic inhibitors, temperature and current density. The more compact the anode structure, the higher the polarization. Current efficiency depends on H^+-ion concentration, anodic current density and is influenced by bright Ni additions. (L17; Ni)

649-L.* (German.) Electroplating of Soldered Parts. Helmut Dahlman. *Galvanotechnik*, v. 50, July 15, 1959, p. 362-364.
Pickling and other pretreatment processes prior to electroplating of electronic equipment parts; Ag plating; rinsing; final Ag plating. (L17, L12; Cu-n, 7-52, *Ag*)

650-L.* (German.) Electrolytic Tinplating. Eduard Weber. *Galvanotechnik*, v. 50, July 15, 1959, p. 374-377.
Current intensity depends on strip dimensions and speed of strip movement. (L17, 3-73; *Sn*, 4-53, ST)

651-L.* Sprayed Metallic Coatings for Automotive Aluminum Castings. Herbert S. Ingham. *Society of Automotive Engineers*, Preprint no. 65B, June 1958, 11 p.
Spraying Mo on steel. Characteristics of coating. (L23, Q9n; Al-b, *Mo, ST*, 5)

652-L.* Recent Tests on Economical Cleaning of Unalloyed Low-Carbon Steel in Sulphuric Acid, Using a Wetting Agent. C. A. Fischer. *Wire Industry*, v. 26, July 1959, p. 647-649, 676.
Pickling reaction with sulphuric acid. Experiences with the addition of rock salts or synthetic wetting agents. Comparison between hydrochloric acid and sulphuric acid pickling. (L12g; CN-g, 4-61)

653-L.* Precision Barrel Finishing. Lester F. Spencer. *Machine Design*, v. 31, Sept. 3, 1959, p. 156-160.
Finer control with different sizes and types of abrasives results in considerable improvement of surface finishes, radii

contour and color. Metal parts can be finished requiring a 3 to 7-micro-in. rms. finish and a 0.0002-in. tolerance on radii. (L10d, 17-55)

654-L.* Vinyl Clad Steel. Glenn E. Wintermute. *Society of Plastics Engineers, 13th Annual National Technical Convention,* v. 3, n. d., p. 339-346.

Metal preparation, adhesive application of adhesive, solvent evaporation, heat reactivation, application of vinyl and cooling. Coatings have good durability, scratch, wear and abrasion resistance and are chemical, stain, weather and corrosion resistant. (L26p; ST)

655-L. Trouble-Shooting in the Plating Shop. C. F. Corfe. *Electroplating and Metal Finishing,* v. 12, Aug. 1959, p. 291-295, 298.

Plating defects correlated with problems in the pre-plating and plating processes. (L17, 9)

656-L. Smooth Copper and Nickel Deposits. D. R. Newman. *Electroplating and Metal Finishing,* v. 12, Aug. 1959, p. 296-298.

Use of diaphragm tanks in conjunction with a high rate of filtration. (L17a; Cu, Ni)

657-L. 7,500-Ton Press Ram Uses a 1500-Lb. Aluminum Bronze Overlay. Victor Nigriny. *Welding Design & Fabrication,* v. 32, Aug. 1959, p. 29-53.

(L24, K1e, W24-g; ST, Cu-s, *Al*)

658-L.* Control of Electrodeposition Processes by Examination of the Deposits. T. E. Such. *Electroplating & Metal Finishing,* v. 12, no. 6, June 1959, p. 215-218.

Study of the appearance of the electrodeposit with regard to brightness and optimum current density. Covering power determined by means of electrocathode test; qualitative tests for adhesion. (L17)

659-L.* A Test of the Degree of Sealing of Anodic Coatings on Aluminum. D. E. Bury and H. P. Godard. *Electroplating & Metal Finishing,* v. 12, no. 6, June 1959, p. 219-220.

Test appears suitable for control of sealing by determining resealing weight gain, using production material. The value of 2% maximum resealing weight gain was set as the acceptance limit. (L19; Al)

660-L.* Vacuum Evaporated Cadmium Deposits. D. J. Fishlock. *Electroplating & Metal Finishing,* v. 12, no. 6, June 1959, p. 222.

Coating of high-tensile steels with Cd by evaporation to avoid embrittlement associated with electrodeposition. (L25g; *Cd,* ST)

661-L.* Thermo-Lay Strip—a New Development in Composite Metal Fabrication. Allen C. Gilbraith. *Electroplating & Metal Finishing,* v. 12, no. 6, June 1959, p. 223-224.

Electrodeposition followed by heat treatment to achieve a metallurgical bond to the base metal strip, and finally rolling to finished thickness and temper, results in a dense, wear resistant surface of improved corrosion resistance. (L17, 2-64; 4-53)

662-L.* Porcelain Enamels for Aluminum and Magnesium. N. H. Stradley. *American Ceramic Society Bulletin,* v. 38, Aug. 1959 p. 401-404.

Characteristics of Pb-bearing and leadless glass systems. Alloy selection and surface treatment. Enamel preparation, application and firing. Properties of porcelain enamels. 8 ref.

(L27; Al-b, Mg-b)

663-L.* (French.) Protection of Uranium by Nickel Plating and Subsequent Diffusion. G. Chauvin, H. Coriou and J. Hure. Paper from "Symposium on Solid State Diffusion". Centre d'Etude Nucleaires de Saclay, Gif-sur-Yvette (S-et-O), France, 1959, p. 119-131.

Uranium bars are Ni plated in a bath containing no boric acid and then heat treated to allow the two metals to partly diffuse. 32 ref.

(L17, 2-64, T11g; U, *Ni,* 8-74)

664-L.* (German.) Electroplating of Tantalum. T. E. Brehmer. *Galvanotechnik,* v. 50, Aug. 15, 1959, p. 410-413.

Coating of Ta with a metallic layer is of importance because of the poor welding and soldering properties of Ta. Electroplating with other metals, using the base metal as a cathode. (L17; Ta)

665-L.* (German.) The Chromium Coating of Diamond Turned Brass Parts. P. P. Nowak. *Galvanotechnik,* v. 50, Aug. 15, 1959, p. 413-415.

Coating defects caused by surfaces resulting from turning. The thickness of Cr coating has to be increased to compensate for the high wear rate. If Pb and Sn

are contained in the brass, Cu coating is suggested before the Ni coating is applied. Bright-nickeling electrolytes are specified, since an additional polishing would destroy the turning effect. (L17; Cu-n, *Cr, Ni*)

666-L.* (German.) Chemical Conversion Coating of Aluminum. E. Herrmann. *Galvanotechnik*, v. 50, Aug. 15, 1959, p. 420-423.

The use of a 3% solution of CrO_3 is suggested for the removal of oxide films from Al parts before protective coatings are applied. (L14; Al)

667-L.* Electrolytic Pre-Treatment of Metals for Metallographic Examination. *Mining Journal*, v. 252, June 19, 1959, p. 671-673.

Electrolytic polishing compared with mechanical polishing techniques. Structural etchings on electrolytically polished specimens are carried out in a shorter time since the shattered surface layers do not have to be removed. (L13p)

668-L.* Plasma Arc Process Coats and Forms Refractory Materials. *Space Aeronautics*, v. 32, July 1959, p. 105-109.

New process to apply coatings and fabricate complex shapes with special plasma arc torches. The plasma is obtained by heating gas to a temperature high enough so that it is ionized. Temperatures above 20,000° F. have been obtained inside the arc column. (L29, G13)

669-L. (Pamphlet.) Industrial Nickel Plating. 17 p. 1959. International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. n. p.

Mechanical properties of Ni deposits; plating before and after fabrication; corrosion resistance of Ni and Ni-plated steel in wide variety of corrosion environments. Applications. (L17, R-general, Q-general; ST, Ni)

670-L. (Book.) Metallizing Handbook. v. 1 and 2. H. S. Ingham and A. P. Shepard. 310 p. 1959. Metallizing Engineering Co., Inc., Westbury, L. I., N. Y.

Surface preparation; selection of metal; physical properties of sprayed metal; spraying; corrosion resistant coatings; production metallizing; miscellaneous metallizing applications. (L23)

671-L.* Precision Plating Lowers Grinding Costs. *Metalworking Production*, v. 103, Aug. 14, 1959, p. 1231-1234.

Semi-automatic deposition of 0.012-in. Ni coating on carbon steel rod. (L17b; CN, *Ni*)

672-L. (Russian.) Surface Structures After Various Shot Blast Treatments of Steels of High Hardness. Yu. G. Myasnikov and Yu. S. Terminasov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 154-159.

Spring steel is shot blasted for various periods of time and the number of lattice dislocations and block formations is investigated by X-ray patterns. 6 ref. (L10c, M26b; ST, SGA-b)

673-L. How to Write Specifications for Anodized Finishes. R. V. Vanden Berg. *Product Engineering (Design Issue)*, v. 30, Sept. 28, 1959, p. 44-51.

(L19, S22; Al-b)

674-L. (French.) Adherence of Electrodeposits. P. Badet. *Galvano*, v. 28, July 1959, p. 335-338.

(L17; *Cu, Ni*)

675-L.* Electrodeposition of Copper-Zinc Alloys From the Pyrophosphate Bath. V. Sree and T. L. Rama Char. *Electroplating and Metal Finishing*, v. 12, Sept. 1959, p. 326-330.

Use of pyrophosphate bath for codeposition of Cu with Zn. Optimum conditions for obtaining satisfactory alloy plates in the composition range 60-100% Cu. Anode behavior of cast alloys; X-ray patterns of deposits; advantages over cyanide baths. (To be concluded.) (L17a; Cu-n)

676-L.* Metallic Finishes for Services' Equipment. D. W. Smith. *Electroplating and Metal Finishing*, v. 12, Sept. 1959, p. 331-337.

Finishes for protection of Al alloys against corrosion; corrosive effects of temperature and moisture. Protective coatings are applied by spraying and electrodeposition. (L23, L17; Al)

677-L. The Reclamation of Worn Components for Glass Bottle Manufacturing Machines. P. H. Marshall. *Electroplating and Metal Finishing*, v. 12, Sept. 1959, p. 338-339, 346.

Reclamation of cast and forged machine parts by metal spraying. Machining and blasting prior to metal spraying. (L23, T7, 18-72)

678-L.* Crack-Free and Duplex Chromium. D. E. Weimer. *Electroplating and Metal Finishing*, v. 12, Sept. 1959, p. 340-343, 348.

Analysis of processes and applications; results of accelerated corrosion tests. (L17, R11; Cr, 8-62)

679-L.* Aluminum Enamelling. C. Vickers. *Vitreous Enamellers Institute, Bulletin*, v. 9, July-Aug. 1959, p. 137-142.

Advantages, disadvantages, methods and practicality of enamelling various Al alloys. Advantages include the fact that finished sheet can be bonded more successfully to other materials by reason of its more flexible nature. Enameling can often be applied to thinner gage Al than is the case with steel. (L27; Al-b, 4-53)

680-L.* (English.) Study on Vacuum Deposition of Metals. Pt. 2. On the Formation of Alloys by Successive Deposition of Constituent Metal Vapors in Vacuum. Y. Fujiki. *Physical Society of Japan, Journal*, v. 14, July 1959, p. 913-917.

Alloy phases formed in a vacuum by successive deposition of metal vapors were investigated for Au-Pb, Bi-Pb, Cu-Sn, Ag-Sn and Cd-Sn systems. By electron diffraction, it was determined that the temperature of the primary surface layer is raised by deposition of a second layer; metal pairs having higher latent heats of condensation may form alloys more easily. (L25g, 1-73; Au-b, Bi-b, Cu-b, Ag-b, *Sn, Pb*)

681-L.* Vapor-Phase Plating With Molybdenum and Tungsten. H. W. Schultze. *Metal Progress*, v. 76, Sept. 1959, p. 74-80.

Deposits of metals or their refractory compounds produced from chlorides and carbonyls of Mo and tungsten at temperatures below the melting point of the metals. Coatings produced on ceramics, glass, refractories and graphite. (L25; Mo, W)

682-L.* Plating With Duplex Chromium. Edgar J. Seyb, Jr. *Precision Metal Molding*, v. 17, Sept. 1959, p. 71-73.

Special operating procedure using SRHS formulation CR-110 provides deposits with a unique over-all crack pattern. This is plated over a crack-free CF-520 deposit, resulting in a combination which provides greatly improved corrosion resistance. (L17, R-general; Cr)

683-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of Wire. J. Paul Tierney. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 483-485.

Cleaning, galvanizing and wiping; influence of steel type on coating properties. (L16, L12, 1-61; ST, *Zn*, 4-61)

684-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of Pipe. J. L. Roemer, Jr. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 485-488.

Cleaning, fluxing and coating steel pipe. (L16, L12; ST, 4-60, *Zn*,)

685-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Electrogalvanizing of Sheet. H. H. Greene. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142, Reinhold Publishing Corp., New York 22, 1959, p. 488-491.

Cleaning, electroplating and phosphating operations; characteristics of electrogalvanized steel strip. (L17, L12, L16; ST, *Zn*, 4-53)

686-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Zinc Coating of Steel Wire by Electrodeposition. J. E. Crowley. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142, Reinhold Publishing Corp., New York 22, 1959, p. 491-499.

Sequence of operations in electrodeposition line; features of Zn anode, magnetite anode and Ag-Pb anode processes; properties of Zn-coated steel wire. (L17, 1-61; ST, *Zn*, 4-61)

687-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. General Electroplating With Zinc. R. E. Harr. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142, Reinhold Publishing Corp., New York 22, 1959, p. 500-503.

Comparative capabilities of acid and of alkaline-cyanide plating solutions. Equipment; thickness of electroplated coatings. (L17; ST, *Zn*,)

688-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of General Products. K. S. Frazier. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 453-465.

Protective action and life of hot-dip Zn coatings applied to steel. Factors influencing coating properties. (L16; ST, *Zn*)

689-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Metallizing With Zinc. Sam Tour. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 503-511.

Metal spraying equipment, spraying Zn on steel for corrosion protection and as base for paint. (L23; ST, Zn)

690-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Sherardizing. C. T. Flachbarth and W. H. Taylor. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 511-513.

Steel articles coated by heating in contact with Zn vapor. Structure of coating. (L15; ST, *Zn*)

691-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Zinc-Rich Paints. G. W. Ashman. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 513-523.

Protection of iron and steel with paints containing metallic Zn. Coating properties. (L26n; ST, Zn, Fe, NM-g30)

692-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of Sheet by Conventional Pot Methods. Nelson E. Cook. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 465-468.

Galvanizing cut length steel sheets; limitations of process. (L16; ST, *Zn*, 4-53)

693-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of Sheet in Continuous Lines by the "Cook-Norteman" Process. Nelson E. Cook. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 468-471.

Application of tight Zn coating to pre-fluxed and preheated steel strip. Induction heating of Zn baths. (L16, 1-61; ST, *Zn*, 4-53)

694-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of Sheet in Continuous Lines by the "Sendzimir" Process. Kasimir Oganowski. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 472-479.

Oxidation and reduction processes for cleaning steel strip. Temperature control; galvanizing. (L16, L12, 1-61; ST, *Zn*, 4-53)

695-L.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Hot-Dip Galvanizing of Sheet by Continuous-Line Operations at the United States Steel Corp. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 479-483.

In-line cleaning, bright annealing and galvanizing of steel strip. (L16, L12, J23a, 1-61; ST, *Zn*, 4-53)

696-L.* (German.) Correct Choice of Flux for Hot Galvanizing. H. Bablik, F. Gotzl and R. Kukaczka. *Metall*, v. 13, Aug. 1959, p. 730-734.

Importance of washing, subsequent to pickling, on the quality of Zn plate. Effect of surface tension of the flux over the range of 20-455° C. Temperature distribution in the flux layer covering the bath surface. (L16; ST, 4-53, RM-q)

697-L.* (German.) Mechanism of the Protection of Zinc and Cadmium by Chromate Coatings. J. Elze. *Metall*, v. 13, Aug. 1959, p. 740-742.

Tests on the porosity of protective layer. Exposure to distilled water, solutions containing $ZnSO_4$, sea water and a phthalate buffer solution of acidity similar to that of fresh water (pH 6), free of chlorides. Protection takes place by the retardation of anodic or cathodic reactions. 4 ref. (L14c, R10; Zn, Cd)

698-L. Ceramic Coated Furnace Rolls Insure Better Silicon Strip. *Steel*, v. 145, Sept. 28, 1959, p. 134, 137.
(L27, W27p)

699-L. Future of Aluminum Enamelling. P. E. Gilroy. *Vitreous Enamellers Institute, Bulletin*, v. 9, July-Aug. 1959, p. 150-154.
Application and limitation of the process. (L27; Al)

700-L.* Fundamental Considerations in Polishing and Buffing. Lester F. Spencer. *Metal Finishing*, v. 57, Sept. 1959, p. 60-67.
Types of finishes; factors influencing surface finishing; buffs and polishing wheels; adhesive and abrasive compounds. Finishing of carbon and stainless steels, Mg alloys, Al, Cu and Ni and their alloys. (L10a, L10b; Al, Cu, Ni, CN, SS)

701-L.* Plating Time Determinations. Edward F. Duffek. *Metal Finishing*, v. 57, Sept. 1959, p. 77.
Test panel and "copper coulometer" methods of time and thickness determinations. Sample equations; table of common electroplated metals and their weights per unit area for 0.0001 in. (L17b)

702-L.* Electropolishing of Aluminum, Review and Literature Survey 1946 to 1958. Anton F. Mornheim. *Metal Finishing*, v. 57, Sept. 1959, p. 80-84.
Some 108 literature and patent abstracts from American, English, French, German, Japanese, Russian and other sources. (L13p, 10-54; Al)

703-L.* Science for Electroplaters. Pt. 50. Copper Plating. Pt. 2. L. Serota. *Metal Finishing*, v. 57, Sept. 1959, p. 85-88.
Anode sludge formation; influence of anode quality and impurities in acid bath on deposition. Electroforming procedures; molds and mandrels; applications. (L17, L18; Cu)

704-L.* (German.) Electrolytic Conductivity of the Binding Substance in Zinc Powder Protective Paints. Martin Kuhn, Klaus Rohardt and Jan Vliegenthart. *Farbe und Lack*, v. 65, Sept. 1959, p. 506-509.
Steel sheet was painted using various binding substances to determine the cathodic protection of Fe by Zn powder present in paint. In subsequent corrosion tests by exposure to an $NaCl + SO_2 + H_2O$ atmosphere, paint with basic binders provided the best corrosion protection. 4 ref. (L26n, R10d; ST, 4-53, NM-g30, *Zn*)

705-L.* Determination of Sulfuric Acid in Copper Plating Baths. M. R. Verma, V. M. Bhuchar, S. K. Mathur and S. S. Sharma. *Chemist-Analyst*, v. 48, June 1959, p. 41.
When a neutral potassium oxalate solution is added to an acidic copper plating solution the soluble copper-oxalate complex forms. If it is present at a molar ratio of oxalate to Cu of 3:1 or more the complex does not hydrolyze even when an excess of alkali is added. The free acid can then be titrated with standard caustic solution without interference by the Cu present. (L17a, 1-54; Cu)

706-L.* Influences of Hydrogen in Vitreous Enamelling of Steel. Gordon P. K. Chu. *Institute of Vitreous Enamellers Bulletin (Silver Jubilee Conference Edition)*, Sept. 1959, p. A1-A17.
Effects of hydrogen upon enamelling processes in relation to its evolution from the steel substrate. Evolution is determined by the diffusion and occulsion of hydrogen within the steel. (L27; ST, *H*)

707-L.* Blistering of Wet Process Vitreous Enamels on Cast Iron—Some Facts and Theories. E. R. Evans and A. D. Morgan. *Institute of Vitreous Enamellers Bulletin (Silver Jubilee Conference Edition)*, Sept. 1959, p. A19-A29.
Blistering has been associated with the presence of a casting skin. Evidence indicates that evolution of oxides of carbon from the iron causes blistering independently of any casting skin effect. (L27; CI, 9-71)

708-L.* Pinholes and Blistering of Enamelled Cast Iron. C. A. Saunders. *Institute of Vitreous Enamellers Bulletin (Silver Jubilee Conference Edition)*, Sept. 1959, p. A31-A37.
Pinholes and blistering are dependent on chemical composition, impurities, entrapped gas, and local hardening. (L27; CI, 9-68, 9-71)

709-L.* Metallic Abrasives Prepare Surfaces for Enamelling. J. P. S. Jenner. *Industrial Finishing (London)*, v. 11, Aug. 1959, p. 28-29.
Steel and chilled iron shot or grit for blasting iron and steel surfaces. (L10c, W2a; ST, CI)

710-L.* Electropolishing Techniques for Metals and Alloys. S. Gruettner. *Industrial Finishing (London)*, v. 11, Aug. 1959, p. 49-50, 50, 52.

Conditions for electropolishing Cu and its alloys, Ni, Zn, Fe and steels in phosphoric acid type baths. (L13p; Cu-b, Zn, Ni, ST, SS)

711-L.* Production of Embossing Plates From Texture Patterns by Electroforming Methods. John P. Young and Vernon A. Lamb. *Plating*, v. 46, Sept. 1959, p. 1033-1036.

Mounting of specimens; duplication of pattern; metallizing surface of mold; electroforming Ni-Cu replicas of pattern; joining to make a large master. 10 ref. (L18; Ni, Cu)

712-L.* Cleaning and Preparation of Metals Prior to Electroplating. Pt. 12. Effect of Fatty Acid Film. Henry B. Linford and Jean J. Grunwald. *Plating*, v. 46, Sept. 1959, p. 1039-1045.

Adherence of Ni plating on Cu specimens soiled with stearic acid films of varying thickness. Effect of greasy impurities on hydrogen bubble attachment and pitting. Literature survey. 30 ref. (L12, L17c, Q10c; Cu, *Ni*)

713-L.* Progress Toward the Development of a Nonembrittling Cadmium Electroplating Process. Pt. 2. Use of Aliphatic Amino Acids as Complexing Agents in Aqueous Baths. P. N. Vlannes and S. W. Strauss. *Plating*, v. 46, Sept. 1959, p. 1046-1051.

Throwing power and current density characteristics of ammoniacal Cd bath containing aliphatic mono-amino-acid. Results of delayed fracture tests on notched Cd plated AISI 4340 steel specimens indicate less embrittlement with amino acid baths than with standard cyanide solutions. 6 ref. (L17a, Q26s; AY, *Cd*)

714-L.* Decorative High Chloride Nickel Plating. Melvin Tippman. *Plating*, v. 46, Sept. 1959, p. 1054-1056.

Bath composition and operation for Plating Ni on steel, Al or Cu plated Zn. Causes of roughness, skips and cloudy plate. Advantages of high chloride bright plating baths. Corrosion resistance and appearance. (L17a; ST, Al, Zn, *Ni*)

715-L.* Plating Speeds Aluminum Soldering. William J. Ross. *Welding Design & Fabrication*, v. 32, Sept. 1959, p. 66.

Brush electroplating covers Al with easily soldered Ni surface. (L17; Al, *Ni*)

716-L. The Sulphuric Acid Recovery Plant in the Acid Circuit of a Wire Pickling Plant. W. Mallach. *Draht (English Edition)*, no. 42, Aug. 1959, p. 102-109.

Means of conserving water and achieving optimum acid recovery in $FeSo_4 \cdot 7H_2O$ process. (L12g, A8b; ST, 4-61)

717-L. A Modern Batch-Type Electric Furnace. Supplies Heat for Enamelled Holloware. *Industrial Finishing (London)*, v. 11, Aug. 1959, p. 32.

(L27, 1-52)

718-L. Modern Materials and Techniques. *Industrial Finishing (London)*, v. 11, Aug. 1959, p. 34-35.

Vitreous enamel and its application to cast iron and steel. (L27; CI, ST)

719-L.* Ceramic Coatings for Light Metals. G. L. Geltman and P. A. Huppert. *Ceramic Age*, v. 74, Sept. 1959, p. 32-39.

Use of ceramic containing lithium compounds to coat Al and Mg alloys. Results or tests for spalling, thermal shock, heat-transfer, reflectance, heat resistance, impact strength, adherence and dielectric strength. (L27; Al-b, Mg-b)

720-L. Development of Uranium Nitride—Stainless Steel Dispersion Fuel Elements. Stan J. Paprocki, Donald L. Keller, George W. Cunningham and Andrew K. Foulds, Jr. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1365, July 31, 1959, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Fabrication procedures for stainless steel clad flat-plate fuel elements having a core of 28% uranium nitride dispersed in 318 stainless steel. The preparation of uranium nitride and its compatibility with the alloy matrix are investigated with the effects of fabrication variables on tensile strength, bend strength and corrosion behavior. 4 ref. (L22, T11g; U)

721-L.* Effect of an Ultrasonic Field, Applied During Electrolytic Zinc Plating, on the Elastic Properties of Steel. A. M. Ginberg and A. P. Gorina. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 20-24.

Electrolytic degreasing and galvanizing in a cell exposed to ultrasonic waves. By this measure, the time of operation is foreshortened and the decrease of elasticity, due to hydrogen absorbed in the electrolytic process, is partly eliminated. 7 ref. (L17, 1-74, N15e, Q21, 2-60; ST, H, *Zn*)

722-L.* Duplex Chromium. Edgar J. Seyb, Jr. *Die Casting Engineer*, v. 3, Sept. 1959, p. 9-12.

Results of Corrodkote tests and copper-accelerated acetic acid salt spray tests on Duplex and ordinary Cr; effects of plating thickness on corrosion. (L17, R11j; Cr)

723-L.* When Cleaning Aluminum. *Modern Metals*, v. 15, Sept. 1959, p. 38, 40, 44, 46.

Chemical, electrolytic and ultrasonic cleaning or Al parts. (L-general; Al)

724-L.* For a Good Mechanical Finish. *Modern Metals*, v. 15, Sept. 1959, p. 48, 50, 54, 56, 58, 60, 62.

Use of grinding, polishing, buffing, embossing, hammering, and blasting in finishing Al. (L10; Al)

725-L.* Chemical Finishing of Aluminum. *Modern Metals*, v. 15, Sept. 1959, p. 64, 66, 71, 72, 74, 76, 78.

Etching, desmutting, conversion coating, brightening and chemical polishing. (L12, L14; Al)

726-L.* Anodizing and Plating Aluminum. *Modern Metals*, v. 15, Sept. 1959, p. 80, 84, 86, 88, 90-91.

Pretreatment coloring, racks, sealing and electropolishing. (L19, L13; Al)

727-L.* Organic Coatings for Aluminum. *Modern Metals*, v. 15, Sept. 1959, p. 94, 96, 98, 100, 102.

Types of finish coats; dip painting; spray painting; lacquering. (L26, L26n; Al)

728-L.* Porcelain Enameling Aluminum. *Modern Metals*, v. 15, Sept. 1959, p. 104-106, 108, 110.

Design considerations; pretreatment frits; color applications; new developments. (L27; 17-51, Al-b)

729-L.* (Russian.) Bimetals and Their Manufacture. L. E. Miller. *Tsvetnye Metally*, no. 7, 1959, p. 59-69.

Manufacture of Invar-Ni, Invar-brass and Invar-beryllium bronze bimetals. (L22; SGA-s, Cu-n, Be-b)

730-L.* New Bonding Process Gives Added Versatility to Cladding. R. A. Davis. *Corrosion*, v. 15, Oct. 1959, p. 88-90.

Use of high vacuum, heat and atmospheric pressure. Stainless steels and nonferrous metals may be used on backing plate; stainless steels, Ni and its alloys and other nonferrous metals are used as cladding. (L22; SS, Ni)

731-L.* Methods for Investigating the Characteristics of Reactive Coatings. Max Kronstein. *Corrosion*, v. 15, Oct. 1959, p. 508t-512t.

Composition and formation of coatings formed by phosphatizing, pickling and sealing. (L14)

732-L.* (Russian.) Hard Surfacing by Welding With a Sheet-Like Electrode. B. M. Kontorov and N. V. Popova. *Svarochnoe Proizvodstvo*, Sept. 1959, p. 27-30.

Granulated flux is spread on the surface of part, the electrode sheet is laid against the surface, flux is spread on the upper surface of electrode and a Cu plate is put on the top to keep the flux in place. (L24, K1; ST)

733-L. New Ceramic Coatings Protection at 3000° F. A. V. Levy. *Ceramics*, v. 10, Aug. 1959, p. 17-20.

Flame-spraying ceramic refractory coatings on steel surface prepared by grit-blasting. Ceramic is applied either as powder or pressed sintered rods. (L27, L10c, 2-62; ST)

734-L. Electroforming of Intricate Electronic Components. E. B. Murphy. *Electronics*, v. 32, Sept. 11, 1959, p. 114-117.

Electrochemical deposition of metal onto a mandrel or into a mold made of plastic which has been made surface-conducting by chemical treatment. A thick plating layer is deposited, with periodic current reversal for smooth surface. (L18)

735-L. Recent Developments of Finishes and Application Techniques for Vacuum Metallizing Plastics. M. A. Self. *Society of Plastics Engineers, 14th Annual Technical Conference*, v. 4, 1958, p. 648-653.

Methods of vacuum deposition of Al upon plastic, obtaining adherence to the substrate by resin coating. (L25g; Al)

736-L. Development of Metal Coating in Australia. *Australasian Manufacturer*, v. 44, Sept. 5, 1959, p. 44-47.

Spraying system for coating Fe and steel with nonferrous metals. (L23)

737-L. Ceramic-Coated Stampings Chosen for High-Temperature Service. Carter C.

Higgins. *Metalworking*, v. 15, Oct. 1959, p. 113-115.
(L27; 4-59)

738-L.* Role of Thiourea in the Electrodeposition of Copper. Bacon Ke, John J. Hoekstra, Bienvenido C. Sison, Jr., and Dan Trivich. *Electrochemical Society, Journal*, v. 106, May 1959, p. 382-388.
Uniform adsorption of thiourea causes deposits of uniform bright polycrystalline plating. Radioactive tracer studies of thiourea adsorption. 25 ref. (L17a, N12d, 1-59; Cu)

739-L.* The Source of the Nitrogen Impurity in Electrodeposited Chromium. N. Ryan and E. J. Lumley. *Electrochemical Society, Journal*, v. 106, May 1959, p. 388-391.
Nitrate ion concentration in electrolyte. Ammonium compounds and dissolved nitrogen have no effect. 6 ref. (L17, 3-69; Cr)

740-L.* Electroplating on Thorium. John G. Beach and Glenn R. Schaer. *Electrochemical Society, Journal*, v. 106, May 1959, p. 392-393.
Previous anodic and chemical pickling permits adherent electroplating of Al, Cr, Cu, Fe, Ni, Ag, In, Zn, Pb and Sn. 8 ref. (L17; Th, *Al, Cr, Cu, Fe, Ni, Ag, In, Zn, Pb, Sn*)

741-L.* The Effect of Magnesium Salts on Nickel Plating Baths. Ahmad Geneidy and W. A. Koehler. *Electrochemical Society, Journal*, v. 106, May 1959, p. 394-403.
Lower nickel deposition potential; reduced cathode polarization; slightly increased cathode efficiency; improved throwing power; reduced coating porosity; harder, stronger, less ductile deposits. High Mg concentration is necessary. 106 ref. (L17a, 2-60; Ni)

742-L.* Electrodeposition of Adherent Titanium Coatings on Induction Heated Cathodes in Fused Salts. B. J. Fortin, J. G. Wurm, L. Gravel and R. J. A. Potvin. *Electrochemical Society, Journal*, v. 106, May 1959, p. 428-433.
KI-KF bath with soluble titanium anode produces smooth, uniform coating on steel cathode. KI-NaI with TiI_4 bath gave dendritic Ti deposit. 7 ref. (L17, C23p; Ti)

743-L.* Molybdenum Plating Inside of Large Bore Tubes. Paul L. Raymond. *Electrochemical Society, Journal*, v. 106, May 1959, p. 444-448.
Equipment and techniques for plating of steel by hydrogen reduction of $MoCl_5$ under vacuum. Effect of variables on plating quality. (L25k, L28; ST, *Mo*)

744-L.* Electroplating of Nickel From the Pyrophosphate Bath. S. K. Panikkar and T. L. Rama Char. *Electrochemical Society, Journal*, v. 106, June 1959, p. 494-499.
Satisfactory deposits are attained over wide range of operating conditions. Effect of addition agents. 24 ref. (L17, 2-60; Ni)

745-L.* Polarization and Polishing Studies on Cu in a Hull Cell. Indra Sanghi and V. R. Ramanathan. *Indian Academy of Sciences, Proceedings*, Section A, v. 49, May 1959, p. 281-292.
Effects of polishing time, specific gravity of the electrolyte, addition of E.D.T.A., electrolyte level on the position, size and shape of the variously polished bands in a Hull cell. (L13p; Cu)

746-L.* Finishing Pointers. Cadmium Plating High Strength Alloy Steels. Elimination of Hydrogen Embrittlement. Ed Calderon. *Metal Finishing*, v. 57, Oct. 1959, p. 76.
Use of improved plating solutions. (L17a; ST, *Cd*)

747-L.* A Survey of the Factors Controlling Metallic Diffusion From the Gas Phase. R. Samuel. *Murex Review*, v. 1, no. 18, 1958, p. 501-527.
Characteristics of diffusion coatings; interstitial, vacant site and grain-boundary diffusion; kinetics and thermodynamics of coatings. Diffusion methods from gas phase including chromizing, siliconizing of ferrous metals, Ni and Mo. 34 ref. (L15, N1; Mo, Fe, Ni, *Cr, Si*)

748-L.* Metallizing Applications for Wear Resistance and Salvaging. Knowles B. Smith. *Society of Automotive Engineers*, Preprint no. 40 S, 1959, 6 p.
Influence of coating composition on coating hardness, abrasion and oxidation resistance. (L23, Q9; 8-67)

749-L.* (Dutch.) The Importance of the Oxy-Acetylene Flame in Hard Surfacing. W. Jansen. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 237-239.
Hard surfacing with a reducing flame has advantage in that the melting point of

a very thin surface layer of the base metal is lowered by increase of the carbon content. This results in a very thin molten layer, very slight penetration of the deposited metal and reduced mixing with the base metal. (L24, K2h)

750-L.* Dry-Cleaning for Metals. *Corrosion Technology*, v. 6, July 1959, p. 210-211.

Current methods of vapor degreasing with trichloroethylene. (L12)

751-L.* Progress Toward the Development of a Nonembrittling Cadmium Electroplating Process. Pt. 3. The Use of Triethanolamine in Cadmium Plating Solutions. P. N. Vlannes, S. W. Strauss and B. F. Brown. *Plating*, v. 46, Oct. 1959, p. 1153-1157.

Plating of steel and Cu with Cd is improved by the use of triethanolamine in the plating bath. The brittleness of the platings is influenced by the temperature and current density. (L17a, 2-61; ST, Cu, *Cd*)

752-L.* An Outline of the Chemistry Involved in the Process of Catalytic Nickel Deposition From Aqueous Solution. Pt. 1. G. Gutzeit. *Plating*, v. 46, Oct. 1959, p. 1158-1164.

Catalytic electroless plating of metal with Ni is made possible by the reduction of Ni by sodium hypophosphite in the plating bath. The rate of deposition of Ni upon the surface to be plated is inversely proportional to the amount of complexing substances within the bath. (L28; Ni)

753-L. Granodising, Anodising, Alochroming at Hoovers. *Industrial Finishing (London)*, v. 11, Sept. 1959, p. 30-31.

Anodizing procedure includes cleaning and etching in caustic soda and acid, rinsing, immersion in dilute H_2SO_4, through which an electric current passes, and sealing in boiling water. Alochroming, which gives a protective oxy-chromatic film, is used rather than anodizing for Al castings. (L19; Al)

754-L. When to Consider Automatic Spray Equipment. Warren Beach. *Metal Finishing*, v. 57, Oct. 1959, p. 69-71, 76.

Advantages of automatic spraying and comparison with manual spraying. (L23, 18-74)

755-L. Fluidized Bed Coating. Solution to Difficult Finishing Operation. Walter R. Pascoe. *Metal Finishing*, v. 57, Oct. 1959, p. 74-75, 80.

New method of coating metals with plastics. (L26p)

756-L. Science for Electroplaters. Pt. 51. Copper Bath Analysis. L. Serota. *Metal Finishing*, v. 57, Oct. 1959, p. 77-80.

Gravimetric and volumetric analysis. (L17a, S11b, S11j; Cu)

757-L. Metal Degreasing. *Metal Treatment and Drop Forging*, v. 26, July-Aug. 1959, p. 291-292.

Use of liquid and vapor trichloroethylene. (L12j, L12h)

758-L.* Electrophoretic Plating Is Reborn. Robert A. Keeler and Louis C. Terminello. *Metalworking Production*, v. 103, Oct. 2, 1959, p. 1563-1564.

Electrophoresis is the movement of charged colloidal particles in a liquid by application of an electrostatic field. If two electrodes are immersed in a prepared suspension and a potential applied to them, the suspended material is deposited on one of the electrodes. The coating is obtained by connecting the workpiece as one of the electrodes and immersing it in the suspension. (L29p)

759-L.* Internally Coated Steel Drums. R. Zuideveld. *Corrosion Technology*, v. 6, July 1959, p. 212.

Manufacture and interior lacquer coating of plain steel drums which hold products incompatible with plain steel. Lacquer is not applied to the flat sheet prior to manufacture but rather to the completed drum components before assembly. (L26n, W12c; CN)

760-L.* The Anodic Oxidation of Zinc and a Method of Altering the Characteristics of the Anodic Films. H. Fry and Marjorie Whitaker. *Electrochemical Society, Journal*, v. 106, July 1959, p. 606-611.

Investigation of Zn and Zn alloys in alkaline solutions. Autoclaving in silicate solutions improves corrosion and abrasion resistance. 16 ref. (L19q; Zn)

761-L.* Some Investigations Into Bright Finishing in Nickel Baths and the Influence of Impurities. A. Chaybany. *Metal Finishing Journal*, v. 5, July-Aug. 1959, p. 263-268.

Action of brightening agent in Ni plating baths. Gloss destroying properties

of chloride compounds. Bath compositions and influence of Co, Fe and Cu impurities on brightness of plating. Bath treatment and purification. (L12a, 3-69; Ni, *Co, Fe*)

762-L.* The Production of Anodic Finishes in Automatic Plants. A. W. Brace. *Metal Finishing Journal*, v. 5, July-Aug. 1959, p. 269-274, 282.

Experiences and problems in automatic anodizing of Al; brightening, anodizing, dying and sealing procedures. Plant layout. (L19, 18-74; Al)

763-L.* Aluminized Steel—Its Properties and Uses. K. G. Coburn. *Metallurgia*, v. 60, July 1959, p. 17-20.

Weight, microstructure, heat resistance, reflectivity and corrosion resistance of hot dipped Al and Al-Si alloy coatings. Physical and mechanical properties of aluminized low carbon steel; fabrication and uses. (L17, Q-general; CN-g, *Al*, 8-72)

764-L.* Automatic Plating in Three Ways at Once. Nathan Sussmann. *Product Finishing*, v. 12, Aug. 1959, p. 54-58.

Layout and operating sequence for automatic electrodeposition of Ni followed by brass, bronze or Cr electroplating. (L17, 18-74; *Ni, Cu-n, Cu-s, Cr*)

765-L.* Organic Finishes for Metal. Pt. 2. B. M. Letsky. *Product Finishing*, v. 12, Aug, 1959, p. 60-62.

Surface preparation; comparative evaluation of phosphating and etch primer processes. (L14b)

766-L.* Razor Parts Plated Automatically. *Product Finishing*, v. 12, Aug. 1959, p. 67-71, 98.

Sequence and equipment for automatic electrodeposition of 20% Co-80% Ni alloy on brass razor parts. (L17, 18-74; Cu-n, *Ni-b, Co*)

767-L. Continuous Coating of Aluminum or Steel Strip. William M. Bevis and Allen S. Dawe. *Industrial Heating*, v. 26, Sept. 1959, p. 1788-1790, 1792, 1794, 1796, 1798, 1800, 1802.

New coating installation which can handle strip 60 in. or wider an entire operation, thus lowering production costs. Finishes now available permit shearing, slitting, forming, piercing and other fabrication processes without damage to finished surface. (L26, 1-61; 4-53, ST)

768-L. Developments in I.C.I. Trichloroethylene Degreasing Equipment. *Machinery (London)*, v. 95, Sept. 2, 1959, p. 399-402. (L12, 1-52)

769-L.* Zinc Coatings on Iron and Steel. Pt. 2. Methods of Applying Zinc Coatings to Iron and Steel Surfaces. A. K. Parker. *Metal Finishing Journal*, v. 5, Sept. 1959, p. 313-322.

Methods of applying the coatings; nature of coating formed; practical advantages and limitations. 14 ref. (L16, L23, L17; *Zn*, ST)

770-L.* Ceramic Coatings Fight Heat and Corrosion. W. J. Plankenhorn. *Metal Products Manufacturing*, v. 16, Nov. 1959, p. 46-48, 84.

Physical, thermal, electrical and chemical properties, processing and typical uses of ceramic coatings on metal. (L27, Q-general, P15; 8-71)

771-L.* Coating Coil Steel in 48-In. Width. *Metal Products Manufacturing*, v. 16, Nov. 1959, p. 54-58.

Plastic and other organic coatings. Cleaning, coating and bonding; results of tests of bond strength, abrasion and stain resistance. (L26p; ST, 4-53)

772-L. Preparing Zircaloy-2 for Autoclave Testing. The Pickling and Rinsing Process. D. W. Shannon and B. Griggs. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission*, HW-60533, July 1, 1959, 78 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.25.

Pickling and rinsing processes developed to prepare Zircaloy-2 plutonium recycle test reactor (PRTR) fuel elements for autoclave corrosion. (L12g, L12e, R10c; Zr-b)

773-L.* (Czech.) Properties of the New Ni-Cr Hard Surfacing Alloy "Real NB". K. Lobl. *Zvaranie*, v. 8, Aug. 1959, p. 227-229.

Alloy developed for use in engine parts for corrosion and wear resistance. Surfaces revealed structural stability up to 700-800° C. Data on eutectics of the alloy. (L24; Ni-b, *Cr*, SS, SGA-m)

774-L.* (English.) Studies in Cladding. Eihachiro Tanaka and Tadatsugu Yoshiki. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 317-331.

24S, 56S and 75S Al alloys are bonded by hot rolling, hot extrusion and cold rolling. Conditions under which ripples and cracks occur; suggested remedies for elimination of such defects. (L22, F23, F24; Al-b, 9-71, 9-72)

775-L. Metal Spraying in the Protection of Iron and Steel. T. P. Hoar. *Metal Finishing Journal*, v. 5, Sept. 1959, p. 303-307.

Metal spraying of Al and Zn by wire, powder spraying or molten metal techniques; grit and sand blasting processes for surface preparation before spraying. (L23, L10c; ST, *Al, Zn*)

776-L. Painting Sprayed Metal Coatings. L. A. Jordan. *Metal Finishing Journal*, v. 5, Sept. 1959, p. 307-312.

Advantages and limitations of Zn and Al sprayed metal coatings. Effects of environment, physical form, porous structure and chemical activity of sprayed metal. (L23, L26; Al, Zn, 8-67)

777-L.* (Japanese.) Coating of Diesel Engine Precombustion Chambers. Hiroharu Uchiyama. *Metal Finishing Society of Japan, Journal*, v. 10, Aug. 1959, p. 289-293.

Coating of SS34B and SEH3 stainless steel with Al. (L12g, L16; SS, *Al*)

778-L.* (Japanese.) Treatment of Aluminum Before Plating. Matsuhei Kishi. *Metal Finishing Society of Japan, Journal*, v. 10, Aug. 1959, p. 293-297.

Adhesive quality of plating on Al as influenced by pretreatment. 22 ref. (L12, L17; Al)

779-L. Let Phosphates Reduce Friction. *Iron Age*, v. 184, Oct. 29, 1959, p. 127.

Phosphate used as a rustproof coating and for lubricity on moving parts. (L14b, Q9)

780-L. (Russian.) Enameling of Aluminum. K. P. Azarov and V. E. Gorbatenko. *Tsvetnye Metally*, no. 1, 1959, p. 79-82.

10 ref. (L27; Al)

781-L.* (Japanese.) Vibratory Electrolytic Polishing in Phosphoric Acid. Takakado Nakayama. *Light Metals*, v. 9, July 1959, p. 13-21.

The reflectivity produced by electrolytic polishing of Al is dependent upon the impurities. (L13p; Al-a)

782-L.* Nature of Adherence of Porcelain Enamels to Metals. B. W. King, H. P. Tripp and W. H. Duckworth. *American Ceramic Society, Journal*, v. 42, Nov. 1, 1959, p. 504-525.

Good adherence is the result of metal-to-metal bonds between the atoms in the base metal and the proper metallic ions in the enamel. It is essential that the enamel at the interface must be saturated with an oxide of the metal and this oxide must be one which, when in the solution, the glass will not be reduced by the metal. (L27)

783-L.* Anodic Oxidation of Aluminum Alloys. R. E. Pettit. *Precision Metal Molding*, v. 17, Nov. 1959, p. 73-75, 82-86, 88, 90, 92.

Review of sulphuric acid, phosphoric acid and boric acid processes. (L19; Al-b)

784-L.* (Czech.) Hard Surfacing Alloys. K. Lobl. *Zvaranie*, v. 8, July 1959, p. 200-206.

Application of stellites to pressure vessel fabrication; chemical composition; tightening capacity of fittings; wear properties as a function of pressure is a limiting factor in the strength requirements demanded from the stellite materials. (L24, T26q; SGB-q)

785-L.* (German.) Surface Treatment and Material Behavior. H. Wiegand. *Metalloberflache*, v. 13, Aug. 1959, p. 226-228.

Importance of the interim surface treatment such as phosphating as a preliminary step to final surface treatment. Bend strength is dependent on thickness of the nitride layers. (L14b, L24, Q5k)

786-L.* (German.) Long-Time Strength of Chromium Hard Plated Carbon Steel. H. Wiegand and H. R. Kaiser. *Metalloberflache*, v. 13, Aug. 1959, p. 249-254.

Carbon steel C-45 is influenced by a phosphor-acid bath and SRHS-electrolyte. The layer-growth and permanent bending strength is analyzed. Influence of immersion time, current density and bath conditions on strength properties. (L17c, Q5g; *Cr*, CN)

787-L.* (German.) Influence of Wetting Agents on the Hardness of Electrolytically Deposited Nickel Layers. H. Spahn. *Metalloberflache*, v. 13, Aug. 1959, p. 259-264.

Iron-active fatty alcoholic sulphates, if added in only small concentrations to a galvanic bath, decrease the hardness from 340 to 190 kg. per sq. mm. A minimum content of 300 mg. per liter of

lauryl sulphate prevents any pore formation. The decreased hardness is often desired if increased ductility is necessary. (L17a, Q29n; Ni, 8-62)

788-L.* (German.) Theory of Bright Plating Baths. R. Weiner. *Metalloberflache*, v. 13, Sept. 1959, p. 269-273.

Reactions and results achieved by various agents in galvanizing bath vary widely. The curve of current density versus cathodic potential of the bath is changed by the brightening agents in a positive or negative manner. (L17a; Zn)

789-L.* (German.) Metallic Protective Coats. H. Reiniger. *Werkstoffe und Korrosion*, v. 10, Aug. 1959, p. 477-489.

Use of sprayed layers of Al, Zn, Cd and Pb as corrosion resisting coatings. Uniformity in thickness can be achieved only by mechanical spraying. Coating thickness and spray losses are dependent on the sprayed surface area. (L23; Al, Zn, Cd, Pb)

790-L. (Russian.) Pickling of Cupronickel in a Solution Containing H_2SO_4 and Additions of $Fe_2(SO_4)_3$. R. I. Rather and V. Ya. Shapiro. *Tsvetnye Metally*, no. 10, 1958, p. 70-73.

6 ref. (L12g; Cu-b)

791-L. (Russian.) Pickling of Non-Passivating Nickel Anodes in a Solution of $Fe_2(SO_4)_3$ in H_2SO_4. R. I. Ratner. *Tsvetnye Metally*, no. 6, 1959, p. 91-92.

7 ref. (L12g; Ni)

792-L.* Hot Dip Galvanizing. Pt. 1. *Corosion Engineer (Corrosion Prevention & Control)*, v. 1, July 1959, p. 12-14.

Effects of galvanizing on steel due to the reactance of carbon and Si; corrosion resistance of hot dip galvanized steel as opposed to electrodeposited sprayed and sherardized Zn coatings. (L16, L17; *Zn*, ST)

793-L.* Finishing Tubular Steel Furniture. P. Almand. *Product Finishing*, v. 12, Sept. 1959, p. 50-57.

Grease, scale and dirt are removed from formed steel tube by dipping in hot acid and alkaline baths. The surface is primed with phosphate and spray enamelled. (L12, T10b; ST, 4-60)

794-L.* Vitreous Enameling Cast Iron Hollow-Ware. *Product Finishing*, v. 12, Sept. 1959, p. 68-74.

Cast iron hollow-ware is coated with vitreous enamel and heated at 600-1000° C. for 30 min. Comparative advantages of electric and fuel fired furnaces. (L27; CI)

795-L.* Vitreous Enamel—the Lifetime Finish. Ken Jones. *Product Finishing*, v. 12, Sept. 1959, p. 78-79.

Review of properties of enameled ware such as durability, coverage and opacity. (L27)

796-L.* Organic Finishes for Metal. Pt. 3. B. M. Letsky. *Product Finishing*, v. 12, Sept. 1959, p. 80-81, 89.

Corrosion-resisting properties exhibited by red lead oxide, calcium plumbate and Zn dust, dissolved in organic solvents. (L26n; SGB-s)

797-L.* Product Finishing Problems. Pt. 3. Electroplating. Frank H. Slade. *Product Finishing*, v. 12, Sept. 1959, p. 84-89.

Electroplating of metal parts with Cu, Ni, hard-chrome and Cd. Equipment, unit operations; optimum plating procedures. (L17; Cu, Ni, Cr, Cd)

798-L.* Continuous Shot-Blasting of Steel Sheet. J. Anthony Edwards. *Sheet Metal Industries*, v. 36, Oct. 1959, p. 637-638.

Shot-blast line for the surface preparation of hot rolled sheet steel is designed to pile, unpile, uncoil, shot-blast, descale, level, shear, oil sheet and plate, all in one continuous operation. This results in the elimination of acid-pickling. (L10c, 1-61; 4-53, ST)

799-L.* Metallizing for Corrosion Protection in the Automotive Field. Sam Tour. *Society of Automotive Engineers*, Preprint no. 40T, 1959, 17 p.

Spraying of metallized Zn and Al as a base for paint at temperatures up to 2000° F. (L23, T21; Al, Zn)

800-L. (German.) Influence of Structure of Pressure Die Cast Aluminum Parts on Decorative Anodic and Cathodic Coatings. A. Buckeley *Aluminum*, v. 35, Oct. 1959, p. 568-571.

8 ref. (L19, 3-74, 3-71; Al-b, 5-61)

801-L. (Russian.) Automatic Hard Facing and Strengthening of Shafts and Axles. M. A. Tylkin and V. I. Sivak. *Svarochnoe Proizvodstvo*, Oct. 1959, p. 37-39.

(L24, T7j)

802-L. (French.) Effects of Electrolytic Polishing and Hard Chromium Plating on the Fatigue Strength of a XC48 Steel. H. de Leiris. *Chrome Dur*, 1958, p. 7-23.
5 ref. (L13p, L17, Q7a; ST, *Cr*)

803-L. (French.) A Nondestructive Metallographic Testing Method and Its Application to Hard Chromium Platings. P. A. Jacquet. *Chrome Dur*, 1958, p. 24-35.
7 ref. (L17, M20r; *Cr*)

804-L. (French.) Development of the Texture of Chromium Electroplatings on Mechanically or Electrolytically Polished Steel. A. R. Weill. *Chrome Dur*, 1958, p. 36-37.
(L17, L13p, L10b, M26c; ST, *Cr*)

805-L. (French.) Investigation of the Chromium Plating Process by Radioactive Tracers. Henri Kagan and M. Bonnemay. *Chrome Dur*, 1958, p. 38-51.
(L17, 1-59; *Cr*)

806-L. (French.) Effect of Impurities Present in the Bright Nickel Bath on the Covering Power of the Chromium Plating. Robert H. Rousselot and Georges E. Rousselot. *Chrome Dur*, 1958, p. 52-62.
(L17, 3-69; *Ni, Cr*)

807-L. (French.) Improvement of Cathodic Efficiency and Throwing Power in Chromium Baths. Tadeusz Zak. *Chrome Dur*, 1958, p. 63-71.
25 ref. (L17a; *Cr*)

808-L.* (Japanese.) Covering of Melted Aluminum Alloys Over Iron Plate. Sadao Horiguchi and Atsumi Ohno. *Metal Finishing Society of Japan, Journal*, v. 10, Aug. 1959, p. 298-300.
The distance covered by the Al alloy is dependent upon content. (L16, 2-60; *Al*, ST)

809-L. (German.) Flame Cleaning. W. Neuhaus. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 527-528.
Applied to steel. (L10g; ST)

810-L. (Czech.) Semikilled Steels Used for Tin and Zinc Plating. J. Teindl and B. Otta. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 886-894.
(L17; ST-k, *Zn, Sn*)

811-L. (French.) Chromate Coating. L. Ades and H. Aronovitz. *Galvano*, v. 28, Oct. 1959, p. 469-472.
(L14c)

812-L. Cold-Emulsion Cleaning and Its Application to Mass-Production Lines. J. Q. Radcliffe. *Corrosion Technology*, v. 6, Sept. 1959, p. 272-273.
(L12m)

813-L. Hydraulic Spray Frees Scale From Slabs and Billets. R. K. Grobholz. *Iron Age*, v. 184, Nov. 19, 1959, p. 120-121.
Descaling by high pressure nozzles for steel billet or strip rolling mills. (L10h, P12a; CN, 4-52)

814-L. Chromize Bolts and Tubing With Gaseous Compound. G. Becker. *Iron Age*, v. 184, Nov. 19, 1959, p. 130-132.
Production of corrosion resistant surface on carbon steel by treating the steel with Cr halide vapor. (L15; CN, *Cr*, 4-60)

815-L. How Versatile Application Techniques for Gold Solve Aircraft and Missile Problems. William L. Aves, Jr. *Plating*, v. 46, Nov. 1959, p. 1260-1263.
Technique for applying thin, adherent and continuous 24-carat gold plate to configured aircraft components by two unique and versatile methods. (L17, T24, T24e; Au)

816-L. An Outline of the Chemistry Involved in the Process of Catalytic Nickel Deposition From Aqueous Solution. Pt. 2. G. Gutzeit. *Plating*, v. 46, Nov. 1959, p. 1275-1278.
Hydrogen evolution in low Ni baths; effect of impurities on plating rate; hypophosphite utilization data at variable Ni concentrations. 6 ref. (L17; Ni)

817-L. (French.) Throwing Power. Richter. *Galvano*, v. 28, Oct. 1959, p. 459-464.
Parameters influencing the throwing power in electroplating. (L17b)

818-L. (French.) Experiments With Electrodeposits. *Galvano*, v. 28, Oct. 1959, p. 465-466.
Various ways to detect porosity. (L17c, 9-68)

819-L. (German.) Part Design for Electroplating. K. G. Elssner. *Industrieblatt*, v. 59, Sept. 1959, p. 460-464.
(L17, 17-51)

820-L.* Improvements in Metal-Diffusion Techniques. *Corrosion Technology*, v. 6, Sept. 1959, p. 267-268.
Dicrom diffusion process produces diffusion depth of between 1 and 15 mil.,

with surface purity of Cr always above 60% and up to 93% while overcoming defects and disadvantages of early techniques. (L15; ST, *Cr*)

821-L.* Practical Aspects of Electroless Nickel Plating. R. A. Edge, *Corrosion Technology*, v. 6, Sept. 1959, p. 285.

Electroless plating is extremely useful for plating objects having irregular and complicated shapes. Attention must be paid to filtering the plating solutions before use; the plating bath must be maintained at the correct temperature; correct pH control of the plating solution is essential for efficient plating. 6 ref. (L28; *Ni*)

822-L.* Electroclad Aluminum on Uranium. John G. Beach and Charles L. Faust. *Electrochemical Society, Journal*, v. 106, Aug. 1959, p. 654-659.

Uranium electroclad with 12 mils of Al over a 0.5-mil Ni or Ni plus Cu electroplate resists corrosion for more than 100 hr. in boiling water. Hot pressing improved corrosion resistance. 12 ref. (L22, R-general; Al, *U*, 8-66)

823-L.* Glycerol Baths for the Electrodeposition of Molten Indium or Indium-Cadmium Alloy. A. J. Certa, T. J. Manns, G. L. Schnable and H. S. Segal. *Electrochemical Society, Journal*, v. 106, Aug. 1959, p. 690-693.

Alloys of eutectic composition of 75% In and 25% Cd were deposited in the form of beads on the end of a 0.05-mm. Ni wire in 2 sec. (L17; In-b, *Cd*, Ni)

824-L.* Plating on Aluminum Using an Iron Inter Layer. Pt. 1. Application of an Iron Inter-Layer With Subsequent Flash-Plating of Copper or Brass. D. S. Tandon and T. Banerjee. *Indian Institute of Metals, Transactions*, v. 12, Mar. 1959, p. 37-44.

Conditioning of the Al prior to plating is essential. Effect of intermediate electrodeposition of brass or Cu in relation to the properties of final plated layers of Ni and other metals. The adhesion of Ni plating (with or without subsequent Cr deposition) obtained by these means and under controlled conditions on Al is highly satisfactory as judged by the usual qualitative adhesion tests. 12 ref. (L17; Al, *Fe, Cu*, Cu-n)

825-L.* Plating on Aluminum Using an Iron Inter Layer. D. S. Tandon and T. Banerjee. Pt. 2. Application of an Iron Inter Layer Without Subsequent Flash-Plating of Copper or Brass. *Indian Institute of Metals, Transactions*, v. 12, Mar. 1959, p. 45-53.

Fe was deposited by immersion in a ferric chloride solution at 90-95 C. and Ni was then directly electroplated on it. The adhesion of the Ni deposit was further improved by stoving at 250° ± 10° C. The adhesion of Ni on Al was good. 4 ref. (L17; Al, *Fe, Ni*)

826-L.* Plating on Aluminum Using an Iron Inter Layer. D. S. Tandon and T. Banerjee. Pt. 3. Use or Iron Inter Layer Deposited From Ferric Chloride Solution at Temperatures Lower Than 95° C. and Without Flash-Plating of Copper and Brass. D. S. Tandon and T. Banerjee. *Indian Institute of Metals, Transactions*, v. 12, Mar. 1959, p. 55-67.

Results obtained when an Fe interlayer was deposited from ferric chloride solution at temperatures lower than 90° C. When ferric chloride is used at 25° C. and below 70° C. for immersion deposit of Fe on Al and the final Ni-plated Al panel was heat treated at 250° C. immediately after Ni plating, some blisters were invariably formed. However, if the specimens after Ni plating were allowed to age for 24 hr. and then heat treated at 250° C., no blisters resulted. (L17, 2-64; Al, *Fe, Ni*)

827-L.* The Causes of Molding Matter and Sand Inclusions in Thin-Walled Iron Castings and Their Effects in Enamelling. P. Gobbels. *Institute of Vitreous Enamellers Bulletin*, v. 10, Sept. 1959, p. 158-162.

Cavities in castings produced by Croning process investigated by water-pressure tests. Acid content is determined by heat-extraction tests. Cavities occur through reaction between molten Fe and molding material causing gas formation. (L27, E16c; CI, 5-60, 9-71)

828-L.* Copper Electroforming of Heat Sinks for Missile Nose Cones. Frank D. Foley. *Plating*, v. 46, Nov. 1959, p. 1268-1274.

Electroforming of Cu-stainless steel heat sinks by Avco for the Titan nose cone. Difficulties associated with electroforming very thick deposits of Cu on a very large dish-shaped stainless steel shell. Chemical and physical properties of the electrodeposit. (L18, T24e; *Cu*, SS)

829-L. (Pamphlet.) Practical Nickel Plating. 55 p. 1959. International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Plating solutions, operating conditions, properties of deposits, purification of solutions. Effect of elevated temperatures on deposits and precautions to be taken for thick deposits; preparation of base metals. 49 ref. (L17; Ni)

830-L. (Translation—ATS.) Electrochemical Deposition of Gold-Copper Alloys. N. P. Fedot'ev. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 2014-2022.

5 ref. (L17c; Au-b, *Cu*)

831-L. (Translation—Brutcher no. 4641.) Phosphating of Iron and Steel Articles. L. A. Shishmareva. *Stanki I Instrument*, Oct. 1958, p. 32-33.

(L14b; Fe, ST)

832-L. (Translation—ATS.) Preparation and Study of Phosphate Films on Zinc. I. V. Krotov. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 1952-1959.

21 ref. (L14b; Zn)

SECTION M

METALLOGRAPHY, CONSTITUTION and PRIMARY STRUCTURES

1-M.* Structure-Cell Data and Expansion Coefficients of Bismuth Telluride. M. H. Francombe. *British Journal of Applied Physics*, v. 9, Oct. 1958, p. 415-417.

Accurate measurements of the structure-cell parameters of bismuth telluride, Bi_2Te_3, have been made using annealed powders and etched rods cut from single-crystal ingots. Previously reported anomalies in the X-ray powder intensity data are found to originate entirely in preferred orientation of the crystallites. 8 ref. (M26c; Bi, Te)

2-M.* Metallography of Disturbed Uranium Surfaces. H. P. Roth and R. B. Russell. *Metal Progress*, v. 74, Oct. 1958, p. 140-141.

Micro-examination and X-ray diffraction work combined to provide data for accurate judgment. (M22g; U, 14-62)

3-M.* Effect of Cooling Rate on the Grain Size of Magnesium Casting Alloys. R. D. Green. *Modern Castings*, v. 34, Aug. 1958, p. 42-48.

The grain size of several Mg-Al-Zn alloys is established at 50° F. below the liquidus, while the grain size of Mg-rare earth-Zn alloy is established at 30° F. below the liquidus. Grain size and cooling rate correlated through the above ranges. In Mg-Al-Zn alloys the grain size decreases as the cooling rate increases to 200° F. per min.; cooling rate has little effect on grain size of Mg-rare earth-Zn alloy. Effect of cooling rate on grain size is explained on basis of constitutional supercooling and nuclei effectiveness. Nuclei in Zr-Mg alloys become effective with less undercooling than do those in Mg-Al-Zn alloys. 10 ref. (M27c, 2-61; Mg-b, *Al, Zn*)

4-M.* Climb of a Dislocation in a Twisted Whisker. F. R. N. Nabarro and P. J. Jackson. *Philosophical Magazine*, v. 3, Oct. 1958, p. 1105-1109.

The observation that twisted Hg whiskers have periodic imperfections separated by distances closely related to the pitch of the twist is explained by considering a dislocation which is approximately parallel to, but displaced from, the axis of the whisker. This dislocation is straight in cartesian coordinates, but helical in the coordinates provided by the crystal lattice. 5 ref. (M26b; 14-61, Hg)

5-M.* On the Stability of Dislocations in Metal Whiskers. J. P. Hirth and F. C. Frank. *Philosophical Magazine*, v. 3, Oct. 1958, p. 1110-1116.

Thermally activated slip of dislocations out of metal whiskers provides a mechanism for the cessation of whisker growth. A single axial dislocation will be in unstable elastic equilibrium if it has an edge component with respect to the whisker axis greater than a critical amount. Metastable dislocations with edge components less than this critical amount have an expectation time for slip out of the whisker which is dependent on whisker radius, temperature and the elastic properties of the whisker material. Effects on whisker morphology predicted by this mechanism. 12 ref. (M26b; 14-61)

6-M.* (Russian.) Investigation of Inner Grain Structure in Aluminum Casting. D. E. Obsienko and E. I. Sosnina. *Fizika Metallov*

i Metallovedenie, v. 6, no. 8, 1958, p. 433-443.

An Al casting with small additions of Si, Fe and Cu was subjected to X-ray photography and contour etching study. Three zones investigated are outer with a thin crust of minute crystals, columnar, and central zones with larger crystalline structures shown to be of complex crystalline formation. Various crystalline growth conditions affect grain structure of the three zones. The presence of alloy additions during the process of solidification affects the crystalline formation. 9 ref. (M27c; Al-b, 5-60)

7-M.* (Russian.) Determination of the Type of Equilibrium Diagram in Copper-Nickel Alloys at High Temperature. Pt. 2. Spectrum Analysis. L. S. Palathik, A. A. Levtchenko, A. F. Bogdanov and B. E. Tepletskiy. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 540-544.

In Cu-Ni binary alloys there are three types of liquid-vapor curves: the "cigar" type; the "cigar with a minimum"; and "cigar with a maximum"; each type answering its own definite curve. The vapor-liquid curve for Cu-Ni alloys is a "cigar with a minimum". (M24b; Cu, Ni)

8-M.* (Russian.) Effect of Elastic Tension on Crystal Structure of Silicon Iron. Ya. S. Schur and V. A. Zaikova. *Fizika Metallov i Metallcvedenie*, v. 6, no. 8, 1958, p. 545-555.

Under action of elongated tension, considerable changes occur in the magnetic crystalline structure of Si iron (3.5% Si). These depend upon tension magnitude, form of initial magnetic structure and tension orientation in relation to crystallographic direction in the crystal. Structure changes could be included in boundary displacements, size change and change in type of magnetic structure. Structural magnetic changes caused by elastic elongation may be irreversible. 6 ref. (M26, P16, 3-68; Fe, *Si*)

9-M.* Texture of Zinc and Cadmium Films Deposited on Fresh Cleavage Faces of Mica. V. R. Guru Moorti and M. K. Gharpurey. *Canadian Journal of Physics*, v. 36, Oct. 1958, p. 1319-1322.

Zn and Cd films condensed from vapor in vacuo on the two sides of mica cleavage exhibit well-matched textures in the corresponding regions on the two sides. In those cases where the deposition is due to the Frenkel mechanism of homogeneous nucleation, there is similarity in the gross features alone. When the condensation is due to the presence of "active" centers of nucleation on the mica surface, there is generally a "one-to-one" correspondence between the crystallites on the two faces. 5 ref. (M26c; 14-62, Zn, Cd)

10-M. (Russian.) X-Ray Investigation of Undistorted Steel. Pt. 1. M. Ya. Fuks and L. Ya. Goldschtein. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 512-516.

Investigation of the structure of a carbon steel with X-ray microcluster before and after distortion in a specially designed device. 7 ref. (M21f; CN)

11-M. (Russian.) Analysis of Metal Phases With Aid of X-Ray Diffractometer. D. M. Xheiker. *Zavodskaya Laboratoriya*, v. 24, no. 9, 1958, p. 1077-1083.

Device to study quantitative and qualitative aspects in phase changes, based on X-ray machine with ionized recording of rays and the intensity of their diffraction. 9 ref. (M22g, 1-53)

12-M. (Russian.) Electron Microscope Investigation of Internal Grain Structure of Powdered Tungsten. N. P. Vasil'eva, T. A. Sultanyan and I. N. Chaporova. *Zavodskaya Laboratoriya*, v. 24, no. 9, 1958, p. 1090-1091.

To study the submicrostructure, the powdered specimens were prepared by reduction of tungsten anhydrate with hydrogen at 900 and 1200°. (M20, M21e; W, 6-68)

13-M. (Russian.) Electron Microscope Investigation of Structure of Cermets. Z. V. Svistunova, I. P. Vasl'eva, T. A. Sultanyan and V. E. Kiselev. *Zavodskaya Laboratoriya*, v. 24, no. 9, 1958, p. 1093-1095.

New methods of preparing the impressions for study of hard alloys in carbide phase. Best results were obtained with impressions of Ti and lacquer materials which were tinted with Cr at an angle of 10-45°. 8 ref. (M20r, M21e; Ti)

14-M.* Design of Heat-Treatable Titanium Alloys. A. J. Williams. *Dept. of Mines*

and Technical Surveys, Mines Branch Research Report, Ottawa, Canada, no. R11, June 4, 1958, 26 p.

The Ti-rich corner of the 900° C. isothermal section of the Ti-Al-Mo constitutional diagram has been redetermined, based on a 4-hr. annealing time, and ternary tie-lines have been added. The presence of a three-phase field, $alpha_1$ + $alpha_2$ + beta, is indicated. A system for the design of heat treatable Ti-Al-Mo alloys, based on this isothermal section, is based on choice of the best beta composition available on solution treatment at 900° C, and the addition of controlled amounts of alpha of a fixed composition. 7 ref. (M24c; Ti-b, *Al, Mo*)

15-M.* Dislocation Etch Pits in Germanium. W. Bardsley, R. L. Bell and B. W. Straughan. *Journal of Electronics and Control,* v. 5, July 1958, p. 19-28.

Influence of the direction of the dislocation line on the shape of the etch pits produced on {111} faces of Ge single crystals. 10 ref. (M26b; Ge, 14-61)

16-M.* Study of Etching Structure on Aluminum by Transmission Electron Microscopy. R. Phillips and N. C. Welsh. *Philosophical Magazine,* v. 3, Aug. 1958, p. 801-805.

Extremely small cellular patterns (0.2 micron spacing) observed on acid-etch Al foil result from etching process and are not part of crystal structure. 9 ref. (M21e, M26n; Al, 4-56)

17-M.* Electro-Polishing Technique for Preparation of Metal Specimens for Transmission Electron Microscopy. Heather M. Tomlinson. *Philosophical Magazine,* v. 3, Aug. 1958, p. 867-871.

Thin metal specimens can be produced by electropolishing for examination by transmission electron microscopy. The method has been applied to Mg, Co, Cu, Ni, Al, alpha-brass and Fe. 7 ref. (M20p, M21e; Mg, Co, Cu, Ni, Al, Cu-n, Fe, 4-56)

18-M.* Solid Solution in $A^{III}B^{V}$ Compounds. J. C. Wooley and B. A. Smith. *Physical Society, Proceedings,* v. 72, Aug. 1, 1958, p. 214-223.

Ranges of solid solutions in GaSb-InSb, GaAs-InAs and in As-InSb systems. Complete solid solution throughout the entire range can be obtained only under special annealing conditions. 16 ref. (M24b, N12p; Ga, Sb, In, As)

19-M.* A General Scheme for the Examination of Precipitates and Inclusions in Steels. G. R. Booker, J. Norbury and Richard Thomas. *British Journal of Applied Physics,* v. 9, Sept. 1958, p. 361-365.

Included material is isolated by extraction replicas in a form suitable for examination by optical and electron microscopy, electron and X-ray diffraction and X-ray fluorescent and spectrographic analysis. The scheme allows the precise form and identity of the included material to be determined, even when only small amounts of specimen are available. 5 ref. (M20r; ST, 9-69)

20-M.* (Russian.) Influence of Deformation on Oscillation Effects in Metals at Low Temperatures. A. M. Kosevich. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 35, July 1958, p. 249-253.

Effect of elastic deformation on the properties of the electrons of the metal. In the presence of electron groups with significantly different numbers of electrons, the de-Haas-van-Alphen effect is very sensitive to deformation. 7 ref. (M25m, 3-68, 2-63)

21-M. Occurrence of Stacking Faults in Metallic Systems. J. Spreadborough. *Philosophical Magazine,* v. 3, Oct. 1958, p. 1167-1173.

Possible qualitative interpretation, using an extension of the ideal of Altmann, Coulson and Hume-Rothery. The metals Ca, Sc and Ti, the epsilon-phase in Fe-Mn, and the alpha-solid solutions of various B subgroup elements in the noble metals are treated as examples. Effect of temperature on hybrids. 7 ref. (M26s, 2-61; Ca, Fe, Mn, Sc, Ti, EG-c)

22-M. Gold-Manganese Alloys: Some Preliminary Studies by Neutron Diffraction. G. E. Bacon and R. Street. *Physical Society, Proceedings,* v. 72, Sept. 1, 1958, p. 470-474.

5 ref. (M22j; Au, Mn)

23-M. (Japanese.) Phase Diagram of the Silver-Rich Alloys of the Termary System of

Silver-Tin-Aluminum. C S. Cheng, S. J. Huang, S. S. Chen, T. M. Chen and K. S. Kan. *Acta Physica Sinica*, v. 14, July 1958, p. 346-353.

Ag-Sn-Al containing up to 30% Sn and 30% Al studied by X-ray and microscopic methods. (M24c; Ag, Al, Sn)

24-M.* The Energy Stored in Deformed Metals. L. M. Clarebrough and M. E. Hargreaves. *Australian Institute of Metals, Journal*, v. 3, May 1958, p. 31-43.

Properties of metals are determined primarily by concentration and arrangement of "crystal defects". Nature of these defects and their role in plastic deformation. Measuring this stored energy from the presence of crystal defects gives information about type, concentration and arrangement of defects. 18 ref. (M26s, Q24)

25-M.* Microradiography—Principles and Applications in Iron and Steel Research. W. Johnson and K. W. Andrews. *Iron & Steel*, v. 31, Sept. 1958, p. 437-444.

Principles and experimental methods illustrate microradiographs and their interpretations. Supplementary X-ray diffraction technique for exploring specific regions. Microradiograph gives information about microsegregation of elements; whereas the diffraction pattern usually gives positive identification of actual phases in same region. 11 ref. (M23n, M22g)

26-M.* A Note on the Grain Size of Non-Ferrous Castings. A. Cibula. *British Foundryman*, v. 51, Nov. 1958, p. 581-584.

Methods of revealing the macrostructure of cast nonferrous alloys by etching. Techniques for estimating and reporting grain size; influence of grain size on properties of cast alloys. (M27c; 5-60)

27-M.* Measurement and Effect of Grain Size in Steel Castings. W. J. Jackson. *British Foundryman*, v. 51, Nov. 1958, p. 584-588.

Simplest test, and the most likely to succeed in revealing austenite grain size in steel castings, is the grain-contrast or martensitic etch method. Simplest method of rating grain size is to compare the revealed grains with standard grain-size charts. Significance of austenite grain size in steel castings is at present not fully understood. (M27c, M20g; 5-60, ST)

28-M.* Problem of Grain Size in Cast Iron. H. Morrogh. *British Foundryman*, v. 51, Nov. 1958, p. 588-591.

Properties of malleable and nodular cast irons are considerably influenced by the type of matrix and grain size of the matrix, and by the type and dispersion of the graphite phase. 8 ref. (M27c; CI-s, CI-r)

29-M.* Evidence for Vacancy Clusters in Dislocation-Free Ge. A. G. Tweet. *Journal of Applied Physics*, v. 29, Nov. 1958, p. 1520-1522.

When dislocations are absent over volumes of the order of cubic centimeters the crystal etches much more rapidly than when dislocations are present. This enhanced etching behavior can be eliminated by appropriate heat treatment at 800° C. Ridges of normal etching rate were observed traversing the rapidly etched areas in (110) directions. Etch figures, usually spiral dislocations, are always associated with these ridges. (M26b, M20g; Ge)

30-M.* Torsion Tests on Whiskers of Silicon and Iron. Robert L. Eisner. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 191-196.

Dislocations, whether originally present or not, operate only in the outermost portions of Si whiskers, where they are relatively immobile, but extensively in Fe whiskers, where they appear to move fairly easily. No plastic strain has yet been observed in Si whiskers smaller than 3 microns in diameter. (M26b; 14-61, Fe, Si)

31-M.* Structure and Elastic Properties of Graphite Whiskers. Roger Bacon. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 197-203.

Whiskers consist of one or more graphite sheets rolled up like a scroll into a tight cylinder. Each sheet may be as much as several hundred Angstrom units thick. Evidence for the cylindrical structure is revealed by electron micrographs. 7 ref. (M26; Zn, 14-61, NM-k36)

32-M.* (French.) Dilatometry of the Zirconium-Hydrogen System. Lucien Espagno, Pierre Azou and Paul Bastien. *Comptes Rendus*, v. 247, Oct. 20, 1958, p. 1199-1202.

Equilibrium diagram; extent and variables involved in the eutectoid transformation. 5 ref. (M23b; Zr, H)

33-M.* (Japanese.) Metallographic Effect of Oxygen on Zirconium. Motoyuki Nakamura and Shizuo Suzuki. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Sept. 1958, p. 22-27.

Microhardness, X-ray and grain structure testing of Zr containing 0.02-0.2% O. Hardness of Zr increased parabolically with increase of O content; when specimens were annealed in a vacuum recrystallization temperature and grain size also varied according to O content. (M26, M27, Q29q; Zr, O)

34-M.* (Polish.) Effect of Plastic Deformation in Austenitic Stainless Steels. A. P. Gulajew. *Hutnik*, v. 25, July-Aug. 1958, p. 237-241.

Plastic deformation in structure of crystals, splintering in blocks of mosaic structure, crushing and deformation of grains and phase deformations in austenitic stainless steels. Degree of deformation, temperature of deformation and state of austenite have effect on martensitic transformation gamma→alpha reverse transformation alpha→gamma and the little known transformation gamma→epsilon. (M27c, N8, 3-68; SS-e)

35-M.* Mechanical Properties of Zinc Whiskers. N. Cabrera and P. B. Price. Paper from "Growth and Perfection of Whiskers", John Wiley & Sons, Inc., New York, 1958, p. 204-213.

Elastic and plastic deformation of whiskers of hexagonal structure. Whiskers, of diameters down to one micron, do not appear to be perfect, but contain dislocation sources with their strength being due to the surface and the oxide layer present in preventing the escape of dislocations. 12 ref. (M26b, Q27; Zn, 14-61)

36-M.* Dislocation Structure of Whiskers. W. W. Webb. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 230-238.

Screw dislocations in whiskers of Mn, Fe, Co, Ni, Cu, Ag, Cd, Zn and Pd. Unequivocal evidence for single axial screw dislocations found in only one metal, Pd. Results raise the question whether most metal whiskers actually have a screw dislocations in them during growth. 29 ref. (M26b; 14-61, Mn, Fe, Co, Ni, Cn, Ag, Cd, Zn, Pd)

37-M. Demagnetizing Energy and Domain Structure of a Uniaxial Single Crystal. M. Fox and R. S. Tebble. *Physical Society, Proceedings*, v. 72, Nov. 1, 1958, p. 765-769.

Closure domain structure of Co examined by Bitter pattern technique on the curved surface of a disk. (M27g; 14-61, Co)

38-M. (German.) Assumption of an Ordered State of Atoms in Iron-Nickel-Platinum Alloys of Low Thermal Expansion. Albrecht Kussmann and Kai Jessen. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958. p. 585-594.

Fe-Pt alloys from 75 to 67 at.% Fe, Fe-Ni alloys from 71 to 64 at.% Fe and Fe-Pt-Ni alloys that represent, by their composition, a transition between the above two groups were heated to different temperatures, water quenched radiographically and tested for dilatometric and thermomagnetic behavior. 28 ref. (M26q, M23b, P16; Fe-b, Pt, Ni)

39-M.* Surface Distortion Round Dislocations. V. G. Bhide. *Physica*, v. 24, Oct. 1958, p. 817-820.

Surface surrounding a hollow dislocation in a single crystal of SiC examined by multiple beam interferometry. Dislocation is shown to be concave and not flat-bottomed. Indirect evidence exists for slip. 6 ref. (M26b; 14-61, Si, C)

40-M. Physical Metallurgy and Properties of Zirconium-Uranium Alloys. A. A. Bauer, S. Kass and K. M. Goldman. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF. 15/P/1785, 1958, 23p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Constitution and transformation kinetic behavior of Zr-U alloys. System is characterized by complete solid solution between gamma U and beta Zr at elevated

temperatures and by the intermediate hexagonal epsilon phase which forms this solution at about 600° C. and contains approximately 50% U. O and N have a pronounced effect on alloy constitution, stabilizing the alpha-Zr phase and restricting the epsilon and beta phase regions. 14 ref. (M24b, Zr, U)

41-M. Techniques for the Metallography of Plutonium. E. M. Cramer and F. W. Schonfield. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/528,1958, 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Adaptations of metallographic apparatus for polishing, etching, micrography, hardness testing. Mounted samples are mechanically polished in a glovebox train and electropolishing and electro-etching then used. Handling is done with forcepts and specimen surfaces remain completely bare during microscopy and hardness testing. (M20, M21, W12a, Pu)

42-M.* (French.) Various Micrographs of Alpha Uranium Before Irradiation. J. Lehmann and H. Aubert. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaries de France, Paris, France, 1958, p. 41-46.

Micrographs of pure and low-alloy U. Crude cast; recrystallized; quenched from 660-770° C. (beta phase); exposed to temperature cycles; alloyed with Cr, Mo, Sn, Al, Tc and Zr alloys. 4 ref. (M27, 2-61, 3-69; U, *Cr, Mo, Sn, Al, Cb, Zr*)

43-M.* (German.) Oxide Inclusions Deformable by Hot Rolling Observed in Rimming Soft Steels. Heinz Lessing and Hanns Malissa. *Archiv fur das Eisenhuttenwesen,* v. 29, Oct. 1958, p. 627-629.

Needle-like inclusions thought to result from sphere-shaped inclusions present in the ingot. 7 ref. (M28k; ST-d, NM-a34, 9-69)

44-M.* New Ways to Look at Corrosion Processes. E. A. Gulbransen. *Chemical Engineering Progress,* v. 54, Nov. 1958, p. 60-61.

Electron diffraction and electron microscope study of crystal structure of oxides formed by oxidation of Fe, Co, Ni, Cr and Cu between 300 and 700° C. (M26r, M22h, M21e, R1h; Fe, Co, Ni, Cr, Cu)

45-M. Electron Diffraction Studies of Crystal Structure of Oxides of Iron. A. Pande. *Journal of Scientific & Industrial Research,* v. 17B, June 1958, p. 205-208.

Oxide films formed on pure Fe heated to different temperatures. Effect of occluded hydrogen on the formation and orientation of the oxide. 11 ref. (M26r, M22h, 2-61; Fe-a)

46-M.* Grain Boundary Etching on Pure Aluminium. I. Braun. *Philosophical Magazine,* v. 3, Nov. 1958, p. 1312-1317.

In the etching of recrystallized Al (99.99% purity and zone-refined material) the grain boundaries resist attack immediately after electropolishing, but become susceptible to severe attack after a few days at room temperature. This is due to diffusion of impurities along the grain boundaries into the oxide film. (M20q, M27f; Al-a)

47-M.* Crystal Structure of Germanium Selenide. Atsushi Okazaki. *Physical Society of Japan, Journal,* v. 13, Oct. 1958, p. 1151-1155.

X-ray diffraction data obtained from relation and oscillation photographs taken with Ni-filtered Cu K radiation. Laue photographs and oscillation photographs taken with Zr-filtered Mo K radiation were used auxiliarily. (M26q, M22g; Ge, Se)

48-M.* Optical Method of Studying the Diffraction From Imperfect Crystals. Pt. 3. Layer Structures With Stacking Faults. B. T. M. Willis. *Royal Society, Proceedings,* v. 248, Nov. 11, 1958, p. 183-198.

Reciprocal lattice intensity distribution was determined quantitatively using a photomultiplier to measure the optical diffraction intensities. The systems examined included the simple-cubic structure with "wollastonite-type" stacking faults, the close-packed, hexagonal structure with growth faults and the face-centred cubic structure with deformation faults on one set and on two sets of {111} planes. 13 ref. (M22g, M26s)

49-M.* Interaction of Dislocation With Atomic Order on Solid Solutions. Koji Sumino. *Tohoku University, Science Reports of the*

Research Institutes, v. 10, Aug. 1958, p. 283-298.

Mechanism of interaction between a dislocation and atomic order due to the coupling of the stress field of the dislocation with the lattice distortion accompanied by ordering in superlattice alloys. Interaction energy and locking force against the motion of the dislocation calculated for superlattice of beta brass type. Effect of thermal motion on locking force. Expression of short-range order hardening in terms of order parameters for superlattice of the beta brass type. 12 ref. (M25g, M25m, M26b, N10a; Cu-n)

50-M.* Observations of Dislocations in Iron Whiskers. R. V. Coleman. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 239-246.

Well-defined etch pits at dislocations can be developed on {100} faces of Fe whiskers using 4% picral or 2% nital etches. The pits develop immediately after deformation at room temperature or at 77° K. Annealing the deformed whiskers at 850° C for periods of 6 to 100 hr. and then etching produces alignment of the etch pits. 6 ref. (M26b, M20g; 14-61, Fe)

51-M.* (French.) Study of Molybdenum-Uranium Alloys. J. Bellot, P. Dosiere and Jean Marie Henry. *Metaux-Corrosion-Industries*, v. 33, Sept. 1958, p. 343-352.

U-Mo diagram for alloys up to 30 at.% (about 15% by weight) established by differential thermal analysis. Kinetics of decomposition of some alloys having a metastable gamma phase, which is maintained at low temperatures in alloys with high Mo content (over 5% by weight). Specimens placed in sealed tubes were hardened by stages from gamma solid solution to domain of stability alpha-epsilon. Transformation was studied by means of dilatometry, metallography and measurement of resistivity and Vickers hardness. For a given temperature, delay before start of transformation increases with increase in Mo concentration. 11 ref. (M24b; Mo, U)

52-M.* (French.) Microfractographic Study of Surfaces of Fatigue Fractures. Example of Application. J. Plateau, C. Crussard, J. Faguet, G. Henry, M. Weisz, G. Sertour and R. Esquerre. *Revue de Metallurgie*, v. 55, July 1958, p. 679-695.

Fracture surfaces in several steels and alloys examined by direct carbon replica technique. Striations on cleavage facets appear to correspond to successive positions of the fracture front and are also related to cross-slips. Influence of nature of metal and prior cold working on appearance of striations. Method is applied to study of surfaces of fractures caused by both fatigue and tension in a high-strength duralumin. 8 ref. (M23p, Q26n, Q7; ST, Al-b)

53-M.* (Russian.) Phase Transformation in the Manganese-Copper-Iron System. R. I. Agladze, L. I. Topchiashvili and V. M. Mokhov. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 10, 1958, p. 2354-2360.

Microstructural, electric resistance, dilatometric studies of Mn-Cu-Fe system showed that this alloy in an annealed stage presents a two-phase composition. (M24c; Mn, Cu, Fe)

54-M. Semi-Automatic Grinding of Metallographic Specimens of Very Hard Materials. Z. Ministr. *Industrial Diamond Review*, v. 18, Sept. 1958, p. 166-170; Oct. 1958, p. 190-194.

(M20p, SGB-q)

55-M. Identification of Inclusions in Steel by Microradiography. Ernest J. Duwell. *Iowa Academy of Science, Proceedings*, v. 65, 1958, p. 208-219.

6 ref. (M23n, 9-69; ST)

56-M. (German.) Surface Replicas on Films. Pt. 2. H. Mahl. *Metalloberflache*, v. 12, Nov. 1958, p. 321-323.

Plain and compound methods of replica making. Contrast resulting from different degrees of surface roughness. (M20r)

57-M. (Russian.) Structure of Electrolytic Manganese. O. S. Popova and K. M. Gorbunova. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 2020-2028.

(M26n; Mn)

58-M.* Isochronal Annealing of Vacancies in Aluminium. C. Panseri and T. Federighi. *Philosophical Magazine*, v. 3, Nov. 1958, p. 1223-1240.

Electrical resistivity measurement at liquid nitrogen temperature on the isochronal annealing out of quenched-in vacancies in 99.995 Al. Annealing takes place in two stages, the first centered at about room temperature, the second at about 160° C., its amount increasing largely with quenching temperature. A clustering of vacancies exists in the first stage with a subsequent dispersion of clusters by self-diffusion in the second. 17 ref. (M26s, J23; Al)

59-M. Dislocation Loops in Quenched Metals. P. B. Hirsch and J. Silcox. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 262-287.

Annealed specimens of Al (99.995% pure) and of Au (99.998% pure) foil, were quenched from a vertical tube furnace from 600 and 930° C., respectively, into iced brine. Au specimens were aged for about 1 hr. at temperatures between 100 and 250° C. Specimens of Cu of comparable purity were quenched in a manner similar to that for Au but in an atmosphere of argon. Specimens were thinned for transmission microscopy by electropolishing methods. 33 ref. (M26b, 2-64; Al, Au, Cu)

60-M.* (Book-German.) Constitution of Ternary Metal Systems. Compendium. William Guertler. 80 p. 1958. Dionysos-Verlag Thulcke und Schulzek.-G., Willdenowstr. 40, Berlin-Dahlem, Germany.

Constitution diagrams for binary systems Al-Mg, Al-Si, Al-Mn, Al-Fe, Al-Ni, Al-Cu, Al-Zn, binary systems from Mg, Si, Mn, Fe, Ni, Cu, Zn, and ternary systems Al-Mg-Fe, Al-Ni-Si, Al-Mn-Ni, Al-Mg-Ni, Al-Si-Zn, Al-Ni-Zn. Survey and discussion of literature after each phase diagram. (M24b, M24c; Al-b)

61-M. (Book.) Growth and Perfection of Crystals. R. H. Doremus, B. W. Roberts and David Turnbull. 1958. 609 p. John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. $12.50.

Proceedings of an International Conference on Crystal Growth held at Cooperstown, N. Y. on Aug. 27-29, 1958. Papers abstracted separately. (M26, N3)

62-M. (Book.) Structure of Steel. Edwin Gregory and Eric N. Simons. 176 p. 1958. Philosophical Library, 15 E. 40th St., New York 16, N. Y. $10.

Nontechnical discussion of structure effects of heat treatment, impurities and metalworking processes on steel, alloy steel and stainless steel. (M27, 2-64, 3-68, 3-69; ST, AY, SS)

63-M. (Book-German.) Aluminum From the Inside. Dietrich Altenpohl. 200 p. 1957. Aluminium-Verlag GmbH, Dusseldorf, Germany.

Behavior in different manufacturing processes and properties in relation to atomic and crystalline structures. Structural changes in deformation and heat treatment. Susceptibility to corrosion; applications. (M25, M26, A-general; Al)

64-M. (Translation.) New Opinions on Grinding and Polishing Especially of Metallographic Specimens. Z. Ministr. *Industrial Diamond Review*, v. 18, Jan. 1958, p. 7-10.

Previously abstracted from *Hutnik*. See item 34-M, 1957. (M20p, L10b)

65-M. (Translation—AIP.) Study of Thin Films of Varying Composition in the Indium-Antimony System. G. A. Kurov and Z. G. Pinsker. *Soviet Physics, Technical Physics*, v. 3, no. 1, 1957, p. 26-31.

Electrical properties and phase composition. Electrical conductivity as a function of temperature. An anomalously low electrical carrier (hole) mobility is noted. 12 ref. (M24b, P15; In, Sb, 14-62)

66-M. (Translation-Brutcher, 4394.) Effect of Conditions of Cold Working and Heat Treating on Fine Structure of Steel. E. Yu. Chemadurova. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 36-40.

Heat treating at 900-1050° C. and tempering at 800° C., cooling in H_2O and air. Deformation produces distortion of second order and reduction of grain size. In warm rolling, after stock is first heated in oil, the grains crumble in comparison with deformation without preheating. Hardness after rolling without preheating was increased from 85 in original sample to 94; after rolling with preheating hardness was increased to 96-97. (M26c, Q29n, 2-64, 3-68; ST)

67-M. (Translation—SLA, 58-1535.) Contributions to the Texture and Anisotropy of Cold Rolled and Recrystallized Iron-Cobalt-Vanadium Alloys of 50% Cobalt Content. E. Houdremont, K. Janseen, G. Sommerkorn and H. Fahlenbrach. *Technische Mitteilungen Krupp*, no. 1, 1957, p. 13-22.

(M26c; Fe, Co, V)

68-M. (Translation—SLA, R-4793.) Results and Trends in the Development of Soviet Metallography. C. A. Brauman. *Zavodskaya Laboratoriya*, v. 23, no. 10, 1957, p. 1202-1211.

(M-general)

69-M.* Solid Solutions of Mercury in Silver and Gold. H. W. Rayson and L. D. Gilbert. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 88-90.

Diffusion technique suitable for preparing alloys containing highly volatile solutes is used to obtain a new lattice-parameter/composition curve for the solid solution of Hg in Au. 15 ref. (M26p, N12p; Hg, Ag, Au)

70-M.* Uranium-Thorium System and Some Aspects of the Uranium-Thorium-Zirconium System. J. R. Murray. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 94-96.

A simple eutectic system is formed with a region of liquid immiscibility extending from 6 to 49 at.% Th. Solubility of Th in U is 0.30 at.% at 900° C. and <0.05 at.% at 700° C. Solubility of U in Th is also temperature-dependent. 13 ref. (M24b, M24c, P12e; Th, U)

71-M. Tabulation, Bibliography, and Structure of Binary Intermetallic Compounds. Pt. 4. Compounds of Zinc, Cadmium and Mercury. Iowa State College. *U. S. Atomic Energy Commission*, ISC-1047, Aug. 1, 1958, 50 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.25.

Crystal class, lattice parameter, X-ray data for some 260 compounds. 208 ref. (M26q)

72-M.* (Spanish.) Photo-Electron Microradiography of Excited Metal Surfaces. J. M. Bermudez. *Instituto del Hierro y del Acero*, v. 11, July-Sept. 1958, p. 180-184.

First application of this technique in Spain; results on samples of iron and steel. 5 ref. (M23n; Fe, ST)

73-M.* Metallography of Uranium. R. F. Dickerson. *American Society for Metals, Transactions*, v. 52, Preprint no. 120, 22 p.

Allotropic transformations occurring in U and the crystallography of these phases in relation to conventional preparatory techniques, including mechanical and electrolytic polishing methods, etching techniques and use of polarized light for the delineation of structure. Nonconventional techniques include vacuum-cathodic etching, anodic oxidation, hot stage microscopy and strain etching. 30 ref. (M20, M26, N6p; U)

74-M.* Constitution Studies of the Antimony and Bismuth-Rich Portions of the Sb-Bi-In System. E. A. Peretti. *American Society for Metals, Transactions*, v. 52, Preprint no. 123, 24 p.

The liquidus and solidus for the Sb-Bi-InSb-InBi portion of the In-Bi-Sb system are determined. Neither of the pairs InSb-Bi or InBi-Sb form true quasi-binary systems. Solid alloys lying approximately in the area bounded by InSb, Sb and Bi consist of alpha and beta and complete their solidification at temperatures ranging from 494 to 109.5° C., depending upon composition. 7 ref. (M24c, 2-60; In, Bi, Sb)

75-M.* Textures in Extruded Uranium. R. B. Russell. *American Society for Metals, Transactions*, v. 52, Preprint no. 124, 22 p.

Preferred orientation or texture of alpha-extruded, cold swaged, recrystallized and beta-quenched U. The mean thermal expansion coefficients are predicted from the texture and principal crystallographic thermal expansion coefficients. 11 ref. (M26c; U)

76-M. The Uranium-Platinum System. J. J. Park and D. P. Fickle. National Bureau of Standards. *U. S. Atomic Energy Commission*, NBS-5946, June 19, 1958, 30 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.

System, constructed from data obtained by thermal, microscopic and X-ray analysis, is characterized by two eutectics, one occurring at 1005° C. and a composition of 12 at. % Pt, and the second at 1345° C. and 87.5 at. % Pt. Four intermetallic compounds are formed — UPt, UPt_2, UPt_3 and UPt_8. 6 ref. (M24b; U, Pt)

77-M.* (Czech.) Study on Copper-Antimony Systems (Up to 20% Sb). Bohuslav Rajda. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 761-768.

Metallographic study found maximum of Sb in Cu to be 10.65% Sb at eutectic temperature of 640° C. Solubilities within ranges of beta phase, alpha + beta phase, and alpha + eta phases. Two-phase transformations were found in the solid state, the alpha + beta transformed to alpha + etc and eta disintegrates into alpha + delta. (M24b; Cu-b, *Sb*)

78-M.* (Russian.) Investigation of the Process of Repeated Decomposition of Aluminum-Copper Solid Solutions. L. S. Palathik and B. T. Boiko. *Doklady Akademii Nauk SSSR*, v. 120, no. 5, 1958, p. 1015-1017.

Electrophotographic and electromicrographic study of repeated theta-phase decomposition and its separation from alpha solid solution of a thin Al-Cu alloy film of about 300 Å thickness. (M24b; Al, Cu, 14-67, 14-62)

79-M.* Constitution of the $AgSbSe_2$ - $AgSbTe_2$ - $AgBiSe_2$ - $AgBiTe_2$ System. J. H. Wernick, S. Geller and K. E. Benson. *Physics and Chemistry of Solids*, v. 7, Nov. 1958, p. 240-248.

The six pseudo-binary phase diagrams in the semiconducting system $AgSbSe_2$ - $AgSbTe_2$ - $AgBiSe_2$ - $AgBiTe_2$. Complete series of solid solutions with the cubic structure exist in this pseudo-quaternary system. Lattice constants as a function of composition for the cubic phase and thermo-electric power data for some of the solid solutions. 7 ref. (M24d; Ag, *Sb, Se, Te, Bi*, EG-j)

80-M.* Theory and Structure of Liquids. George H. Vineyard. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 1-48.

Current theories of simple liquids; statistical mechanical basis of all liquid series; qualitative discussion of reason for sharp phase transitions which set liquid apart from solid and gaseous state. Use of cell models, distribution functions and numerical methods in theory of liquids. Determination of liquid structure by X-ray and neutron diffraction. Results obtained for liquid metals. 85 ref. (M25, P12; 14-60)

81-M.* Zirconium-Beryllium Phase Diagrams. Henry H. Hausner and Herbert S. Kalish. Paper from "Powder Metallurgy in Nuclear Engineering". American Society for Metals, 1958, p. 149-164.

Zr-Be system contains a relatively low melting point eutectic and several high melting point phases. Influence of small amounts of Zr in Be is most important in the powder metallurgy of Be-rich alloys for Zr can increase the melting point while the solidus line remains at approximately 2335° F. 6 ref. (M24b, H-general; Zr, Be)

82-M.* (French.) Chemical and Structural Heterogeneities Along Former Grain and Sub-Grain Boundaries. Pierre Coulomb and Paul Lacombe. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 918-926.

When the A transformation point is crossed in annealing, the boundaries migrate or are swept out. A net of impurities remains along the former boundaries. Precipitation is influenced by geometric parameters of the boundaries as well as atmosphere used in heat treatment. 14 ref. (M27f, 2-64, 3-69; Fe-a)

83-M.* (Russian.) Analysis of Complex Systems by Images of Beta - Emissions. S. N. Kryokov, B. S. Bokshtein, T. I. Degaltsev and A. A. Zhukhovitskii. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1305-1308.

Analysis of three-component system Fe-Mo-W and Fe in ore. Mixtures of isotopes Sr^{90} and Y^{90} were used for radiation. (M24c, M22h; Fe-b, *Mo, W*)

84-M.* (Russian.) Theories of Electro-Chemical Phase Analysis. Yu. A. Klyachko, M. M. Shapiro, V. S. Mal'tseva and V. A. Mil'chev. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1308-1314.

Investigation of Ni-base alloys shows three phase separations: basic solid solution; intermetallic; carbide. (M24; Ni-b)

85-M.* (Russian.) Phase Analysis of Nitrided Steels. N. I. Block, M. N. Kozlova, N. F. Lashko and A. G. Andreeva. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1315-1319.

To explain causes of corrosion behavior of nitrided austenitic stainless steels; methods of phase analysis; nature of phases; distribution of alloying elements between phases and solid solutions along the depth of the nitriding layer. (M24d, R1; SS)

86-M. (Russian.) Investigation of Metal Stream by Means of Rapid Filming. A. G. Il'in and B. Z. Kononov. *Stal'*, v. 18, Nov. 1958, p. 994-995.

Rapid filming makes possible the recording of many phenomena which cannot be detected by sense organs. It is now

widely used in Soviet aviation and rocket technology. (M21c, X5h)

87-M.* Crystal Structure of the Intermetallic Compound $Mg_2 Cr_2 Al_{18}$. Sten Samson. *Acta Crystallographica*, v. 11, Dec. 10, 1958, p. 851-857.

Lattice constant determined. The truncated tetrahedron, the icosahedron and the hexagonal prism are prominent coordination polyhedro in this structure. In places where interaction between the atoms of the transition element (Cr) and those of the hypo-electronic elements (Al and Mg) are to be expected, the packing of the atoms is very efficient, whereas in places where such interactions are less likely the packing of atoms appears to be normal or rather loose. 22 ref. (M26q; Cr, Mg, Al)

88-M.* Production of Dislocations in Germanium by Thermal Shock. K. S. Wagner. *Journal of Applied Physics*, v. 29, Dec. 1958, p. 1670-1682.

Dislocations introduced into single crystals of Ge grown by the Czochralski technique. Most of the dislocations do not originate during growth but are produced after growth as a result of thermal shock. Thermal stresses resulting from non-uniform temperature gradients during growth seem to have little or no effect on the dislocation density and distribution. (M26b; Ge, 14-61)

89-M.* (German.) Improvement of Metallographic Grinding Techniques. C. G. Nestler and F. W. Gunther. *Fertigungstechnik*, v. 8, Nov. 1958, p. 504-506.

Use of 50-50 Pb-Sn alloy plates coated with tungsten carbide powder. Excellent surfaces with time saving up to 50% compared to conventional abrasive paper or wax plates. Surface roughness of order 0.3 micron attainable. 14 ref. (M20p; Sn-b, *Pb*)

90-M.* Direct Observation of the Long Period of the Ordered Alloy CuAu (II) by Electron Microscope. Shiro Ogawa and Denjiro Watanabe. *Acta Crystallographica*, v. 11, Dec. 10, 1958, p. 872-875.

Parallel lines spaced at intervals of about 20 Å observed, corresponding to satellite spots flanking the direct spot in the diffraction pattern. Their spacing is in close agreement with the size of an anti-phase domain. Lines are believed to be caused by some lattice modulation with the same period as the domain size. 10 ref. (M26q; Cu, Au)

91-M.* (Polish.) Examination of Austenite Grains by Anodic Etching at High Temperatures. Z. Wojcik. *Prace Instytutow Ministerstwa Hutnictwa*, v. 9, No. 4, 1957, p. 141-150.

Etching eight grades of steel in molten lithium chloride. Results proved conformity between new method and methods of ferrite network or etching with Vilella reagent. 17 ref. (M20q; ST)

92-M. (German.) Metallographic Grinding Techniques. H. Klemm and K. Wiegmann. *Fertigungstechnik*, v. 8, Nov. 1958, p. 507-510.

Analysis of surface quality obtainable with emery paper of different origin and roughness. (M20p; Al)

93-M. (Russian.) New Method of Depositing Separation Grids Upon a Sample's Surface. L. M. Rybakov. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1392-1394. (M20s)

94-M. (Russian.) Theory of Cathodic Disintegration. V. E. Yurasova. *Zhurnal Telchnicheskoi Fiziki*, v. 28, no. 9, 1958, p. 1966-1970.

Importance to ionic etching of substances and many phenomena such as appearance of polycrystal grain boundaries, formation of orientations on metal surfaces. 9 ref. (M20q)

95-M.* (Hungarian.) Thermal Expansion Measurements at High Temperatures. Gabor Szonyi. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 135-138.

The usual types of dilatometers are not dependable when measuring the expansion of metals at about 1500° C., because the quartz tube recrystallizes at 1150° C. and its coefficient of expansion becomes uncertain. That shortcoming corrected by substituting a tube made of sillimanite for the quartz tube. 7 ref. (M23b)

96-M. (Translation—AIP.) Etchant for Gallium Arsenide. D.N. Naslevdov, A.Ia. Patrakova and B.V. Tsarenkov. *Soviet Physics, Technical Physics*, v. 3, no. 4, 1958, p. 726-728.

Methods of etching gallium arsenide surfaces. (M20q; Ga, As, 14-61)

97-M. (Translation—Brutcher, 4428.) Grain-Boundary Structure and High-Temperature Strength of an Austenitic Steel. E. N. Sokolkov, M. G. Lozinskii and E. I. Antipova. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 19-25.

Change in the structure of boundaries of austenitic grains caused by severe distortion in a preliminary plastic deformation brings about an increase in the high-temperature strength. Reduction of the creep rate is related to the breaking effect of plastic deformation along the austenitic grain boundary. 9 ref. (M27f, Q3n, Q27a, 3-68; SS-e)

98-M. (Translation-ConBur.) Study of the Zirconium Apex of the Zr-Ta-Nb Phase Diagram. V. S. Emel'lanov, Iu. G. Godin and A. I. Evstiukhin. *Soviet Journal of Atomic Energy*, v. 4, Feb. 1958, p. 211-220.

Zr apex with up to 82% Zr and a temperature of 1200° C. of the ternary system Zr-Ta-Cb. Phase regions found were two one-phase regions alpha and beta; three two-phase regions alpha + beta, beta + gamma and alpha + gamma; one three-phase region alpha + beta + gamma. 5 ref. (M24c; Zr, *Ta, Cb*)

99-M. (Translation—ConBur.) The Uranium-Oxygen System. *Soviet Journal of Atomic Energy*, v. 4, Feb. 1958, p. 299-301.

Structure and properties of uranium oxides. 9 ref. (M24b; U, O)

100-M.* The Sulphides, Selenides, and Tellurides of Titanium, Zirconium, Hafnium and Thorium. Pt. 1. Preparation and Characterization. F. K. McTaggart and A. D. Wadsley. *Australian Journal of Chemistry*, v. 11, Nov. 1958, p. 445-457.

Nine systems (Ti-S, Ti-Se, Ti-Te, Zr-S, Zr-Se, Zr-Te, Hf-S, Hf-Se and Hf-Te) investigated by X-ray techniques. Compounds prepared from materials of high purity by direct synthesis from the elements or by degradation of a higher to a lower phase. Several new compounds are reported, 19 ref. (M24b; Ti, Zr, Hf, *S, Se, Te*, 14-68)

101-M.* Selective Delineation of Screw Dislocations by Cathodic Sputtering. B. B. Meckel and R. A. Swalin. *Journal of Applied Physics*, v. 30, Jan. 1959, p. 89-93.

Method of revealing screw component dislocations involving low-energy cathodic sputtering with argon ions. Hillocks having the shape of truncated cones with a spiral pattern on their tops form at the sites of intersection of screw dislocations with the surface. Data for Ge single crystals. (M26b; 14-61, Ge)

102-M.* (Russian.) Hardness of Alloys in System $InAs-In_3Te_2$. N. A. Gopyunova and S. I. Radautson. *Doklady Akademii Nauk SSSR*, v. 121, no. 5, 1958, p. 848-849.

X-ray study of systems in which interaction of components produces heterovalent isomorphism, In-As-Te. Alloys are formed with structure of Zn blend throughout the concentration. 12 ref. (M24c, Q29n; In, As, Te)

103-M.* (Russian.) Solid Solution in Aluminum-Antimony-Gallium System. N. A. Goryunova and I. I. Buriyan. *Doklady Akademii Nauk SSSR*, v. 120, no. 5, 1958, p. 1031-1034.

Results show that inter-reaction of binary components in environments approaching equilibrium has no eutectoid character and brings about formation of solid solutions in a large range of concentration. (M24c; Al, Sb, Ga, 14-67)

104-M.* (Russian.) Magnetic Analysis of Deformed Texture of Cold Rolled Recrystallized Pure Electrolytic Nickel. I. L. Bryukhatov, I. A. Grinchar and I. Ya. Ekamasov. *Izvestiya Akademii Nauk, SSSR Seriya Fizicheskaya*, v. 22, no. 10, 1958, p. 1237-1243.

In high-purity Ni under cold rolling during forceable reduction (15-20 passes) up to 94-95%, the formed texture is of (112) order, while strong internal strain produces (111) order. (M26c; Ni-a)

105-M.* (Russian.) Thermodynamic Properties of Binary Iron-Manganese System in the Solid State. A. P. Lyubinov, A. A. Granovskaya and L. E. Berenstein. *Zhurnal Phiyzicheskoi Khimii Akademii Nauk SSSR*, v. 32, July 1958, p. 1591-1596.

Partial vapor pressure and activity coefficient show this system to approach an ideal solution with a slight deviation at lower temperature. (M24b, P12c; Fe, Mn)

106-M.* (Russian.) Boron-Carbon Phase Diagram. G. V. Samsonov. *Zhurnal Fizicheskoi Khimii*, v. 32, Oct. 1958, p. 2224-2229.

Based on comparison of data on the properties of alloys of the boron-carbon system, a tentative diagram is plotted within the concentration limit of 0-80% carbon. (M24; B, C)

107-M. (Russian.) Construction of Conoids by Microhardness Method in a 20-Phase Diagram of a Metallic System. V. N. Vigdorovich. *Doklady Akademii Nauk SSSR*, v. 120, no. 5, 1958, p. 1027-1030.

Geometric construction of conoids in an alpha + copper titanide (alpha + Cu_3

Ti) region of the Cu-Al-Ti diagram at 500 and 580° C. from given microhardness measurements. (M24c, Q29q; Al, Cu, Ti)

108-M. (Russian.) Electronic Theory of Metal Adhesion. B. V. Depyagin and V. P. Smilga. *Doklady Akademii Nauk SSSR*, v. 121, no. 5, 1958, p. 877-880.

Electrostatic force plays major role in adhesion of semiconductor metal layers. Residual electrostatic adhesive force in double-layer semiconductor metals and its effect on grain boundaries. The thinner the layers the greater the adhesive strength. 4 ref. (M25, M27f; EG-j)

109-M. (Russian.) Examination of Crystal Structure of Welds by Electrolytic Etching. V. A. Sidlyarenko, G. I. Parfessa and A. A. Rossoshinskii. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1217.

(M20q, 7-51)

110-M. (Russian.) Negative Ions of Iron, Cobalt and Nickel. V. M. Dukel'skii and V. M. Sokolov. *Zhurnal Experimental noi i Teoreticheskoi Fiziki*, v. 35, Sept. 1958, p. 820-829.

Electron structure of negative Fe, Co, and Ni ions. (M25; Co, Fe, Ni)

111-M. (Russian.) System InAs-In_2Se_3. N. A. Goryuhova and S. I. Radautsan. *Zhurnal Tekhicheskoi Fiziki*, v. 28, no. 9, 1958, p. 1917-1921.

11 ref. (M24c; As, In, Se)

112-M. (Russian.) Theory of Non-Elastic Electron Dispersions in Metals, Pt. 1. A. Ya. Vyazkin. *Zhurnal Tekhnicheskoi Fiziki*, V. 28, no. 10, 1958, p. 2217-2227.

(M25)

113-M. (Ukranian.) Investigation of Zirconium-Boron-Molybdenum System. M. S. Koval'chenko, V. S. Neshpor and G. V. Samsonov. *Dopovidi Akademii Nauk*, no. 7, 1958, p. 740-742.

(M24c; B, Mo, Zr)

114-M.* (Russian.) Dynamics of Substitutional Structure in Crystals of Transformer Steel Under Stress. L. V. Kurenskii, M. K. Savchenko and A. M. Rodichev. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya*, v. 22, no. 10, 1958, p. 1181-1184.

During elongation the dome structure changes considerably; the character of these changes depends upon direction of applied load. (M26, 3-68; AY-b, *Si*)

115-M.* (Russian.) Texture Formation of Transformer Steel During Annealing. L. V. Mironov. *Izvestiya Akademii Nauk SSSR, Seriya Phizicheskaya*, v. 22, no. 10, 1958, p. 1231-1236.

During annealing of cold rolled steel, subjected to a two-stage rolling with intermediate annealing, or single-stage with an area reduction of more than 75%, a secondary recrystallization takes place, creating conditions favoring growth of oriented grains. (M26c, 2-64, 3-68; ST, SGA-n)

116-M.* (Russian.) Structural Transformation Change in Permalloy Alloyed With Molybdenum. Yu. S. Avraamov, B. G. Lifshits and V. B. Osvenskii. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya*, v. 22 no. 10, 1958, p. 1263-1268.

Critical temperature range for alloys and analysis of the system. (M24c; Ni-b, *Fe*, Mo)

117-M.* (Russian.) Phases Forming in the System Chromium-Boron. V. N. Apel' baum, N. G. Sevastyanov, M. A. Gurevich, B. F. Ormont and G. S. Zhdanov. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 11, 1958, p. 2545-2552.

Investigation of products of interaction of initial elements of high purity with boron, in argon atmosphere at 1300-1350°. Chemical, X-ray and metal graphic methods were used. (M24b; Cr, B)

118-M.* (Russian.) Investigating the Gold-Silver-Copper System. Gricor'ev, L. A. Panteleimonov, V. V. Kuprina and V. S. Vorob'ev. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 11, 1958, p. 2932-2936.

System investigated by thermal analysis, Brinne's hardness microstructure, electric resistance and temperature coefficient. (M24c; Au, Ag, Cu)

119-M.* (Russian.) Heat Resistance Diagrams of Ternary Alloy: Titanium-Vanadium-Niobium. V. S. Vlasov and I. I. Kornilov. *Izvestiya Akademii Nauk, SSSR*, July 1958, p. 136-139.

Diagram of Ti-V-Cb system showed that all alloying metals of the ternary system crystallize out as unbroken solid solutions. Properties shown on a "composition-heat resistance" graph are independent of the number of components entering the system and are determined by the phase state and the phase structure. (M24c, M27, Q-general, 2-62; Ti-b, *Cb*, *V*, SGA-h)

120-M.* (Russian.) Phase Diagram of the System Zirconium-Boron ZrB_2 Phase. Pt. 2. V. A. Apel'baum and M. A. Gurevich. *Zhurnal Fizicheskoi Khimii*, v. 32, Oct. 1958, p. 2274-2281.

High-purity Zr plus B investigated in A atmosphere in vacuum at 1900-1200°. The formation of phase ZrB_2 takes place even at small B content. (M24b; B, Zr)

121-M* (Russian.) Structural Diagram of Magnesium-Neodymium Alloy. E. M. Savitskii, V. F. Terekhova and I. A. Novikova. *Zhurnal Neorganicheskoi Khimii Akademiya Nauk SSSR*, v. 3, no. 9, 1958, p. 2136-2142.

By thermal analysis, metallography and microhardness tests constructed a diagram of Mg-Nd alloy with 30% of Nd by weight, which is a eutectoid diagram. (M24b; Mg, Nd)

122-M.* (Russian.) Lower Columbium Oxides. S. I. Alyamovski, G. P. Shveikin and P. V. Gel'd. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 11, 1958, p. 2437-2444.

X-ray structural investigations of phase systems Cb-O, obtained by reducing Cb_2O_5 with metallic Cb and carbon. (M24b; Cb, O)

123-M.* (Ukrainian.) X-Ray Investigations of Approximate Structure of Zinc in Mercury Liquid Solutions. D. N. Kalikov. *Ukrainskii Phizichnii Zhurnal Akademii Nauk, Ukrainskoi RSR*, v. 3, no. 3, 1958, p. 370-373.

Structures of liquid solutions of Zn in Hg, with Zn concentrations of 8.7, 12, and 21%. (M27; Hg, Zn, 14-60)

124-M.* Sodium Improves Aluminum 356. R. A. Zuech. *Iron Age*, v. 183, Jan. 29, 1959. p. 88-89.

Small amounts of metallic Na added to liquid 356 (7% Si and 0.30 Mg) change the microstructure considerably. The Si crystals become very small and finely dispersed in the eutectic. Excess of Na lowers the fluidity and causes excessive porosity. (M27c; Al-b, *Na*, AD-p35, 5-60)

125-M. Metallography of Thorium. H. P. Roth. Nuclear Metals, Inc. *United States Atomic Energy Commission*, NMI-1193, June 17, 1958, 28 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.

Polishing by mechanical methods result in a speckled finish often described as a "salt-and-pepper" appearance, and it is difficult to remove all scratches. Three other methods are used-electrolytic, cathodic and chemical polishing. These methods produce a highly polished surface yet result in partial or complete destruction of inclusions. 12 ref. (M20p; Th)

126-M.* (German.) Quasi-Binary System of a Six-Component Nickel Solid Solution and Titanium Carbide. I. I. Kornilow and L. I. Priachina. *Planseeberichte fur Pulvermetallurgie*, v. 6, Dec. 1958, p. 80-88.

Studies on the equilibrium between a solid solution of Ni-Cr-W-Mo-Cb-Al and titanium carbide for the range from 700 to 3100° C. System was found to be of a eutectic character resembling the Ni-TiC system. 9 ref. (M24e, N9n; Ni-b, *Cr, W, Mo, Cb, Al*, Ti, *C*, NM-a35)

127-M.* (German.) Metallography of Tantalum Alloys. H. Braun, R. Kieffer and K. Sedlatschek. *Planseeberichte fur Pulvermetallurgie*, v. 6, Dec. 1958, p. 104-105.

Coarse powders of Ta and W were mixed, compressed at 6 tons per sq.cm. and vacuum sintered at 1750 to 2600° C. Polished sections were subjected to anodic oxidation. In micrographs, the Ta and W particles can be distinguished by color and progressive diffusion at increasing sintering temperatures. (M27d; 6-72, Ta-b, *W*)

128-M.* (German.) X-Ray Tests on Distortions and Particle Sizes, With Iron and Steel. Pt. 1. Influence of Elastic Deformation on Iron Compared With That on Tungsten. Friedhelm Brasse and Hermann Moller. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 757-771.

Steel vacuum heat treated at 560° C. for 2 hr. and slowly cooled. Grain size was reduced by heating up to 800° C. and subsequent water quenching. By tensile elastic deformation the particle size was reduced. Imperfections influenced by position of lattice planes. (M27c, M26s, 2-64, 3-68; ST, *W*)

129-M.* (German.) Influence of Quenching Stresses on the Lattice Constant in the Aging of Iron-Copper Alloys. Gunter Wassermann and Peter Wincierz. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 785-792.

Fe-Cu alloy homogenized under hydrogen at 100° ± 15° C. for 3.5 hr. and quenched in water of 11° C. and then aged under hydrogen at 500 ± 3° C. for different periods. Quenching stresses and precipitation process examined by radiographic measurements of the lattice

constant. (M26, J27d, 2-61, 3-67; Fe-b, *Cu*)

130-M.* (German.) Effect of Etching Process on the Representation of Structure in the Electron Micrograph. Angelica Schrader. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 793-797.

Replicas from polished and etched surfaces of steel. With short etching times, ferrite that surrounds carbide inclusions is not attacked by picric or nitric acid as fast as the other ferrite. 11 ref. (M20q, M21e; ST)

131-M.* (Italian.) Influence of the Recrystallized Outer Layer on the Hot Deformation of Avional 24 Extrusions. C. Panseri and E. Di Russo. *Alluminio*, v. 27, Sept. 1958, p. 375-380.

Coarse-grained outer layer sometimes found in Av 24 extrusions causes forging and stamping defects. Effect of thickness of recrystallized layer, shape and size of grains and degree of deformation on such defects in extruded stock stamped with double-cone die. Macrographic study. (M28k; Al-b, 4-58, 9-71)

132-M*. (Italian.) Lattice Vacancies in Aluminum. T. Federighi. *Alluminio*, v. 27, Oct. 1958, p. 435-441.

Properties of vacancies introduced into Al by quenching from high temperature. Determination of energy of formation and energy of migration of vacancies, and of activation energy for self-diffusion of Al. Role of vacancies in phenomenon of aging. Influence of impurities on elimination of vacancies. 8 ref. (M26s, N1d, N7a, 3-69; Al)

133-M.* (Russian.) Electronic Conditions in Crystals. V. P. Shirokovskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 3-14.

Mathematical analysis indicates that the application of group theory to investigation of problems relating to the status and structure of electron energy bands in periodic poles yields solutions which may not be obtained by means of the usual methods of zonal theory. 6 ref. (M25)

134-M.* (Russian.) Study of Defects in Crystal Lattice by Means of Internal Friction. V. A. Pavlov. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 122-127.

Internal friction in pure Al and Al alloys with 3% Mg at low temperatures. Two peaks were determined at -50, -80, -170, -180°, and increases at -196°. Energy activation processes at peaks of internal friction correspond to 0.5, 0.14 e.v., and rising internal friction to 0.05 e.v. Diffusion defects in crystal lattices explained by position of peaks. 18 ref. (M26s, Q22, 2-63; Al-a, Al-b, *Mg*)

135-M.* A Note on the Cell Structure of Unmodified Al-Si Eutectic. S. Ghosh and V. Kondic. *British Foundryman*, v. 51, Dec. 1958, p. 637.

Small additions of Na and rapid cooling cause a change from a coarse to fine or modified structure. Suitable etching reveals that an unmodified alloy has a cell structure equally well developed as one that is modified. The tendency to form cell or grain structures is therefore not a basic difference between unmodified and modified (or normal) eutectic. (M27, N12q; Al-b, *Si*)

136-M.* (Russian.) X-Ray L-Spectra of CeB_6 and CeO_2. N. V. Troneva, I. D. Marchukova and I. V. Borovskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 141-147.

Influence of chemical bond on X-ray spectra of rare earth elements demonstrated experimentally. Chemical bond and valency of Ce atoms in compounds show considerable effect on emission and absorption spectra. 26 ref. (M25, P17c, P17d; Ce, *B*, *O*)

137-M.* (Russian.) Distribution of Silicon in Steel Dendrites. Ya. N. Malinochka. *Stal'*, Dec. 1958, p. 1130-1132.

Metallographic analysis of the intracrytalline structure of cast Si steel. Method can be applied in detecting distribution of other alloying elements. (M27, S11e; ST, *Si*)

138-M. (Russian.) Titanium Tetrachloride-Columbium Pentachloride and Titanium Tetrachloride-Tantalum Pentachloride Systems. L. A. Nisel'son and G. L. Perekurest. *Zhurnal Neorganicheskoi Khimii Akademii Nauk, SSSR*, v. 3, no. 9, 1958, p. 2150-2155. (M24b; Cb, Ta, Ti, *Cl*)

139-M.* Domain Configurations on Ferrites. D. J. Craik and P. M. Griffiths. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 1-13.

Mn, Ni and Ba ferrite patterns agree with nature of their magnetic constants. Mn-Zn ferrite crystal gave anomalous patterns due to strain-induced uniaxial anisotropy. 26 ref. (M27g; Mn-b, Ni-b, Ba-b, Cu-b, *Zn*, *Fe*, 14-61)

140-M.* Microtopography of Oxide Films on Niobium. J. V. Cathcart, J. J. Campbell and G. P. Smith. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 442-446.

Anomalous oxidation rate behavior of Cb is explained in terms of the formation of small, blister-like cracks in the oxide film. An oxidation model is proposed, based on the idea that an oxidation process is maintained by interstitial-anion or anion-vacancy diffusion leading to the generation of stresses in the oxide film. 9 ref. (M26r, R1h; Cb, 14-62)

141-M.* Phase Diagrams Covering Pressure, Temperature and Composition. A. G. Guy and Shotaro Morozumi. *Metal Treatment and Drop Forging*, v. 26, Jan. 1959, p. 21-26.

Calculation of complete pressure-temperature-composition diagram from thermodynamic activity and vapor pressure data for Cd-Zn system. Determination of equilibria of solid-liquid, liquid-vapor, solid-vapor and liquid-solid-vapor sections. 14 ref. (M24f, P12, 2-60, 2-61, 3-74; Cd, Zn)

142-M. Correlation of Titanium Phase Diagrams. I. Cadoff. New York University. (Watertown Arsenal Laboratory). *U. S. Office of Technical Services*, PB 131691, May 1956, 14 p. $.75.

Twenty-five binary phase diagrams surveyed, grouped and analyzed according to similarities. Correlations are based on size factor, electronegativity, valence, crystal structure and free energy. (M24b; Ti-b)

143-M. Phase Transitions in Two-Component System. E. L. Rubin. *Royal Society, Proceedings*, Series A, v. 249, Jan. 13, 1959, p. 335-345.

8 ref. (M24b, N11h)

144-M. (Russian.) Problem of Force Bound in Martensite Crystals. V. K. Kritskaya, H. M. Nodia, and Yu. A. Ocip'yan. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 177-181.

5 ref. (M25, N8p)

145-M. (Russian.) Problem of Character of Interatomic Force Bound in Iron-Aluminium Alloys. S. A. Nemnonov and K. M. Kolobova. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 183-185.

(M25; Fe-b, *Al*)

146-M. Crystal Structure of LiAs. Don T. Cromer. *Acta Crystallographica*, v. 12, Jan. 10, 1959, p. 36-41.

10 ref. (M26; Li, *As*, 14-68)

147-M. Crystal Structure of NaSb. Don T. Cromer. *Acta Crystallographica*, v. 12, Jan. 10, 1959, p. 41-45.

8 ref. (M26; Na, *Sb*, 14-68)

148-M. (Czech.) Distribution and Number of Spherical Grains in a Given Specimen. Stanislav Drapal and Vratislav Horalek. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1105-1110.

Computation after measurements carried out with micrographs. 9 ref. (M27c)

149-M. (Russian.) Relationship Between Electron Emission From Hexoborides of Alkaline and Rare Earth Metals and Their Electron Structure. G. V. Samsonov and V. S. Neshpor. *Doklady Akademii Nauk, SSSR*, v. 122, no. 6, 1958, p. 1021-1023.

(M25; EG-f43, EG-g45)

150-M. (Russian.) Investigation of the Tin-Tellurium and Germanium-Tellurium Systems. N. Kh. Abrikosov, A. M. Vasserman and L. V. Poretskaya. *Doklady Akademii Nauk, SSSR*, v. 123, Nov. 1958, p. 279-281.

Sn-Ge-Te system along the transverse section of SnTe-GeTe. X-ray analysis, microhardness data, electroconductivity and thermo-emf. studies. 12 ref. (M24c; Sn, Ge, Te, 14-67)

151-M. (Russian.) Microheterogeneous Changes in Alloys Resulting From Interaction of Components. M. E. Drits, E. S. Kadaner and Z. A. Suiderskaya. *Izvestiya Akademii Nauk, SSSR*, May 1958, p. 120-124.

Study of binary Al and Mg-base alloys by radioactive isotopes. (M27, 1-59; Al-b, Mg-b)

152-M. Deformation Textures in Uranium-Aluminum Alloys. W. C. Thurber. Oak Ridge National Laboratory. *U.S. Atomic Energy Commission*, ORNL-2635, Nov. 20, 1958. 61 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $1.50.

Textures for U-Al alloys containing up to 13% U and fabricated by both extrusion and cold rolling. Sheet textures of Al, 5% and 13% U-Al alloys determined for alloys reduced 90% in thickness by cold rolling. Fiber texture of the 13% U-Al alloy extruded at 455° C. with a 90% reduction in area; preferred orientation. (M26c; *U*, Al)

153-M. Metallography of Titanium Alloys. H. R. Ogdem and F. C. Holden. Battelle

Memorial Institute. *U.S. Office of Technical Services*, PB 121645, May 1958, 96 p. $2.75.

Titanium metallography as affected by composition and thermal treatment. Glossary; methods of preparing samples for metallographic examination. (M-general, 2-60, 2-64, 3-68; Ti)

154-M.* (Czech.) Structure of Heat Resistant Austenitic Stainless Steels. Frantisek Poboril and Marcela Zezulova. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1061-1069.

Investigation on the structure of Cr-Ni austenitic steels and of ferritic and martensitic Cr steels. Increased ferrite content thought to reduce deformability in hot working and to cause brittleness and affect heat resistance. (M24d, N8; SS-e, SGA-h)

155-M.* (Czech.) Constitution of Fe-Cr-Mn Alloys. Bedrich Potucek. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1070-1076.

Sigma phase found to be composed of all three elements. A certain amount of Mn makes the alpha phase disappear and the structure becomes austenitic. If the Mn is increased after this occurs, the sigma phase or, at high temperatures, delta ferrite may form. 44 ref. (M24c, 2-60; Fe, *Cr*, *Mn*)

156-M.* (French.) Structure and Magnetic Properties of Silver-Manganese-Aluminum. E. O. Hall. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1145-1148.

Examination of alloys centered around the basic composition, Ag_5MnAl, shows the ferromagnetic constitutent to be a hexagonal precipitate finely dispersed in the Ag matrix. It grows during heat treatment into Widmanstatten structure and transforms above the Curie point into beta Mn. 6 ref. (M27, P16, 2-61, 2-64; Ag-b, *Al*, *Mn*)

157-M.* (French.) X-Ray Tests of Stacking Faults in FCC Metals. Cold Deformation Studied on Nickel Filings Produced at Low Temperatures. C. N. J. Wagner. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1171-1176.

Broadening and shift of powder pattern peaks of Ni filings prepared under liquid oxygen. Peak shifts due to deformation stacking faults. Average fault probability one for every 200 (111) planes. Variations of particle sizes and strains with annealing temperatures and times. 20 ref. (M26s, 2-63, 2-64, 3-68; Ni)

158-M.* (Russian.) Radiographic Investigation of Deformed Steel Making Use of X-Ray Micro-Clusters. M. Ya. Fuks and L. Ya. Gol'dshtein. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 673-681.

Study of changes in microstructure taking place during tensile stress. (M27, M21f, 3-66; CN)

159-M.* (Russian.) Intensity of Radiograph Rear Lines in Cold Deformed Metals. O. H. Shivrin. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 682-685.

During static compression of Cu and brass up to a certain limit of residual deformation, an increase of the intensity of lines 331 and 420 was noticed. Same was noticed with Al where the intensity of lines 422 and 511 was increased through the entire range of residual deformation. Lines of brass, Cu, Al and steel that underwent annealed recrystallization are distorted. 6 ref. (M21f, 2-64, 3-68, ST, Cu-n, Cu-b, Al-b)

160-M.* (Russian.) Nature of Etched Shapes in Aluminum-Copper Alloys. V. G. Rankin and N. N. Buinov. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 687-691.

Etched form depends upon the degree of Cu dissociation and concentration and tendency to aging. 13 ref. (M20q, 2-65, Al-b, Cu)

161-M.* (Russian.) Microstructure of Aluminum-Killed Steel for Deep Drawing. V. M. Chirkin. *Stal'*, Dec. 1958, p. 1135-1137.

In some cases, it is possible to attain a drawn pancake-like structure in aluminum-killed low-carbon steel, and its capability for deep drawing is improved. Recommendations for attaining the desired grain structure by improved practice in melting and rolling. (M27, Q23q, F23, D11r)

162-M.* (Czech.) Equilibrium Diagrams of Alloys and Metals Obtained by Differential Thermal Analysis. Hanus Tuma and Miloslav Vyklicky. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1077-1081.

Apparatus and method based on comparison of values measured on a standard sample with values measured on the sample tested. 9 ref. (M24, M23r, 1-53)

163-M.* (Czech.) Hypereutectoid Al-Si Alloys Treated With Phosphorus Pentachloride. Josef Koritta and A. Franek. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1081-1087.

Effect of temperature and time on size of primary Si crystals. Phosphorus pentachloride was added to the melt at different temperatures and test pieces were cast at different times.. Optimum temperature for a fine and equally distributed state of Si crystals was 780 to 810° C. (M27c, 2-61, 2-60, 3-67; Al-b, *Si*)

164-M. (Translation—AIP.) Structure and Composition of the Carbide of Low-Tempered Steel. Iu. A. Skakov, I. N. Chernikova and A. V. Sharshatkina. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 151-153.

Electron diffraction of tempering of carbon steel shows that C atoms are distributed in the octahedral pores of hexagonal lattice of Fe atoms. 7 ref. (M25; CI, ST, *C*)

165-M. (Translation—AIP.) Study of the Structure and Phase Constitution of the Coating in the Hot Tinning of Sheet Iron. A. I. Vitkin, T. B. Plotnikova and G. A. Kokorin. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 391-395.

Intermediate layer consists of dark and light areas. Electron diffraction revealed two structural phases of underlayer. 13 ref. (M22h, M27, 1-66; Fe, 4-53, 8-65, *Sn*)

166-M. (Translation—AIP.) Some Properties of Binary Metallic Systems. O. S. Ivanov. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 423-425.

Systems of Ti, Th, U, PU, Fe, Mn-Cu, in terms of electron shells. (M24b; Ti, Th, U, Pu, Fe, Mn, Cu)

167-M. (Translation—AIP.) Variations in Short Range Order Structure in the Precrystallization Period of Semiconductor Chemical Compounds With ZnS Type of Lattice. D. A. Petrov and V. M. Glazov. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 640-642.

7 ref. (M26; Zn-b, *S*, NM-a37)

168-M. (Translation—AIP.) Interaction Between Electrons and Lattice Vibrations in a Normal Metal. A. B. Migdal. *Soviet Physics JETP*, v. 7, Dec. 1958, p. 996-1001.

Method to obtain electron-energy spectrum and dispersion of vibrations without assuming that interaction between electrons and phonons is small. (M25, M26, P18)

169-M. (Translation—BISI, no. 1053.) Cube Orientation as Recrystallization Texture in Iron-Silicon Alloys. Hans Eberhard Mobius and Franz Pawlek. *Archiv fur das Eisenhuttenwesen*, v. 29, July 1958, p. 423-432.

See item 535-M, 1958. (M26c, N5; *Fe-b, Si*)

170-M. (Translation—BISI, no. 1196.) Theory of Counter Tubes With a Newly Designed Specimen Holder for the Determination of Textures in Quantitative Pole Figures. Johanna Grewen. *Archiv fur das Eisenhuttenwesen*, v. 29, Feb. 1958, p. 115-118.

See item 231-M, 1958. (M23c, M26c, 1-53)

171-M.* Flow of Impurities to an Edge Dislocation. R. Bullough and R. C. Newman. *Royal Society, Proceedings*, Series A, v. 249, Jan. 13, 1959, p. 427-440.

18 ref. (M26b, 3-69, 2-65; CN-g)

172-M.* (Spanish.) Metallographic Inspection of a Fusionless Weld in a Pearlitic Cast Iron. Alberto Sole. *Ciencia y Tecnica de la Soldadura*, v. 8, Sept-Oct. 1958, 6 p.

Fusion and fusionless welded specimens were tested for tensile strength and Brinell hardness and examined under microscope. Greater structural homogeneity of base and filler metal was found in fusionless weld. (M28h, Q27a, Q29b; CI, 7-51)

173-M. (Japanese.) Polarimetric Measurements of Thin Films. Yasuhiro Doi. *Mechanical Laboratory of Japan, Report*, no. 27, Nov. 1958, 48 p.

Techniques and analysis of measurement; heterogeneity and anisotropy of the film. (M21c; 14-62)

174-M. (Russian.) Interaction of External and Internal Electrons in Ferromagnetic Transition Elements. Yu. A. Izyumol. *Zhurnal Experimental'noi i Teoreticheskoi Fiziki*, v. 35, no. 5, 1958, p. 1148-1154.

8 ref. (M25; SGA-n)

175-M. (Russian.) Investigation of Alloys of the System Iron-Cobalt-Palladium. V. V. Kuprina and A. T. Gricor'ev. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 12, 1958, p. 2736-2739.

Diagram of meltability of Fe-Co-Pd studied in nine cross sections, with Pd content from 0 to 90% of at. wt., by method of thermal analysis, hardness testing and examination of microstructure. 27 ref. (M24c; Fe-b, *Co*, Pd)

176-M. Carbon Positions in Uranium Carbides. A. E. Austin. *Acta Crystallographica*, v. 12, Pt. 2, Feb. 10, 1959, p. 159-161.

Positions determined from neutron diffraction data. Metal-carbon bonding discussed. 8 ref. (M25m; U-b, *C*, NM-a35)

177-M.* (Japanese.) Microstructure of 99.85% Aluminum Extruded Rods. Yoshikazu and Eiichi Sawato. *Light Metals*, v. 8, Nov. 1958, p. 29-32.

Microstructures of rods extruded at different temperatures and in different reduction ratios. Higher reduction results in narrow and long grains in the extruding direction and microstructures of rods extruded at 325°C. are similar to those of cold worked ones and the subgrain structures which seem to be created from dendrite structure of cast billets and linear structures are observed in the rods extruded at 550°C. (M27, 2-61, 3-68; Al-a, 4-55, 4-58)

178-M.* (Japanese.) Microstructure of 99.85% Aluminum Extruded Rods on Fiber Structures. Yoshikazu and Eiichi Sawato. *Light Metals*, v. 8, Nov. 1958, p. 33-36.

The lower the temperature and the higher the reduction, the higher the amount of the structure, which has its axis in [111] + [100] direction. The change is not remarkable in the longitudinal direction, but in the radial direction, and is inclined to the extruding direction near the surface. (M27, M26, 2-61, 3-68; Al-a, 4-55, 4-58)

179-M.* (Japanese.) Microstructure of 99.85% Aluminum Extruded Rods; Changes Caused by Annealing. Yoshikazu Hosoi. *Light Metals*, v. 8, Nov. 1958, p. 37-40.

The softening characteristic of the rods is similar to that of cold worked rods; no generation and growth of nuclei occur; linear structure is created from fine-grained structure, whose grain boundary becomes obscure; linear structure tends to form a screw dislocation. (M27, M26; Al-a, 4-55, 4-58)

180-M.* (Ukrainian.) X-Ray Diffraction Study of Vanadium-Germanium Alloys. E. I. Gladushevsky and Yu. V. Kuz'ma. *Dopovidi Akademii Nauk Ukrainskoi RSR*, no. 11, 1958, p. 1208-1211.

4 ref. (M27; Ge, *V*, 14-68)

181-M. (Japanese.) Structure of 99.995% Aluminum Extruded Rods. Yoshikazu Hosoi. *Light Metals*, v. 8, Nov. 1958, p. 24-28.

Rods from cast billets have almost similar structure to those from forged billets. At 550° C. extruded rods do not change their structure by recrystallization. (M26, 2-64; Al-a, 4-55)

182-M.* Nature of Mechanically Polished Metal Surfaces: An Electron-Diffraction Examination of Polished Silver Surfaces. L.E. Samuels and J.V. Sanders. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 129-135.

Examination of polycrystalline and single crystal Ag polished mechanically. Diffraction patterns indicate that polished surfaces differ from the substrate only in that they have been plastically deformed. Deformation decreased progressively with increasing fineness of abrasive. (M20p, M22h, M26n, Q24; Ag, 14-61)

183-M.* Metallographic Study of the Deformation and Recovery of Beta-Brass by Means of the Etch-Figure Technique. Guido Bassi and J.P. Hugo. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 155-159.

On polycrystalline and single crystals of beta brass subjected to varying degrees of compressive deformation and to annealing treatments in range of 200-500° C. after compression. 7 ref. (M20q, Q24c, 3-68, 2-64; Cu-n, 14-61)

184-M.* The Constitution of Bismuth-Uranium Alloys in the Composition Range 0-35 Atomic Per Cent Uranium. P. Cotterill and H.J. Axon. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 159-160.

Differential thermal analysis in positive pressure of argon used to determined liquidus and solidus relationships. (M24b, 2-60; Bi-b, U)

185-M.* The Lattice-Spacing Relationships in Alloys. T.B. Massalski. *Metallurgical Reviews*, v. 3, no. 9, 1958, p. 45-96.

Lattice spacing relationships in fcc. primary solid solutions based on Cu, Ag, and Au. Bcc. alloys, closed-packed hexagonal alloys, binary and ternary alloys of trivalent Al. In, Sn and Pb-base alloys and various alloys containing transition elements. 93 ref. (M26, 2-60; Cu-b, Al-b, Sn-b, Pb-b, Au, In, Ag-b)

186-M.* Microstructural Changes in a 42% Ni, 30% Cr, 26% Fe Alloy During Creep Rupture Testing. R.J. Raudebaugh and E.P. Sadowski. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 23-29.

Alpha prime, the nonmagnetic, high-Cr bcc. ferrite formed at 1400 and 1600° F. but not at 1800°. Amount of N_2 pickup from atmosphere, magnetic change, grain growth. 5 ref. (M27, Q3m, 2-62; Ni-b, *Cr, Fe, N*)

187-M.* Microbeam Analysis of Widmanstatten Structure in Meteoritic Iron. R.E. Maringer, N.A. Richard and A.E. Autin. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 56-57.

Concentration and distribution of Fe and Ni in various phases of meteoritic Fe measured by electron probe microanalyzer. (M26, S11g; Fe-b, *Ni*)

188-M.* Effect of Orientation on Strain Induced Grain Boundary Migration in Silicon Iron Bicrystals. K.T. Aust, E.F. Koch and C.G. Dunn. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 90-96.

Bicrystal given 7% cold rolling strain and annealed at 1100° C. Analysis in terms of residual strain energy densities. Migration direction depends on orientation. 16 ref. (M27f, 3-72; Fe-b, Si)

189-M.* Formation of Beta Manganese Type Structure on Iron-Aluminum-Manganese Alloys. D.J. Schmatz. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 112-114.

Phase diagrams and isothermal sections showing extent of beta Mn phase and effect of quenching and Al. 8 ref. (M24c, N8g, 2-64, 2-60; Fe-b, *Al, Mn*)

190-M.* Metallurgy of Silicon. R.M. McPherson. *Australian Institute of Metals, Journal*, v. 3, Nov. 1958, p. 250-259.

High-purity Si becomes ductile at temperatures greater than about 600° C. and exhibits a sharp yield point not obtained on immediate reloading, but recovered on aging. Solid Si can be considered as an infinite covalent molecule in which edge dislocations have electrical properties associated with broken bonds. The yield behavior is qualitatively consistent with the Cottrell-locking hypothesis, the high interaction energy implied may be due to electrical defects associated with edge dislocations. 75 ref. (M26s, Q24; Si)

191-M.* Cavity Formation During the Heat Treatment of Aluminium Alloys. L.J. Polmear. *Australian Institute of Metals, Journal*, v. 3, Nov. 1958, p. 267-271.

Cavities appear to be associated with intermetallic compounds and perhaps form by the coagulation of vacant lattice sites at the sites of the compounds. With intermetallic compounds which do not dissolve during heat treatment the vacancies may collect together at the interfaces of the compounds with the matrix. 28 ref. (M26s, 2-64; 14-68, 9-72, Al-b)

192-M.* Study of Reversion Phenomena in the Carbon Alpha Iron System. D. Keefer and C. Wert. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 114-119.

Increases in aging temperature leads to reversion, studied according to grain size, C content and difference between final and initial aging temperature. 13 ref. (M24b, J27d, 2-65, 2-61, 2-60; Fe-b, *C*, 14-67)

193-M.* Grain Boundary Migration in High Purity Lead and Dilute Lead Tin Alloys. K.T. Aust and J.W. Rutter. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 119-127.

Migration depends on Sn and orientation relationship between adjacent grains. Relation to formation of annealing textures in metals and structure of high-angle boundaries. 19 ref. (M26c, M27f, 2-60; Pb-a, Pb-b, *Sn*)

194-M.* Nickel Titanium Carbon System. E.R. Stover and J. Wulff. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 127-137.

An 870° C. isothermal section, the solidus equilibria and solubility of TiC and graphite in Ni solid solution determined with arc cast specimens. Quasi binary and ternary eutectics occur. 6 ref. (M24c, N12q; Ni, Ti, C, 14-67)

195-M.* Electron Diffraction Study of Tempered Low-Carbon Martensite. B.S. Lement. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 163-165.

Determines if cementite forms directly from martensite under conditions which preclude epsilon carbide formation. 4 ref. (M22h, N8k; Fe-b, *C*)

196-M.* (Russian.) Use of Microhardness Method to Construct Conoids of a Two-Phase Region of a Ternary Component Diagram. V.M. Glazov and V.N. Vigdorovich. *Zavodskaya Laboratoriya*, v. 25, Jan. 1959, p. 57-62.

Method of constructing graphic conoids in a two-phase metal system by utilizing microhardness; Al-Mg-Si, Cu-Cr-Zi and Cu-Al-Ti systems. 6 ref. (M24c; Al-b, *Mg, Si*, Cu-b, *Cr, Ti, Zr*)

197-M.* (Russian.) Electron Microscope and Electronograph Examination of Diffraction Pattern of Alloy Steel Strip. Yu. A. Skakov, M.B. Arengold and A.V. Sharshatkina.

Zavodskaya Laboratoriya, v. 25, Jan. 1959, p. 64-65.

On the electron diffraction pattern there is disclosed, besides lines of solid solution, secondary system of lines which correspond to sections of the alloy's higher content of Mo and C. (M22; AY, *Co, Cr, Mo, C*)

198-M.* Review Paper on the Constitution of Uranium-Molybdenum Alloys. A. J. Carrea, D. R. F. West and J. G. Ball. *Journal of Nuclear Energy*, v. 7, Sept. 1958, p. 189-198.

Constitution of U-Mo alloys. Differences between the proposed equilibrium diagrams are due partly to the difficulty of establishing equilibrium in the solid state transformations. 22 ref. (M24b; U, Mo)

199-M.* Metallurgy of Welding and Fabrication of Steel. H. C. Skevington. *Sheet Metal Industries*, v. 36, Feb. 1959, p. 85-90.

Structure of zones in and around weld; influence of chemical composition on steel properties, weldability and corrosion. Effect of flame cutting, hot and cold forming, work hardening. (M27c, K9, G22g; ST)

200-M.* (French.) Micrographic Methods for Examination of Nuclear Metals and Alloys. H. Monti. *Metaux Corrosion-Industries*, v. 33, Dec. 1958, p. 481-492.

Methods of specimen preparation; grinding, polishing and etching techniques for Pu, U, Th, Cb, Ta, V and Al-Pu, U-Pu, Th-N Cb alloys. 7 ref. (M20, T11g; Al, Pu, U, Th, Cb, Ta, V)

201-M.* (German.) Texture Evaluation of Metallic Materials by the Counting Tube Technique. F. Haeszner. *Metall*, v. 12, Dec. 1958, p. 1094-1101.

Texture analysis by X-ray spectrometer, reflection and transmission techniques. (M26c, X2)

202-M.* (Russian.) Elastic Dislocation of Micro-Volumes in Alpha Cobalt on Heating. M. G. Lozinskii. *Izvestiya Akademii Nauk, SSSR*, July 1958, p. 134-135.

Presence of transposition of separate resilient grain volumes during heating and elongation tests. Study of resilient microcontour on alpha-cobalt. 7 ref. (M26b; Co)

203-M. Pseudo-Binary Systems of Uranium Carbide With Zirconium Carbide, Tantalum Carbide, and Niobium Carbide. L. D. Brownlee. *British Nuclear Energy Conference, Journal*, v. 4, Jan. 1959, p. 35-38.

13 ref. (M24b; U, Zr, Ta, Cb, C, NM-a35)

204-M. Investigation of an Alloy Surface With the Field Emission Microscope. R. C. Bradley and L. A. D'Asaro. *Journal of Applied Physics*, v. 30, Feb. 1959, p. 226-233.

Field emission patterns indicate that a high-temperature flash (2000°K.) reduces the surface concentration of Zr to zero. Subsequent heat treatment at 1000°K. brings Zr to the surface in small clusters at the {100} planes. (M21e, 2-64; Mo-b, *Zr*)

205-M. Dislocation Etch Pits in Bismuth. L. C. Lovell and J. H. Wernick. *Journal of Applied Physics*, v. 30, Feb. 1959, p. 234-235.

Etch pits which are probably the sites of dislocations produced on the (111) cleavage plane of Bi. (M26b; Bi)

206-M. Cellular Substructure in Zn Crystals Grown From the Melt. V. Damiano and M. Herman. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 136-138.

6 ref. (M26, N12, 3-72; Zn)

207-M. Pd-B System. W. M. Lehrer. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 168-169.

Thermal arrests and eutectic temperature and eutectic composition as function of B determined. (M24b; Pd, B)

208-M. Structural Defects in Germanium Mono-Crystals Irradiated by Beta Particles and Fast Neutrons, and the Influence of These Defects on Electron-Hole Recombination. V. S. Vavilov, L. S. Smirnov, A. V. Spitzin, V. M. Patskevitch and M. V. Chukichev. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 482-494.

16 ref. (M25, P15g, 2-67; Ge, 14-61)

209-M. Electronic Band Structures of the Alkali Metals and of the Noble Metals and Their Alpha-Phase Alloys. M. H. Cohen and V. Heine. *University of Chicago, Institute for the Study of Metals, Quarterly Report*, no. 51, Dec. 1958, p. 445-474.

75 ref. (M25, P11, P15g, EG-c, EG-e)

210-M. (Russian.) Etching Methods to Bring Out Microstructure of High-Nickel Alloy. E. E. Levin and E. M. Pivnik.

Zavodskaya Laboratoriya, v. 25, Jan. 1959 p. 67-68.
(M20q; Ni-b)

211-M. (Russian.) Method of Qualitative Absorptional Microradiography of Chemical Non-Uniformity in Alloys. B. A. Mobchan. *Zavodskaya Laboratoriya*, v. 25, Jan. 1959, p. 68-70.
Method used successfully in binary and ternary alloys with Al and Cu base. (M23n; Al-b, Cu-b)

212-M. (Russian.) X-Ray Measurements of Macro and Micro Stresses by Method of Angular Diffraction. D. M. Vasil'ev. *Zavodskaya Laboratoriya*, v. 25, Jan. 1959, p. 70-75.
Method of determining oriented microstresses after macro homogeneous plastic deformation of polycrystallic samples and a method of sectional determation of residual macro and microstresses after passing through macroheterogeneous plastic deformation. 11 ref. (M22g, Q25)

213-M.* (French.) Physical and Metallurgical Properties of Alpha Iron-Silicon Alloys. Pierre Coulomb. *Metaux Corrosion-Industries*, v. 33, Nov. 195 8, p. 431-440.
Physical properties; techniques for studying metallurgical properties; grain boundary energy, anisotropy of grain growth, polygonization, rolling and primary recrystallization textures, exaggerated grain growth, double textures. 83 ref. (M26, M27, P-general; Fe-b, Si)

214-M.* (German.) Evaluation of Micrographs Obtained From Tempered High Speed Steels. Ernst Kunze. *Stahl und Eisen*, v. 79, Feb. 5, 1959, p. 145-148.
Clarification of grain boundaries in steel depends on degree of etching, etchant, and on the degree of tempering. (M27, M20q, 2-64; TS-m)

215-M.* (French.) The Concept of Trace Elements, Particularly in Metallography. Albert Portevin. *Genie Civile*, v. 136, Jan. 1959, p. 9-13.
Effects of traces on metal structures and properties; traces as impurities and as addition elements. 33 ref. (M26, 3-69)

216-M.* (French.) Micrographic Evidence in Support of Dislocation Theory. J. B. Lean and J. Plateau. *Metaux Corrosion-Industries*, v. 33, Oct. 1958, p. 389-405.
Microstructure correlated with slip, deformation and edge dislocations in single crystals of alpha brass, stainless steel, Ge, Si, Ag and Al. 85 ref. (M26b, Q24a; Ge, Si, Ag, Al, SS, Cu-n, 14-61)

217-M. (Russian.) Conoid for Estimating Composition, Structure and Strength of Pearlitic Cast Iron. A. A. Zhukov. *Liteinoe Proizvodstvo*, Jan. 1959, p. 36-41.
Methods for the composition of constitution diagrams and estimation of structure and properties of pearlitic cast iron starting from the C and Si contents. 20 ref. (M24e; CI, *C*, *Si*)

218-M.* New Wrought Iron Has Better Corrosion Resistance. E. P. Best. *Materials in Design Engineering*, v. 49, Feb. 1959, p. 100-102.
New 4-D wrought iron contains a fine dispersion of very thin silicate inclusions throughout its structure. Threads of silicate present in a concentration of approximately 250,000 per cross-sectional sq. in. interrupt the granular pattern of the metal, providing a fibrous pattern which gives the material its corrosion resistance. (M27, R-general; Fe-m)

219-M.* Binary and Ternary Alloys of Tin With the Elements of Groups IIB, IIIB and VB of the Periodic Table. H. W. Rayson, C. W. Goulding and G. V. Raynor. *Metallurgia*, v. 59, Feb. 1959, p. 57-62.
To examine the effect of third metals on the simple hexagonal tin-rich intermediate phases of the beta Sn-Cd type, tin-rich alloys of the systems Sn-Cd-Zn, Sn-Cd-Tl and Sn-In-Sb were examined by metallographic, X-ray and electrical resistance methods. Experiments on the binary systems Sn-Cd, Sn-Zn, Sn-Tl and Sn-In were also carried out. 20 ref. (M24b, M24c; 2-60; Sn, Cd, Zn, Tl, In)

220-M.* (German.) Electrolytic Treatment of Samples in Metallography. F. Rammele. *Technik*, v. 14, Jan. 1959, p. 46-50.
Etching and polishing of surfaces in an electrolyte by an electric current. Polishing effect depends on the voltage, current density and resistance of the external circuit of current and of the electrolyte. (M20q, M20p)

221-M. (Book.) Constitutional Diagrams of Uranium and Thorium Alloys. Frank A. Rough and Arthur A. Bauer. 153 p. 1959. Addison-Wesley Publishing Co., Inc., Reading, Mass. $5.

Compilation of U. S. and United Kingdom constitutional diagrams and data on crystallography of intermetallic compounds. Includes both binary and ternary systems. Melting points and allotropic modification of the basic metals. (M24, U, Th)

222-M. (Translation—AIP.) X-Ray Diffraction Analysis of the Changes in Mosaic Structure During the Aging of Beryllium Copper. Ia. Umanskii, V. Eliutina, A. Kagan and L. Pivovarov. *Soviet Physics, Crystallography*, v. 2, no. 4, 1958, p. 500-504.

Changes in size of subgrains which occur during isothermal precipitation from supersaturated solid solutions of Be in Ni or Cu are determined from the intensities of small-angle X-ray diffraction lines. 7 ref. (M26s, N7, 2-64; Ni-b, Cu-b, *Be*, 14-67)

223-M. (Translation—AIP.) Change in the Crystal Structure of Steel During Cold Work and Heat Treatment. E. L. Gal'tserin and Iu. S. Terminasov. *Soviet Physics, Crystallography*, v. 2, no. 4, 1958, p. 515-521.

Samples of steel 55 C (and some of steel 20) examined by radiometallography, microhardness testing and elastic constants measurement. Fragmentation, structural distortions, lattice binding forces and mechanical properties were studied before and after heat treatment and cold working. 21 ref. (M27, Q-general, 2-64, 3-68; ST)

224-M. (Translation—BISI no. 816.) Mottling of Tinplate. Hans Eggers. *Archiv fur das Eisenhuttenwesen*, v. 28, Dec. 1957, p. 777-783..

See item 298-M, 1958. (M26c; ST, Sn, 8-62)

225-M. (Translation—BISI no. 949.) Extraction of Sulphide Inclusions and Relation Between the Properties of the Steel and the Inclusions. Kurt Born. *Archiv fur das Eisenhuttenwesen*, v. 29, Mar. 1958, p. 179-187.

See item 221-M, 1958. (M23; ST, 9-69)

226-M. (Translation—BISI no. 1051.) Recrystallization Textures of Cold Rolled Transformer Steel. Helmut Stablein and Hermann Moller. *Archiv fur das Eisenhuttenwesen*, v. 29, July 1958, p. 433-447.

See item 536-M, 1958. (M26c, N5; ST, SGA-n)

227-M. (Translation—BISI no. 1079.) Investigations Into the Isolation of Grain Boundary Materials and Inclusions in Steels by the Thin Section Process. Hermann Schenck. *Archiv fur das Eisenhuttenwesen*, v. 29, Aug. 1958, p. 479-484.

See item 593-M, 1958. (M27f; ST)

228-M. (Translation—Columbia.) X-Ray Spectroscopic Investigation of Solid Solutions. I. B. Borovskii, K. P. Gurov, S. A. Ditsman, V. A. Batyrev and N. D. Lobanova. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 10, 1957, p. 1389-1399.

Variation of distribution in energy of electron states in continuous series of binary solid solution alloys of the transition elements as typified by the Cr-Mo system. 12 ref. (M25, M24b, M23, 3-69; Cr, Mo, 14-67)

229-M. (Translation—Columbia.) X-Ray Spectroscopic Investigation of Chemical Composition in Microvolumes of Alloys. I. B. Borovskii, N. P. Il'in, L E. Loseva, I. D. Marchukova and A. N. Deev. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 10, 1957, p. 1404-1411.

Analysis of phase composition and of structure of welded and soldered joints; investigation of diffusion layers. (M23, M27, N1c, M24; Cu-b, *Ni,Zn* SGA-h)

230-M. (Translation—Columbia.) X-Ray Spectroscopic Method of Investigating the Electron State Distribution in Metals and Alloys. N. D. Borisov, V. V. Nemoshkalenko and A. M. Fefer. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 10, 1957, p. 1412-1422.

Atomic structure of Fe-Cr alloys. 10 ref. (M25, M23; Cr-b, *Fe*)

231-M. (Translation—Columbia.) State of Atoms in Ferromagnetic Iron, Cobalt and Nickel-Base Alloys. I. Ia. Dekhtiar. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 10, 1957, p. 1440-1446.

9 ref. (M25, P16; Cr-b, *Co, Fe*)

232-M.* (German.) Testing of Kish Graphite. Franz Roll. *Archiv fur das Eisenhuttenwesen*, v. 30, Feb. 1959, p. 91-94.

Chemical composition and structure of kish obtained from pig iron and ferro-alloys. (M27; NM-k36)

233-M. Theory of the High Temperature Strength of Alloys. John C. Fisher. Paper from "High Strength Materials, Their Strength Potentials and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 23-29.

Influence of elevated temperature on the six factors which originate strength

at low temperatures—dislocation pinning by short-range order, by solute atoms and by static friction, strengthening by second-phase particles, strengthening by other dislocations, strengthening by long-range order. Plastic deformation is accelerated at high temperatures largely because the process of diffusion occurs more rapidly. (M26b, Q24, N7e, 2-62)

234-M.* Uranium-Niobium Alloy System in the Solid State. P. C. L. Pfeil, J. D. Browne and G. K. Williamson. *Institute of Metals, Journal*, v. 87, Feb. 1959, p. 204-208.

Equilibrium diagrams and apparent phase boundaries as determined by metallography, X-ray diffraction and thermal analysis. Comparison with results obtained by other workers. 23 ref. (M24b; U, Cb)

235-M. Direct Observation of Anti-Phase Domain Boundaries in Ordered CuAu Alloy. Am. B. Glossop and D. W. Pashley. *Royal Society Proceedings*, Series A, v. 250, Feb. 24, 1959, p. 132-146.

Image by electron microscope consists of series of closed loops which are arranged so that there are zones of regularly spaced anti-phase boundaries with a period of 20 Å. Effect of dislocations on the formation. 19 ref. (M26q, M27g, M27f; Cu-b, *Au*)

236-M. Constitution, Metallurgy and Oxidation Resistance of Iron-Chromium-Aluminum Alloys. Walston Chubb, Sam Alfant, Arthur A. Bauer, Edward J. Jablonowski, Fred R. Shober and Ronald F. Dickerson. Battelle Memorial Institute. *U. S. Atomic Energy Commission, BMI-1298*, Oct. 16, 1958, 104 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.50.

Limits of the alpha-plus-sigma region are found to extend from 33 to 63% Cr at 600° C. Oxidation resistances of 23.7% Cr 6.0% Al iron-base alloy and of 20.0%, Cr 1.1% Cb nickel-base alloy are compared at 1900 and 2100° F. 66 ref. (M24c, R1h, 2-62)

237-M.* Orientation and Anisotropy in Low Carbon Steel Sheets. Robert S. Burns and Robert H. Heyer. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 29-41.

Rimmed and Al-killed steels tested for directionality by means of tension test, tear length, magnetic torque, X-ray pole figures and microstructure. Effects of mechanical fibering and crystallographic preferred orientation on directionality. (M26c; CN-g, 3-72)

238-M. Structure of Evaporated Tungsten Films. R. L. Moss and I. Woodward. *Acta Crystallographica*, v. 12, pt. 3, Mar. 10, 1959, p. 255.

(M26; W, 14-62)

239-M. Electronic Band Structures of the Alkali Metals and the Noble Metals and their Alpha-Phase Alloys. M. H. Cohen and V. Heine. *Philosophical Magazine, Supplement-Advances in Physics*, v. 7, Oct. 1958, p. 396-434.

60 ref. (M25; EG-c, EG-e)

240-M. (Russian.) Radiographic Study of the Distribution of Columbium in Stainless Steel. L. S. Livshits and L. P. Bakhpach. *Svarochnoe Proizvodstvo*, Jan. 1959, p. 20-22.

Effect of heating conditions of steel 18-9 containing Cb on formation and solubility of Cb carbides studied by means of the isotope Cb-95. Optimum Cb content is given to assure stability against intercrystalline corrosion at temperatures ranging from 550-650° C. 4 ref. (M23q, R2h; SS, 14-68, *Cb*)

241-M.* (French.) Method of Testing Surface Layers. Louis Pons. *Comptes Rendus*, v. 248, Jan. 12, 1959, p. 188-189.

Deformation structure caused by friction in the surface zones of roller bearings is made visible by nitrogen diffusion. (M26c, Q9p, 3-68, T7d; ST)

242-M.* (German.) The Combined Platinum-Carbon Replica Method in Electron Metallography. Frank W. Gunther and Dieter Raab. *Neue Hutte*, v. 4, Feb. 1959, p. 113-115.

To increase the contrast of the carbon replica technique it is desirable to produce heavy-melted shadows. A new electrode evaporates both Pt and carbon, resulting in replicas with excellent contrast in electron microscopy. 14 ref. (M20r, M21e)

243-M.* Quenching of Imperfections in Aluminum. W. DeSorbo and D. Turnbull. *Acta Metallurgica*, v. 7, Feb. 1959, p. 83-85.

Energy of formation and annealing out of point defects in high-purity Al by resistometric techniques. 13 ref. (M26s, J23; Al)

244-M.* Behavior of Semiconductor and Magnetic Materials in Radiation Environment. Alvin Boltax. *Electrical Manufacturing*, v. 63, Mar. 1959, p. 90-95.

Atomic displacements in semiconductors; changes in magnetic properties of magnetic materials. 9 ref. (M25, P16, 2-67; EG-j, SGA-n)

245-M.* Aligned Crystals in Metals. B. D. Cullity. *Scientific American*, v. 200, Apr. 1959, p. 125-126, 128, 130, 132, 134, 137, 138, 141.

Mechanism of preferred orientation in silicon steel, Alnico and uranium. (M26c; ST, *Si*, Al-b, *Co*, *Ni*, U)

246-M.* (Czech.) Crystallization of Technical Fe-Al-C Alloys in the Alpha Range of Solid Solution. Miloslav Vyklicky and Hanus Tuma. *Hutnicke Listy*, v. 14, Feb. 1959, p. 118-127.

The constitution of alloys with approximately 10-32% Al and 0.1 and to 2.5% carbon after quenching from 900-1200° C. studied by thermal analysis and micrographs. In addition to the alpha phase, the epsilon phase, graphite and the carbide Al_4C_3 are also present. 20 ref. (M24c; Fe-b, *Al*, *C*)

247-M.* (Hungarian.) Methods for Investigating Inclusions in Steel. Jozsef Vero. *Kohaszati Lapok*, v. 91, Oct-Nov. 1958, p. 449-459.

Microscopic tests currently used to detect inclusions in steel; quantitative determination of oxygen in steel; laws of growth of oxygen inclusions. 15 ref. (M27, S11r, ST, *O*, 9-69)

248-M. (German.) Electron Investigations on Twin Formation in Silver Layers Deposited by Evaporation. L. Reimer. *Optik*, v. 16, Jan. 1959, p. 30-34.

Electron diffraction patterns of Ag layers deposited on the heated cleavage planes of NaCl crystals show satellites around the normal spot due to twin formation. 6 ref. (M22h, M21e, M27e, Ag)

249-M. (Rumanian.) Structure of Alloys as Determined by Radioactive Isotopes. S. Bercu, A. Kathrein, N. Petrescu and C. Rizescu. *Studii si Cercetari de Metalurgie*, v. 3, no. 3, 1958, p. 371-384.

12 ref. (M23q)

250-M.* Formation of Surface Pits by the Condensation of Vacancies. P. E. Doherty and R. S. Davis. *Acta Metallurgica*, v. 7, Feb. 1959, p. 118-123.

Formed on electropolished surfaces of Al single crystals during cooling from high temperatures. Possibly a definite and constant supersaturation of vacancies is required before condensation begins. 10 ref. (M26s, 2-64; Al, 14-61)

251-M. Improved Metallographic Technique for Revealing Temper Brittleness Network in Ordnance Steels. J. P. Rucker. U. S. Naval Proving Ground. *U. S. Office of Technical Services*, PB 131941, Aug. 1957, 28 p. $1.

Combination etch (zephiran chloride, followed by 5% nital) saves considerable time in metallographic preparation and analysis in determining presence of free ferrite, tempered martensite and network. (M20q, Q26s; ST)

252-M.* (French.) Electron Microscopy of Precipitates Illustrating the Multiplying Sources of Dislocations in an Aged 4% Cu Aluminum Alloy. P. A. Jacquet and E. Mencarelli. *Comptes Rendus*, v. 248, Jan. 19, 1959, p. 405-408.

Study of alumina replicas confirms that areas of heterogeneity produced at beginning of tempering of quenched solid solution are related to dislocations in lattice. Shape and orientation of precipitates. (M26b, M21e, N7a; Al-b, *Cu*)

253-M.* (French.) Electron Diffraction Study of the Epitaxy of Gold on Alkaline Halides. P. Conjeaud. *Comptes Rendus*, v. 248, Jan. 26, 1959, p. 566-569.

Epitaxial orientation of thin films of Au deposited by evaporation under vacuum on NaCl, KCl and KBr depends not only on nature and temperature of support but also on number of atoms of metal striking support per sq.cm. and per sec. Ultimate orientation of film is determined by that of nuclei formed at point of contact with support. 5 ref. (M26c, M22h; Au, 14-62)

254-M.* (Russian.) Heterogeneity in Magnesium Cast Iron. N. M. Zarubin. *Liteinoe Proizvodstvo*, Feb. 1959, p. 40-41.

Structure and distribution of chemical elements in spheroidal graphite cast iron. Data on dispersion of graphite. 11 ref. (M27; CI-r, *Mg*)

255-M.* (Russian.) Heterogeous Structure in Transformer Steel Ingots. N. F. Dubrov, I. A. Gorlach, N. V. Kets and D. G. Zhukov. *Stal'*, Feb. 1959, p. 117-122.

Heterogeneity of a 6.2-ton ingot of transformer steel (3.2% Si) prepared in an electric arc furnace. Stability of cold

rolled transformer steel is increased by reduction of heterogeneity and control or carbon content to 0.02%, S to 0.003% and elimination of Al. 5 ref. (M27, 2-60; SGA-n, 9-69, ST)

256-M.* (Russian.) Tellurium in Steel. Ya. E. Goldshtein. *Stal'*, Feb. 1959, p. 156-159.

Micro-alloying of structural steel with Te produces compact grain structure of rolled stock (or forging), and reduces sensitivity to overheating. (M27c, 2-60; ST, *Te*)

257-M.* Binary and Ternary Alloys of Tin With the Elements of Groups IIB, IIIB and VB of the Periodic Table. H. W. Rayson, C. W. Goulding and G. V. Raynor. *Metallurgia*, v. 59, Mar. 1959, p. 125-130.

To examine the effect of third metals on the simple hexagonal Sn-rich intermediate phases on the beta Sn-Cd type, Sn-rich alloys of the systems Sn-Cd-Zn, Sn-Cd-Tl, Sn-Cd-Bi and Sn-In-Sb were examined by metallographic, X-ray and electrical resistance methods. 20 ref. (M24c; Bi, Cd, In, Sb, Sn, Tl, Zn)

258-M.* (French.) Influence of Surface Condition on Some Properties of Uranium. C. Sella and J. J. Trillat. *Revue de Metallurgie*, v. 56, Feb. 1959, p. 105-121.

Reactivity of U with oxygen; nature of oxides and crystallographic structure and oxide texture tested with regard to surfaces mechanically or electrolytically polished and oxidized in varying conditions. 14 ref. (M26c, R1h; U)

259-M.* (German.) Comparison Between Feathery Crystalline and Fine-Grained Aluminum Bar of Commercial Purity With Reference to the Development of Ears in Finished Sheets. M. F. Jordan and J. C. Blade. *Metall*, v. 13, Mar. 1959, p. 193-196.

Feathery crystalline structure does not influence development of ears any more than fine-grained structure, but it creates a tendency for broader scattering of ears values and has some asymmetrical sequences. 4 ref. (M26c, F23; Al, 4-55)

260-M.* (German.) Effect of Process Annealing on Texture of Rolled Aluminum. W. Bunk and P. Esslinger. *Metall*, v. 13, Mar. 1959, p. 198-202.

An alloy-type rolled texture may be developed in Al under certain conditions. This type of texture is determined by its main maxima in the pole figures. (M26s, 2-64; Al)

261-M. Study of Metallic Carbides by Electron Diffraction. Pt. 3. Iron Carbides. Sigemaro Nagakura. *Physical Society of Japan, Journal*, v. 14, Feb. 1959, p. 186-195. 16 ref. (M26c; Fe, *C*, NM-a35)

262-M. Memorandum on the Use of X-Ray Diffraction for the Study of Titanium and Titanium Alloys. J. R. Doig, Jr. Battelle Memorial Institute. *U. S. Office of Technical Services*, PB 131940, Mar. 1958, 19 p. $.50. (M22g; Ti-b)

263-M. (Russian.) Structure of Titanium Weldments Revealed by Electropolishing. G. I. Parfessa and A. A. Rossoshinskii. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 185. (M20p; Ti, 7-51)

264-M. (Russian.) Fractography in Fracture Testing. M. L. Bernshtein and A. I. Paisov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 186-189.

Use of electron microscope. 13 ref. (M23p, Q26)

265-M. (Russian.) Instrument for Analysis of Metallic Phases. Yu. D. Labut'ev, V. A. Mil'chev and M. M. Shapiro. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 227-228. (M24, 1-53)

266-M. (Russian.) Instrument for High-Temperature Quenching and Thermal Analysis. V. P. Lebedev. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 228-229. (M23r, 1-53)

267-M. (Russian.) Use of Electrophoresis in the Preparation of Samples for the Electron Microscope. Yu. K. Popyalkovskii. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 238. (M20s, M21e)

268-M.* (German.) Surface Replicas From Electrolytically Deposited Metals for the Electron Microscope. Ludwig Reimer and Manfred Aust. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 101-105.

Platinum-carbon replicas are made from electrodeposited Cu. The influence of organic compounds added to a Cu sulphate electrolyte. 12 ref. (M20r, M21e; Cu, 8-62)

269-M.* (English.) New Voltammetric Method of Investigation of the Formation of Intermetallic Compounds Using the Hanging Mercury Electrode. W. Kemula, Z. Galus and Z. Kublik. *L'Academie Polonaise Des*

Sciences, Bulletin, v. 6, no. 10, 1958, p. 661-668.

Analysis of the Ni-Zn, Zn-Cu, Cd-Cu, Cu-Zn and Ag-Cd systems. 12 ref. (M24b; Ag, Cd, Au, Zn, Cu, Ni, 14-68)

270-M. (Book—German.) Heterogeneous Equilibria. Rudolf Vogel. 728 p. 1959. Akademische Verlagsgesellschaft Geest & Portig K.-G., Leipzig, Germany.

Fundamentals of the theory of equilibria and treatment of binary, ternary and quaternary systems. (M24, P12)

271-M. (Translation—AIP.) Survey of Electron Diffraction Structural Analysis. Z. G. Pinsker and B. K. Vainshtein. *Soviet Physics, Crystallography*, v. 2, no. 4, 1958, p. 551-571.

Theory of electron scattering, process of structure determination, Fourier synthesis of potential and experimental investigations of organic and inorganic compounds, metals and alloys. 84 ref. (M22h)

272-M. (Translation—BWRA.) A Procedure for the Metallographic Investigation of Welds in Aluminum. V. F. Grabin and D. M. Rabkin. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 35-38.

Etching reagent consists of three parts 60% nitric acid, one part 30% hydrochloric acid, one part distilled water. Sections are etched at room temperature for 3 to 5 min.; etching ends when the macrostructure has become sufficiently clear. Chemical, mechanical and electrolytic techniques for the preparation of surfaces for microstructural investigation. 5 ref. (M20q, M20p; Al, 7-51)

273-M.* (German.) Fracture Testing of Steel With the Electron Microscope. Carl-Georg Nestler and Frank Walter Gunther. *Archiv fur das Eisenhuttenwesen*, v. 30, Mar. 1959, p. 161-167.

Fractography of steel C75W3 with approximately 0.8% carbon tested after different heat treatments. Effect of testing temperature. (M23p, 2-64;CN-r)

274-M. Kinetics of Grain Boundary Grooving in Copper. W. W. Mullins and P. G. Shewman. *Acta Metallurgica*, v. 7, Mar. 1959, p. 163-170.

Theory predicts that shape of groove profile has a time-independent form and that groove width and depth increase linearly. Tested by studying grooving of tilt boundaries in Cu annealed in dry hydrogen at 930 and 1035° C. Calculates surface diffusion coefficient. 16 ref. (M27f, J23; Cu)

275-M. Dislocation Structure of Slip Bands in Iron. J. R. Low, Jr., and R. W. Guard. *Acta Metallurgica*, v. 7, Mar. 1959, p. 171-179.

Silicon iron examined by etch-pit technique showed that arrays, when viewed normal to edge component, are straight but not coplanar over long distances, while the arrays where the screw component emerges from the surface show much curvature. 11 ref. (M26b, Q24c; Fe-b, *Si*, 14-61)

276-M.* (Russian.) Structure of 50% Fe-50% Ni Alloy Strip. M. M. Borodkina and N. P. Gromov. *Fizika Metallov i Metallovedente*, v. 6, no. 5, 1958, p. 819-824.

Texture deformation and recrystallization investigated by means of pole figures. The predominant orientations in the deformed strip are $(110)[1\bar{1}2]$, $(11\bar{2})$, $[111]$ and $(236)[53\bar{3}]$. 5 ref. (M26c, N5; Fe-b, Ni, 4-53)

277-M.* (Russian.) Block Fragmentation and Distortion of Atomic Lattice. V. F. Mindukshev and Yu. S. Tepminasov. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 919-923.

Distortion phenomena under static and dynamic loading of duralumin and Cu at room temperature and at temperature of liquid nitrogen. At room temperature lattice distortion is higher under static than dynamic deformation. 10 ref. (M25, 3-68, 2-63; Al-b, *Cu*)

278-M. Nature of Mechanically Polished Metal Surfaces. L. E. Samuels. *Electroplating and Metal Finishing*, v. 12, Apr. 1959, p. 130-133.

Evidence establishes that the polishing of metal surfaces by mechanical metallographic methods occurs by cutting and not by surface flow. (To be continued.) (M20p)

279-M. Double Bragg X-Ray Scattering From Cold-Worked Metals. W. T. Ogier, R. L. Wild and J. C. Nickel. *Journal of Applied Physics*, v. 30, Mar. 1959, p. 408-412. 14 ref. (M21f, 3-68)

280-M. Cause of the Strengthening in Quenched Beta Brass. N. Brown. *Acta Metallurgica*, v. 7, Mar. 1959, p. 210-215.

Quenched Cu-Zn is strengthened by vacancies which are generated by the rapid disorder-to-order transformation. Temperature which produces maximum

strength is a function of quenching rate. 9 ref. (M26s, Q27a, Q29n, J26; Cu-n)

281-M.* Texture and Mechanical Properties of Iron. C. J. Ball. *Iron and Steel Institute, Journal*, v. 191, Mar. 1959, p. 232-236.

Substructures developed in pure Fe by deformation, in tension at temperatures in the range -77 to + 500° C. The flow stress on subsequent straining at room temperature is related to the substructure. Subgrain formation occurs by glide during formation and is not the result of a subsequent process of polygonization. 13 ref. (M26c, Q-general, 3-68; Fe-a)

282-M. Point Defects and the Mechanical Properties of Metals and Alloys at Low Temperatures. A. H. Cottrell. Paper from "Vacancies and Other Point Defects in Metals and Alloys". Institute of Metals, London, S.W.1, England, 1958, p. 1-39.

Mechanical effects of vacancies and other point defects introduced into metals and alloys by irradiation, quenching, deviations from stoichiometry and cold work. Irradiation with fast atomic particles hardens metals and sometimes embrittles them. A high yield stress, sensitive to temperature, results. Yielding often occurs with a fall in stress, and coarse slip lines, overshooting and changes of texture are observed. 148 ref. (M26s, Q-general, 2-63, 2-64, 2-67)

283-M. The Effects of Lattice Defects on Some Physical Properties in Metals. T. Broom and R. K. Ham. Paper from "Vacancies and Other Point Defects in Metals and Alloys". Institute of Metals, London, S.W.1, England, 1958, p. 41-78.

Various ways by which point defects are introduced into metals. Provisional interpretation of annealing processes for Cu in terms of the migration of interstitials, vacancy pairs, single vacancies and dislocations. Theoretical and experimental work on the effects of lattice defects on stored energy, electrical resistivity, density, X-ray lattice parameter, thermo-electric properties, thermal conductivity, magnetic properties and nuclear magnetic resonance. 141 ref. (M26s, P-general, J23; Cu)

284-M. Point Defects and Diffusion in Metals and Alloys. W. M. Lomer. Paper from "Vacancies and Other Point Defects in Metals and Alloys". Institute of Metals, London, S.W.1, England, 1958, p. 79-98.

A distinction is drawn between chemically homogeneous systems, in which diffusion may be followed by means of radioactive tracer atoms, and inhomogeneous systems, in which ordinary chemical diffusion occurs. The transport of mass by diffusion is also considered together with the relations between these various diffusion coefficients for dilute binary alloys. 54 ref. (M26s, N1)

285-M. Point Defects and Mechanical Properties of Ionic Crystals. P. L. Pratt. Paper from "Vacancies and Other Point Defects in Metals and Alloys". Institute of Metals, London, S.W.1, England, 1958, p. 99-130.

Distribution of point defects in annealed crystals. Changes in mechanical properties due to alloying, quenching and irradiation, with special reference to accompanying changes in density and distribution of point defects. Dislocation lines are shown to be electrostatically charged and surrounded by a space-charge of vacancies of the opposite sign, and by this means the development of a potential across the ends of a lightly deformed crystal is explained. 106 ref. (M26s, M26b, Q-general)

286-M. Point Defects Near the Surface of a Metal. E. C. Williams and P. C. S. Hayfield. Paper from "Vacancies and Other Point Defects in Metals and Alloys". Institute of Metals, London, S.W.1, England, 1958, p. 131-157.

Changes occurring during annealing of copper, as observed microscopically, are interpreted in terms of recrystallization, evaporation and diffusion of impurities to the surface. Worked surface layers do not readily recrystallize on heating because of retarded atomic mobility, probably due to impurities introduced into the surface layer by the working operation. 47 ref. (M26s, J23, N5, N1; Cu)

287-M. Point Defects and Mechanical Properties of Metals and Alloys at High Temperatures. D. McLean. Paper from "Vacancies and Other Point Defects in Metals and Alloys". Institute of Metals, London, S.W.1, England, 1958, p. 159-198.

Creep at high temperature seems to be governed in most metals by the rate of climb away from obstacles. In single-phase metals the obstacles are presumably the stress fields of other dislocations, and in most commercial creep resistant

alloys they take the form of small particles of a second phase. The strong effect of stress on creep rate is due to the influence of the stress on the number of active dislocations and their mean free path. 109 ref. (M26s, M26b, Q3, 2-62, 3-66)

288-M. Quenched-In Vacancies of Noble Metals. Pt. 1. Theory of Decay. H. Kimura, R. Maddin and D. Kuhlmann-Wilsdorf. *Acta Metallurgica*, v. 7, Mar. 1959, p. 145-153.

Decay laws for quenched-in vacancies in metals calculated using stray or network dislocations and sessile rings formed by the condensation of vacancies. Decay of quenched-in resistivity in Au analyzed. 22 ref. (M26b, J26; Au, EG-c)

289-M. Quenched-In Vacancies in Noble Metals. Pt. 2. Mechanism of Quench Hardening. H. Kimura, R. Maddin and D. Kuhlmann-Wilsdorf. *Acta Metallurgica*, v. 7, Mar. 1959, p. 154-162.

Hardening observed on aging after quenching Cu wire. Comparison of observed quench hardening in Cu and Au with the decay of quenched-in resistivity in Au shows that the two types of hardening can be explained assuming two types of sinks for vacancies. 12 ref. (M26b, J26, J27d; Cu, Au, EG-c, 4-61)

290-M. Electron Irradiation of Aluminum-Copper Alloys. C. W. Tucker, Jr., and M. B. Webb. *Acta Metallurgica*, v. 7, Mar. 1959, p. 187-190.

Mobile irradiation defects promote low-temperature clustering of Cu atoms at -60° C. Implies that thermally activated clustering of Cu proceeds by an excess vacancy mechanism rather than a dislocation mechanism. 11 ref. (M28n, 2-67, M26s; Al-b, *Cu*)

291-M. The Crystal Structure of Plutonium. Delta and Epsilon Phases. J. G. Ball, P. Greenfield, P. G. Mardon and J. A. L. Robertson. *United Kingdom Atomic Energy Authority*, AERE M/R 2516, June 1958, 12 p.

Thermal analysis experiments indicate that five allotropic modifications of Pu, designated alpha, beta, gamma, delta and epsilon, exist between room temperature and melting point. Of the five phases only two give simple X-ray patterns. These are the delta and epsilon phases. X-ray diffraction photographs are used to provide data on their patterns and structural interpretation. 13 ref. (M26, M24; Pu)

292-M.* Dislocation Etch Pits and Polygonization in High-Purity Copper. L. C. Lovell and J. H. Wernick. *Journal of Applied Physics*, v. 30, Apr. 1959, p. 590-592.

Chemical etch developed to reveal dislocations on the (111) plane of high-purity Cu without prior decorating. 14 ref. (M20q, M26b, N4; Cu-a)

293-M. The Lanthanum-Carbon System. F. H. Spedding, K. Gschneidner, Jr., and A. H. Daane. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 192-199.

From thermal, metallographic, X-ray, dilatometric and electrical resistance data a phase diagram is proposed. Two compounds are formed, body-centered cubic, La_2C_3 having a large range of solid solubility, and body-centered tetragonal LaC_2. Two eutectics are formed in the system; the first, at 2.2% carbon, melts at 806° C., the second occurs between LaC_2 and carbon with a melting point of 2271° C. 16 ref. (M24b; La, C)

294-M. The Antimony-Uranium Alloys System. B. J. Beaudry and A. H. Daane. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 199-203.

Four intermediate phases are present: USb_2 and USb_4 which undergo peritectic decomposition at 1355 and 1695° C., respectively, and USb and U_4Sb_3, which melt congruently at 1850 and 1800° C. There is a eutectic between U_4Sb_3 and USb which melts at 1770° C. 10 ref. (M24b; Sb, U)

295-M. A Study of the Liquidus in Aluminum-Uranium Alloys. Victor W. Storhok, Arthur A. Bauer and Ronald F. Dickerson. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1264, May 1, 1958, 10 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Liquidus temperatures for alloys containing 13 to 50% U. Neither Si additions up to 1% or Mg additions up to 0.5% produce any change in liquidus temperature, although the Si additions lower the peritectic temperature from 732 to 700° C. (M24b, P12, 2-60; Al-b, *U, Si*)

296-M. Comparative Measurements of the Velocity of Propagation of an Ultrasonic Pulse in Uranium Fuel Elements. Peter R. Morris. National Lead Co. of Ohio. *U. S. Atomic Energy Commission*, NLCO-764, Feb. 11, 1959, 47 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Equipment distinguished differences in preferred orientation between alpha-rolled and alpha-rolled, beta-heat-treated

U fuel elements and offers a more reliable test of the beta-heat-treating operation than currently employed grain size measuring equipment. (M26c, T11g, 2-64; U)

297-M. Phase Relationships in the System Iron-Aluminum-Oxygen. L. M. Atlas and W. K. Sumida. Armour Research Foundation of Illinois Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151000, Feb. 1957, 55 p. $1.50.

Research on specific regions of the phase field provides background for future development of cermets composed of Fe-Al alloys and Al_2O_3. (M24c; Al, Fe, O, 6-70)

298-M. Use of Diamond Abrasives in Metallographic Problems. E. C. Olden. Frankford Arsenal. *U. S. Office of Technical Services,* PB 151042, Mar. 1958, 23 p. $ .50.

New polishing procedure found to minimize three problems usually encountered in metallographic preparation of ferrous and nonferrous alloys—loss of nonmetallic inclusions, surface distortion, and insufficient flatness of field. (M20p)

299-M.* (English.) Constitution of Silver-Rich Silver-Arsenic Alloys. G. A. Eade and W. Hume-Rothery. *Zeitshcrift fur Metallkunde,* v. 50, Mar. 1959, p. 123-126.

Solubility of As in the alpha mixed crystal is lower than previously indicated in the literature. The lattice constant increases in proportion to the As content. 9 ref. (M24b, P12e, 2-60; Ag, *As*)

300-M.* (German.) Secondary X-Ray Diffraction of Metals After Deformation. Horst Fricke and Volkmar Gerold. *Zeitschrift fur Metallkunde,* v. 50, Mar. 1959, p. 136-145.

X-ray diffraction testing of monocrystalline and polycrystalline Cu and Al foils from 1 to 45 angular degrees. The scattering of diffracted rays following deformation is explained by double reflection of adjacent subgrains. 19 ref. (M22g, 3-68; Cu, Al, 4-56)

301-M.* (Italian.) Lattice Vacancies. Tiziano Federighi. *Metallurgia Italiana,* v. 51, Mar. 1959, p. 57-64.

Formation and importance of vacancies. Importance of vacancies in the diffusion process and in the aging of Al alloys; vacancies in relation to mechanical properties; methods of revealing vacancies. 15 ref. (M26s)

302-M.* Determination of Crystal Orientation by High Intensity Reflectograms. G. H. Schwuttke. *Electrochemical Society, Journal,* v. 106, Apr. 1959, p. 315-317.

Instrument based on light figure technique applied to Ge and Si monocrystals. 5 ref. (M26c; Ge, Si, 14-61)

303-M. Etch Patterns in Zinc. Victor V. Damiano and Marvin Herman. *Franklin Institute, Journal,* v. 267, Apr. 1959, p. 303-315.

Loops and spiral etch patterns observed on surfaces parallel or nearly parallel to the basal plane of Zn. 4 ref. (M26; Zn)

304-M. Structural and Magnetic Properties of Mn-Co-C Alloys. A. H. Holtzman and G. P. Conrad. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 103S-104S. (M26, P16; MN-b, *Co, C*)

305-M. Effect of Impurities on the Temperature Dependence of the (110) [001] Texture in Silicon-Iron. J. E. May and D. Turnbull. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 210S-211S. (M26c, 3-69; Fe-b, *Si,* SGA-n)

306-M. Electronic Structure of Transition Metals. W. Marshall and R. J. Weiss. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 220S-224S. (M25)

307-M. (German.) The Systems TiC-HfC and ZrC-HfC. H. Nowotny, R. Kieffer, F. Benesovsky and C. Brukl. *Monstshefte fuer Chemie,* v. 90, no. 1, 1959, p. 86-88. (M24b; C, Ti, Hf, Zr NM-a35)

308-M.* (Russian.) X-Ray Determination of Dispersion-Structure Components and Extent of Microstresses in Highly Coercive Alloys Cu-Ni-Fe. B. Ya. Pines and Barutkin. *Fizika Metallov i Metallovedenie,* v. 6, no. 6, 1958, p. 1053-1060.

With increased tempering time a weakening of gamma^{-1} and gamma^{-2} phases is caused. Higher coercive force is reached the greater the numerical value between the two phases. A further prolonged tempering brings about coagulation of broken up phase particles, which is accompanied by reduction of the coercive force. 12 ref. (P16a, M26q; Cu-b, *Fe, Ni*)

309-M.* (Russian.) Determination of the Energy Formation of Vacancies and Their

Numbers in Pure Metals. S. D. Gertsiken and B. F. Slyusar. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1061-1069.

Electrical resistance methods over a wide temperature range were used for Ag, Cu, Al, Zn, Pb, Cd and Sn; dilatometry was employed for Al, Zn, Pb, Sn and C. 28 ref. (M26s, M23b, M23s; Ag, Cu, Al, Zn, Pb, Cd, Sn)

310-M.* (Russian.) Effect of Chromium on Strengthening and Weakening of Nickel. M. P. Arbuzov and M. P. Krulikovskaya. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1070-1076.

The higher the Cr content, all other conditions being equal, the stronger the alloy. Strengthening is characterized by presence of a high distortion lattice value and small block sizes. Falling off of the hardness (weakening) in alloys during heating is accompanied by a reduced distortion lattice and by growth of the mosaic blocks. 5 ref. (M26c, 2-60; Ni-b, *Cr*)

311-M.* Quantitative Deformation Textures of Aluminum, Copper, Silver and Iron Wires. August Freda and B. D. Cullity. University of Notre Dame, Dept. of Metallurgy. *Office of Naval Research*, Technical Report no. 5, June 1958, 25 p.

Measurement of skin texture of Al and inside textures of Al, Cu, Ag and Fe by X-ray diffractometer. 18 ref. (M26c, M22g, 3-68; Ag-a, Al-a, Cu-a, Fe-a, 4-61)

312-M.* Structure of the Aluminum-Copper Eutectic and Its Transformation Due to Heating. Noboru Takahashi and Kan-ichi Ashinuma. *Journal of Electron Microscopy*, v. 7, 1959, (Annual Edition) p. 37-40.

Lamellar structure of thin films and transformation structures observed by electron microscopy. (M26, N-general; Al-b, *Cu*)

313-M. (German.) Transformations in a Copper-Beryllium System. Bernhard Ilschner. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 349-356.

Micro-calorimetric investigations on an alloy with 1.65% Be in the 100 to 360° C. range. 15 ref. (M24b, N7c; Cu-b, *Be*)

314-M. (German.) The Gallium-Arsenic-Zinc System. Werner Koster and Werner Ulrich. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 361-364.

Thermal, microscopic and radiographic analyses permit the determination of GaA GaAS, GaAs-Zn, GaAs-Zn_3As_2. 11 ref. (M24c; Ga, As, Zn)

315-M. (German.) Isomorphism of Compounds of the A^{III} B^{V}-Type. Werner Koster and Werner Ulrich. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 365-367.

Investigation on the Al-Ga-Sb, Al-In-Sb, Ga-In-Sb, In-InP and InP-InAs systems. 13 ref. (M24c; Al, Ga, In, Sb)

316-M. (German.) Constitution Diagram of the System Lead-Indium. Siegfried Valentiner. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 375.

(M24b; Pb, In)

317-M. (German.) Determination of the X-Ray Reflection Shift in Internal Stress Measurements. Horst-Guido Muller and Gerhard K. Schmidt. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 376-381.

5 ref. (M22g, Q25h)

318-M. (German.) Orientation of Single Crystals, Determined by a Japanese Optical Method. Frank Haessner and Wilhelm in der Schmitten. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 507-509.

9 ref. (M26c, 1-54)

319-M. (German.) Constitution of the Gold Corner in the System Gold-Cadmium-Indium. Jorg Wegst and Konrad Schubert. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 533-544.

Structural aspect for the temperature of 350° C. (M24c; Au, Cd, In)

320-M.* Metallographic Differentiation of Cobalt Metal, Oxide and Sulphide. R. S. Young. *Metallurgia*, v. 59, Apr. 1959, p. 210.

Etching with 1% mercuric chloride for 30 sec. or 35% sodium bisulphite for 2 min. (M20q; Co)

321-M.* Etching Reagents for Dislocations in Metal Crystals. L. C. Lovell, F. L. Vogel and J. H. Wernick. *Metal Progress*, v. 75, May 1959, p. 96.

General methods and precautions. Data sheet lists recommended etching solutions and times for various metals; typical results. (M20q, M26b)

322-M.* Use of the Electron Microscope. Study of Creep in a Chromium-Molybdenum Steel. K. F. Hale. *Metal Treatment and Drop Forging*, v. 26, Apr. 1959, p. 145-153, 160.

Observations on specimens of 2¼ Cr, 1% Mo steel covering stress and unstressed conditions between 550 and 675° C. and times to 20,000 hr. (M21e, M20r, Q3n; AY, *Cr, Mo*)

323-M.* (German.) Rolling Texture and Recrystallization Texture of Tantalum. Herbert Muller. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 575-577.

After a 90% deformation by cold rolling, with process annealing, of tantalum sheet, the texture showed preferred orientation in the (100) [011] and (112) [110] planes. Weaker orientations were found in the (111) [112] and (111) [110] planes. 4 ref. (M26c, N5f; Ta)

324-M.* (German.) Magnetic Measurements on Gold-Iron Alloys. Erich Scheil, Hansgeorg Specht and Ernst Wachtel. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 590-600.

Observation of a single-phase reaction in mixed gold-rich crystals and precipitation of alpha-iron mixed crystals. The change in the homogeneous phase influences the Curie-point while the number of Bohr magnetons remains almost constant. (M24b; Au-b, *Fe*)

325-M.* (German.) Carbide Phases in Tantalum. Richard Lesser and Georg Brauer. *Zeitschrift fur Metallkunde*, v. 49, Dec. 1958, p. 622-625.

Four phases are found in the system Ta-TaC from 1800 to 2100° C. Two are metallic phases, while two are phases with 39 at.% carbon and 42.5 to 50 at.% carbon. (M24b; Ta, *C*)

326-M.* (Hungarian.) Influence of the Macrostructure of Aluminum Slabs on the Properties of Rolled Sheets. E. Istvan Boczor. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 17-23.

99.5% purity Al slabs cast in semicontinuous process investigated to determine how far grain size and orientation influence mechanical properties and fabrication of rolled sheets. (M28, Q-general, 3-72, 2-59; Al, 4-52)

327-M.* Segregation Substructure in Aluminum. Frank B. Cuff, Jr., and Nicholas J. Grant. *Institute of Metals, Journal*, v. 87, Apr. 1959, p. 248-254.

The three-dimensional structure is a continuous region of impurity-atom segregation enclosing small volumes of relatively high-purity Al. 9 ref. (M26s; Al)

328-M.* Constitution of Molybdenum-Rhodium and Molybdenum-Palladium Alloys. C. W. Haworth and W. Hume-Rothery. *Institute of Metals, Journal*, v. 87, Apr. 1959, p. 265-272.

Laboratory furnaces used to measure the melting points of Rh, Cr, Ir and Mo and to determine the equilibrium diagrams of Mo-rich alloys in the systems Mo-Rh and Mo-Pd. 12 ref. (M24b, P12n; Cr, Ir, Rh, Mo-b, *Pd*)

329-M.* Distortion of High-Carbon High-Chromium Die Steel. Effect of Variations in Carbide Distribution on the Sensitivity of the Steel to Distortion. K. Sachs and G. T. F. Jay. *Iron and Steel Institute, Journal*, v. 191, Apr. 1959, p. 353-360.

Influence of hammer, press and upset forging on distribution of carbide particle and dendritic cell sizes. Relation of forging method and macrostructure with heat treatment distortion. Distortion of cast specimens. (M28k, N8r, J26, F22, 9-74; TS)

330-M.* Morphology of the Pearlite Examined by the Direct Observation Method of Electron Microscopy. Zenji Nishiyama, Atsuo Kore'eda and Ken'ichi Shimizu. *Journal of Electronmicroscopy (Annual Edition)*, v. 7, 1959, p. 41-47.

Each ferrite and cementite plate in the pearlite colony is a single crystal. 5 ref. (M26, N8; ST, 4-56, 14-61)

331-M.* Structure and Density of Iron Films Formed by Thermal Evaporation. O. S. Heavens, M. M. Brown and V. Hinton. *Vacuum*, v. 9, Mar. 1959, p. 17-20.

Electron diffraction examination shows films to be in a crystallographically ordered state and electron micrographs show no voids or grain boundaries. 8 ref. (M26, P10a; Fe, 14-62)

332-M.* (German.) One-Phase Constitutional Change in Silver-Manganese Alloys. Heinrich Wollenberger. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 467-471.

Samples with 3.30-30.8% Mn quenched from 800° C. and annealed at 150 and 400° C., with various holding times. Measurements of magnetic susceptibility and specific heat point to the existence of one-phase changes occurring in short-time annealing at above 200 and 300° C. 8 ref. (M24b; Ag-b, *Mn*)

333-M. A Search for the Sigma Phase in the Fe-W and Co-W Alloys Systems. E. C. van Reuth. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 216-218.

Presence of sigma in the Fe-W systems is confirmed. The same sigma structure was found in the Co-W system. The peritctic temperature of 1640° C. in the Fe-W system is questionable. 4 ref. (M24b; Fe-b, Co-b, *W*)

334-M. On the Nickel-Rich End of the Zirconium-Nickel Phase Diagram. D. Kramer. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 256-258.

Zr-Ni system from 0 to 25 at% Zr shows the existence of two intermetallic phases, epsilon and sigma, which contain approximately 16 and 22 at.% Zr respectively. The epsilon phase decomposes at 1340 ± 10° C. while the sigma phase melts at 1575 ± 25° C. The eutectic temperature is 1185 ± 10° C. (M24b; Zr-b, *Ni*)

335-M. Cold-Rolling Textures of Iron Base Alloys Containing 3 to 12 Pct. Aluminum. R. G. Aspden, J. A. Berger and R. S. Mateer. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 251-253.

Cold rolling textures appear similar to those reported for other body-centered cubic alloys. Pole figures indicate no significant change in the cold rolling textures with an increase in Al content. Minor variations in the pole figures may have resulted from small differences in the orientations present in the strips prior to cold rolling. 4 ref. (M26c; Fe-b, *Al*)

336-M. X-Ray Detection of Dislocation Tilts and Strains in Single Crystals of Copper. Larry Kaufman and S. Andrew Kulin. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 273-279.

Broadening of X-ray double-crystal spectrometer rocking curves due to distribution of tilts and strains. If edge-type dislocations are the sole source of tilts and strains in the crystal then the measured broadening is found to be a function of only the dislocation distribution and the Bragg angle. 11 ref. (M26b; Cu, 14-61)

337-M. Orientation Sensitivity of Alpha Titanium to Electrostaining. R. H. Hiltz and R. W. Douglass. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 286-289.

Observed differences in the stain-etching response of alpha Ti are due to the orientation of the basal plain with respect to the polished surface. If a grain is oriented such that its basal plane makes an angle of less than 15° with the surface, that grain shows retarded activity to staining; the smaller the angle the slower the reactivity. 16 ref. (M20q, 3-72; Ti)

338-M. A New Etchant for Zinc Alloys. R. J. Gennone and E. C. Kersey. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 307-308.

An H_2SO_4-HF mixture is a simple one-step etchant which will reveal grain size for a variety of Zn alloys, the interface of Zn and Al and the depth of diffusion with bright field illumination. (M20q; Zn-b)

339-M.* Techniques Employed in the Electron Microscope Study of Titanium Alloy With 8% Manganese. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 3-23.

Examination of structures corresponding to nine different heat treatments. Relative merits of various specimen preparation and replicating techniques. Usefulness of electron microscopy. (M20r, M21e, M27d, 2-64, 2-65; Ti-b, *Mn*)

340-M.* Technique for Easy Removal of Direct Replicas for Electron Microscopy. W. H. Bridges and E. L. Long, Jr. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 25-31.

Pretreatment of surface with vacuum-evaporated wetting agent to facilitate stripping of replicas. Use on 85% Zr, 15% Cb alloy. Vanadium oxide, Zircaloy and Cu surfaces for shadowed carbon and Faxfilm replicas. (M20r; Cu, Zr-b)

341-M.* Examination of Metals by Transmission Electron Microscopy. F. W. C. Boswell and E. Smith. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 31-42.

Individual dislocations, stacking faults and secondary phases in electrolytically polished Al, austenitic stainless steel, alpha brass, Fe and Al (10% Ag) alloy foils. 5 ref. (M20p, M21e, M26b; SS, Cu-n, Fe-a, Al-a, Ag-b, 4-56)

342-M.* Study of Dislocations in Thin Aluminum Foils Elongated in the Electron Microscope. H. G. F. Wilsdorf. Paper from "Symposium on the Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 43-67.

Patterns and behavior of dislocations during deformation of electron transparent Al foil. 18 ref. (M26b, M21e, 3-68, Q24c; Al, 4-56)

343-M.* Electron Probe Analysis of Segregation in Inconel. E. J. Brooks and L. S. Birks. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 100-105.

Electron probe microanalysis of grain boundary and matrix precipitates, distribution and relative concentrations of Cb, Ti and Cr. 6 ref. (M27f, M21e; Ni-b, *Cb, Ti, Cr*, 9-69)

344-M.* Selected Etchants for Electron Microscope Studies of Magnesium Alloys. C. A. Moe. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 106-120.

Etching techniques for preparation of Mg alloys for electron microscope examination; microstructures. (M20q, M21e, M27d; Mg-b)

345-M. The Nature of the Beta' and Beta'' Phases in the Cu-Al System. D. F. Toner. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 223-225.

Alloys from 11.0 to 13.4% were transformed for short periods at 535, 500 and 470° C. and analyzed by X-rays. No experimental verifications or ordering were found in the beta phase. The evidence is consistent with the existence of such a phase. It is likely that beta'' is not a separate phase from beta'. 15 ref. (M24b, N7c; Cu-b, *Al*)

346-M. CsCl-Type Equiatomic Phases in Binary Alloys of Transition Elements. A. E. Dwight. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 283-286.

Lattice parameters were determined for 18 equi-atomic alloys of the CsCl-type structure, ten of which are previously unreported. Formation of this type of structure is largely dependent on position of the elements in the periodic table. 9 ref. (M25; Cs)

347-M. (German.) Formation of Dislocations During the Plastic Deformation of Crystals. Doris Kuhlmann-Wilsdorf, Robert Maddin and Hiroshi Kimura. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 584-589.

Dislocations are thought to be originated by vacancies present around the spots of closely packed planes and which cause dislocations by slipping. 26 ref. (M26b, Q24a, 3-68)

348-M. (German.) Constitution of the Palladium Vanadium System. Werner Koster and Wolf-Dieter Haehl. *Zeitschrift fur Metallkunde*, v. 49, Dec. 1958, p. 647-649.

87 ref. (M24b; Pd, V)

349-M. (Book.) Symposium on Advances in Electron Metallography. 120 p. 1958. American Society for Testing Materials, STP no. 245, 1916 Race St., Philadelphia 3, Pa. $4.

Papers abstracted separately. (M21e, M20)

350-M. (Book.) Vacancies and Other Point Defects in Metals and Alloys. 238 p. 1958. Institute of Metals, 17 Belgrave Square, London,S.W.1, England. $6.

A symposium organized by the Institute of Metals and held at the Atomic Energy Research Establishment, Harwell, Berks., Dec. 1957. Papers abstracted separately. (M26s)

351-M. (Translation—AIP.) Electron Diffraction Analysis of the Processes of Decomposition of Supersaturated Solid Solutions in Systems Al-Cu and Ag-Cu. Z. G. Pinsker and N. A. Skobel'tsyna. *Soviet Physics Crystallography*, v. 2, no. 5, p. 610-614.

Effects of quenching and subsequent decomposition of the solid solution on annealing in the temperature range 130 to 180° C. (M24b, J23, J26; Cu-b, *Al, Ag*, 14-67)

352-M. (Translation—ConBur) Metastable State Diagram of the Iron-Chromium System. A. G. Lesnik. *Academy of Sciences of the USSR, Proceedings, Physical Chemistry Section*, v. 119, Mar-Apr. 1958, p. 249-251.

Energy of interatomic reaction in alloys of the Fe-Cr system; study was based on the data previously obtained and on results of experiments devised especially for the determination of curves representing the alpha-gamma phase equilibrium in this system. 5 ref. (M24b; Cr, Fe)

353-M.* Progress Report on Dislocation Behavior in Lithium Fluoride Crystals During Cyclic Loading. R. E. Keith and J. J. Gilman. Paper from "Symposium on Basic Mechanism of Fatigue". American Society for Testing Materials, STP no. 237, 1958, p. 3-20.

Motions of individual dislocation loops; changes in surface contour and dislocation densities; relation of point-defect clusters and dislocation motions. 19 ref. (M26b, Q7)

354-M.* (Russian.) Heterogeneity of Magnetic Properties of Cold-Rolled Transformer Steel. A. G. Petrenko, L. A. Kurtova, M. M. Petlyakov and A. I. Belyakov. *Stal'*, Mar. 1959, p. 267-268.

To prevent formation of fine-grained nontextured areas in cold rolled transformer steel with poor magnetic properties, it

is necessary to eliminate nonmetallic inclusions and to attain, as far as possible, a complete decarburization of the steels during various stages of its fabrication. 6 ref. (M27c, P16; SGA-n, AY, 9-69)

355-M.* (Russian.) The Iron-Palladium System. V. V. Kuprina and A. T. Grigor'ev. *Zhurnal Neorganicheskoi Khimii*, v. 4, no. 3, 1959, p. 655-661.

Differential thermal analysis, Brinell hardness, microstructure, electrical resistance and temperature coefficient studies. Solubility of Pd in alpha Fe does not exceed 5 at .%. Polymorphic alpha ⇌ gamma transition of Fe is reduced by Pd. A eutectic point exists at 40 at.% Pd. 10 ref. (M24b, N12q; Fe-b, *Pd*)

356-M.* (Russian.) Rhenium-Titanium System. E. M. Savitskii, M. A. Tulkina and Yu. A. Zot'ev. *Zhurnal Neorganicheskoi Khimii*, v. 4, no. 3, 1959, p. 702-704.

Metallographic study of the system Re-Ti by X-ray analysis. Data on melting temperature, electrical resistance, harness and microstructure. (M24b, P-general; Re-b, *Ti*)

357-M.* (Czech.) X-Ray Tests With Plastically Deformed Kovar Alloys. Alexander Spirkov. *Hutnicke Listy*, v. 14, Apr. 1959, p. 316-319.

Lattice distortions, thermal vibrations and phase transformations on Kovar alloys of various composition. 7 ref. (M22g, N6p, 9-74, 2-60; SGA-s)

358-M.* (German.) The Titanium-Magnesium System. I. Obinata, Y. Takeuchi and R. Kawanishi. *Metall*, v. 13, May 1959, p. 392-397.

Mg rods or a mixture of Ti and Mg were sealed in Ti sheaths, heated to various temperatures for various periods and cooled both slowly and rapidly. No intermetallic compound could be determined. 10 ref. (M24b, M22; Ti-b, *Mg*)

359-M.* (Russian.) Investigation of the System Tantalum-Tellurium. Yu. M. Ukrainskii, A. V. Novoselova and Yu. N. Simanov. *Zhurnal Neorganicheskoi Khimii*, v. 4, Jan. 1959, p. 148-152.

A combination of $TaTe_3$ and two components of varying compounds are found. These are alpha phase $TaTe_{0.85-1.2}$ and beta phase $TaTe_{1.5-2.0}$. The $TaTe_3$ has a tetragonal lattice. 4 ref. (M24b; Ta-b, *Te*)

360-M. Irradiation Damage. Papers Presented at the First Colloquium of the United Kingdom Atomic Energy Authority Diffraction Analysis Conference. April 2, 1958. *United Kingdom Atomic Energy Authority*, AERE M & C/R 2751, Nov. 1958, 37 p.

The five principal mechanisms of radiation damage, ionization, vacancies, interstitials, impurity atoms and thermal spikes, are investigated by diffraction techniques. Data are given for U and B with reference to application in control rods, fuel elements, moderators and structural materials. (M26b, M26s, M22g, 2-67; U, B)

361-M. Fractography of Some Reactor Fuel Materials. T. K. Bierlein and B. Mastel. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission*, HW-57207, Aug. 15, 1958, 17 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Fractographic analysis of irradiated uranium is a sensitive method for revealing the effect and presence of the many gas fission products believed to be responsible for the macroscopic swelling of uranium during high-temperature irradiation. To facilitate valid fractographic interpretation of irradiated uranium nonirradiated beta heat treated uranium was fractured at -196, -80 and 25° C. At -196° C. impact produces large smooth fracture facets which contain few deformation twins; generalized step cleavage is common. (M23p, T11g, P10d, Q26, 2-67; U)

362-M. (Czech.) High-Temperature X-Ray Chamber. Zdenek Jiskra and Bernard Fleischer. *Hutnicke Listy*, v. 14, Apr. 1959, p. 280-287.

Apparatus for X-ray testing at high temperatures. 33 ref. (M22g, 1-53)

363-M. (Czech.) Carbon Replicas for Electron Microscopy and Diffraction. Miroslav Rozsival. *Hutnicke Listy*, v. 14, Apr. 1959, p. 307-309.

5 ref. (M20r)

364-M. (Czech.) Methods for Structural Testing of Uranium. B. Prenosil and J. Voboril. *Hutnicke Listy*, v. 14, Apr. 1959, p. 309-315.

Directions for grinding, polishing and etching in specimen preparation. 12 ref. (M20; U)

365-M. (French.) Influence of Crystal Orientation on Formation of Profiles on Copper and Silver Surfaces During Oxidizing Treatment at High Temperatures. Jean Moreau and Jacques Benard. *Comptes Rendus*, v. 248,

Mar. 16, 1959, p. 1658-1661.
(M26c, 2-62, 3-72; Ag, Cu)

366-M. (French.) Study of the Diagram of Gold-Copper Alloys in the Vicinity of $AuCu_3$. Antoine Pianelli and Rene Faivre. *Comptes Rendus*, v. 248, Mar. 16, 1959, p. 1661-1663.
(M24b; Au-b, *Cu*)

367-M. (French.) Study of Impurity Accumulation at the Grain Boundaries of Aluminum Bicrystals Prepared by Progressive Solidification. Claude Goux and Jean Montuelle. *Comptes Rendus*, v. 248, Mar. 16, 1959, p. 1667-1669.
(M27f, N12, 3-69; Al)

368-M. (Italian.) Microstructure Testing Methods and Equipment. Oscar Grossi. *Macchine*, v. 14, Apr. 1959, p. 389-405.
(M23, X4)

369-M.* (French.) Influence of Quenching Rate on the Structure of 6% Ti-Al-4% V Alloy. A. Saulnier. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 205-214.
Electron microscopy of quenched and quenched and tempered alloys reveals a wide range between elastic limit and tensile strength when quenched from 850° C. If quenching is retarded or tempering is applied the transformation takes place by nucleation and growth. Rapid quenching from 950° C. produces needle-shaped grouping of sub-microscopic plates. (M27, J26, J29, Ti-b, *Al, V*)

370-M.* (French.) Dislocations in Aluminum-Magnesium Alloys at Various Temperatures. J. Caisso. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 237-245.
Portevin-Le Chatelier phenomenon studied. It is shown that its appearance is restricted to tensile curves above a certain minimum deformation. 8 ref. (M26b, Q27; Al-b, *Mg*)

371-M.* (German.) Constitution of the Nickel-Copper-Germanium System. Walter Burkhardt and Konrad Schubert. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 196-198.
X-ray and metallographic testing after isothermal annealing at 500° C. The compound $Ni_3Cu_2Ge_2$ has a hexagonal lattice while the phase with 15 at.% Ni, 65 at.% Cu and 20 at.% Ge resembles beta-manganese in structure. Two phases of the gamma-brass type are assumed for the composition 15 at.% Ni, 58 at.% Cu and 22 at.% Ge. (M24; Ni, *Cu, Ge*)

372-M.* (German.) Ternary Carbides of the Transition Metals Nickel, Cobalt, Iron and Manganese With Germanium and Indium. Leo J. Hutter and Hans H. Stadelmaier. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 199-203.
Determination of ternary carbides, formed by three Ni, Co, Fe or Mn atoms, with one Ge or In atom, in the systems Co-Ge-C, Fe-Ge-C, Mn-Ge-C, Ni-In-C, Co-In-C and Fe-In-C. 15 ref. (M24c, M26; Ni-b, Co-b, Fe-b, Mn-b, Ge, In, C, NM-a35)

373-M.* Techniques for the Metallography of Porcelain-Enameled Steel. H. L. Conaway. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 55-69.
Selecting, mounting, polishing, etching and photographing specimen. (M20; ST, 8-71)

374-M. (Japanese.) Lead KS Bronze With Homogeneous Fine Structure. Z. Takao, T. Noda and H. Takata. *Metals*, v. 29, Feb. 1959, p. 148-149.
Microstructure of a 77% Cu, 8.0% Sn, 15% Pb alloy. (M27; Cu-s, *Pb*)

375-M.* The Nature of Mechanically Polished Metal Surfaces. L. E. Samuels. *Electroplating and Metal Finishing*, v. 12, May 1959, p. 169-174, 178.
Election diffraction established that surfaces polished by metallographic methods are produced by cutting and not by surface flow. (Conclusion.) 74 ref. (M20p)

376-M.* (Italian.) Etch Figures on Iron and Ferro-Silicon Alloys for Determining of Crystal Orientation and Relationship to the Structure of Ferromagnetic Domains. F. Brossa, A. Ferro and G. Venturello. *Metallurgia Italiana*, v. 51, Apr. 1959, p. 139-141.
Reagents were developed, such as mercuric chloride and mercurous nitrate salts, which produce clear etch figures and permit rapid, approximate identification of crystal orientation. Prior passivation of surface of specimen is necessary. 19 ref. (M20q, M26c, M27g; Fe-b, *Si*)

377-M. (Ukrainian.) Determination of Dislocation Densities During Deformation of Nickel, Silver and Aluminum. S. D. Hertzricken and N. N. Novikov. *Ukrainskii Fizicheskii Zhurnal*, v. 3, no. 6, 1958, p. 802-814.
The number of dislocations in deformed materials may decrease only up to a certain limit, which varies according to the

material. The minimum possible distance between dislocation centers also varies slightly. (M26b, 3-68; Ni, Ag, Al)

378-M.* Direct Observations of Defects in Quenched Gold. J. Silcox and P. B. Hirsch. *Philosophical Magazine*, v. 4, Jan. 1959, p. 72-89.

Electron transmission microscopy of thin Au foil annealed at 930° C., quenched into iced brine and then aged for 1 hr. at 100-250° C. Formation of stacking faults and dislocation loops. 27 ref. (M21e, M26b, M26s, J26n; Au, 4-56)

379-M.* The Ejection of Atoms From Gold Crystals During Proton Irradiation. M. W. Thompson. *Philosophical Magazine*, v. 4, Jan. 1959, p. 139-141.

Directions in which atoms leave the surface of gold foil under irradiation. 5 ref. (M25, 2-67; Au, 4-56)

380-M.* (Russian.) Disclosure of Inter-Dendritic Nonmetallic Laminae in Cast Steel. H. A. Ermanovich, M. F. Longinov, L. G. Orlov and L. M. Utevskii. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 440-442.

Metallographic, spectrographic, X-ray and chemical analyses in cupels of steels 40KHNMA, 12KH2N4A (Cr-Ni steels); 38KHVFYU (Cr-Ni-V) 30KHGSA (Cr-Si-Mn) and 30KHGSNA (Cr-Mn-Si-Ni) established that defects in these steels are caused by a coarse multilayer of laminae between the crystalline grains. (M26s; SS, Cr, Ni, V, Si, Mn)

381-M.* Partially Pinned Tilt Boundaries. T. Vreeland, Jr. *Acta Metallurgica*, v. 7, Apr. 1959, p. 240-245.

Theoretical study of the conditions under which small angle tilt boundaries in a crystal can be moved when subjected to a stress which does not produce general slip. The dislocations in the boundary are assumed to be partially pinned by Cottrell atmospheres, intersecting substructure or precipitates along the dislocation lines. Partially pinned dislocation boundaries may move at lower stresses then similarly pinned isolated dislocations if the density of pinned segments is sufficiently low. 7 ref. (M26b, 3-66)

382-M.* The Orientation Dependence of Etching Effects on Germanium Crystals. P. J. Holmes. *Acta Metallurgica*, v. 7, Apr. 1959, p. 283-290.

Patterns of smooth, polished, pitted and matt surfaces are, in many cases, characteristic of one type of etchant only and cannot be reproduced by any other, even if the latter's concentration is adjusted to give the same pH or reaction rate. This suggests that the detailed mechanisms of removal of Ge atoms from the bulk, and of removal of etch products from the vicinity of the surface, are the features controlling the observed results. 13 ref. (M20q, 3-72; Ge)

383-M.* (Russian.) Structure of Newly Deformed Magnetic Alloys. M. I. Raevskaya. *Izvestiya Akademii Nauk, Seriya Fizicheskaya*, v. 33, no. 3, 1959, p. 266-271.

Metallographic, X-ray and microstructure studies of Fe-Ni-Al-Cb isotropic alloys and Fe-Co-Ni-Al-Cb anisotropic alloys in high coercive field (deformed and tempered at 800-1200° C.) showed that they are composed of beta and beta prime phase with a large Cb separation in the background. At 1200° C. tempering temperature and at a cooling rate of 10° per hr. there is a beta prime phase separation with oriented beta separation with Cb in the background. (M24d, M26q, Q24g; SGA-n, Fe-b, *Ni, Al, Cb*)

384-M.* An Exploration of High Boron Alloys. A. U. Seybolt. *American Society for Metals, Transactions*, v. 52, Preprint no. 135, 1959, 23 p.

Vacuum high-frequency induction melting of boron alloys containing up to 6 at.% Ga, Y, Ce, Si, Sn, Ti, Zr, Cb, Ta, Mo, W, Re, Fe, Ni or Co. X-ray diffraction, metallographic examination and hot hardness testing of alloys. Hot pressing of boron and boron alloy powders. 11 ref. (M24b, M27d, Q29p; B, *Ce, Y, Ga, Re, Si, Sn, Ti, Zr, Cb, Ta, Mo, W, Fe, Ni, Co*)

385-M.* Some Properties of Crystals of Silver Chloride Containing Traces of Copper Chlorides. A. S. Parasnis and J. W. Mitchell. *Philosophical Magazine*, v. 4, Feb. 1959, p. 171-179.

Dislocations in crystals following annealing, recrystallization and plastic deformation. 11 ref. (M26b, N5f, Q24)

386-M.* The Positions of Dislocations in Arrays. A. K. Head. *Philosophical Magazine*, v. 4, Mar. 1959, p. 295-302.

Calculation of equilibrium positions of dislocations in a number of types of array. 11 ref. (M26b, Q24a)

387-M.* The Observation of Dislocations in Thin Single Crystal Films of Gold Prepared

by Evaporation. D. W. Pashley. *Philosophical Magazine*, v. 4, Mar. 1959, p. 324-335.

Transmission electron microscope observations of dislocations and their movements in coherent single crystal films of Au prepared by deposition on smooth Ag substrate. Effect of annealing. 25 ref. (M26b, L25g; Au-a, 14-61, 14-62)

388-M.* The Detection of Dislocations by Low Temperature Heat Conductivity Measurements. Jenifer N. Lomer and H. M. Rosenberg. *Philosophical Magazine*, v. 4, Apr. 1959, p. 467-483.

Calculation of dislocation density in Cu-Zn single and polycrystals containing 7, 15 or 30% Zn after deformation at room temperature from the decrease in lattice conductivity at 2 to 5° K. Comparison of electrical resistivity and thermal conductivity data. Transmission electron microscope observations. Dislocation densities during fatigue testing. 31 ref. (M26b, P11h, P15g, Q24, 2-63, 3-68; Cn-n)

389-M.* Helical Dislocations in Quenched Aluminum—4% Copper Alloys. G. Thomas and M. J. Whelan. *Philosophical Magazine*, v. 4, Apr. 1959, p. 511-527.

Transmission electron microscopy of thin foil of polycrystalline Al alloy quenched from temperatures of 440 to 540° C. Helical dislocations and dislocation loops. Theoretical mechanisms. 33 ref. (M26b, J26n; Al-b, *Cu*, 4-56)

390-M.* The Direct Observation of Metallic Surfaces in the Electron Microscope. K. Thomas and K. F. Hale. *Philosophical Magazine*, v. 4, Apr. 1959, p. 531-532.

Modification of electrolytic polishing technique retains surface detail on one side of foil aiding interpretation of dislocation arrays in deformed material. Application to Al and stainless steel tensile specimens and to observation of surface growths on vacuum annealed Al. 4 ref. (M20p, M26c, N3; SS, Al)

391-M.* (Czech.) Constitution of Phases Precipitating in Modified 12% Cr-Steels at Temperatures Above 550° C. Jaroslav Jezek, Jaroslav Koutsky and Jaroslav Pluhar. *Hutnicke Listy*, v. 14, May 1959, p. 469-472.

Samples of various composition held at temperatures from 600-800° C. for 100-3000 hr. The precipitates are isolated by electrolytic and chemical methods and studied by radiographs. 14 ref. (M24e, N7; AY, *Cr*)

392-M.* (French.) Crystallographic Studies of a Transformation by Means of Kikuchi Lines. Micheline Sorel. *Comptes Rendus*, v. 248, Apr. 6, 1959, p. 2106-2108.

Techniques to obtain electronic diffraction pattern and a micrograph simultaneously. (M22h, M21e)

393-M.* (French.) Statistical Aspects of Grain Measurement. Pt. 1. A. H. Bazin. *Cuivre, Laitons, Alliages*, no. 48, Mar-Apr. 1959, p. 35-51.

Homogeneity of grain size and shape in specimens of Cu and brass completely recrystallized after sufficient cold working to destroy foundry structure. (M27c; Cu, Cu-n)

394-M.* (German.) Equilibrium of Iron-Cobalt-Chromium System. Werner Koester and Gernot Hofmann. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 249-251.

Isothermal equilibrium diagram of Fe-Co-Cr system for 20, 600 and -700° C. formulated after annealing for 1000 hr. An equilibrium between alpha and gamma solid solution resulted, while a short time heat treatment leads to an irreversible gamma alpha transformation. (M24c, N-general; Fe-b, *Co, Cr*)

395-M.* (German.) Carbide Phases of Columbium. Georg Bauer and Richard Lesser. *Zeitschrift fur Metallkunde*, v. 50, Jan. 1959, p. 8-10.

Binary system of Cb-CbC. Alpha, beta, zeta and delta phases were found between 1800 and 2000° C., the zeta phase being observed for the first time. Samples with very high carbide content proved thermally unstable. 7 ref. (M24b, N-general; Cb, 14-68)

396-M.* (German.) High Melting Sintered Tungsten Alloys. Richard Kieffer, Karl Sedlatschek and Horst Braun. *Zeitschrift fur Metallkunde*, v. 56, Jan. 1959, p. 18-24.

W-Cb and W-Ta systems investigated in relation to density, hardness, electric conductivity and corrosion resistance. Data on the W-V system. 15 ref. (M24b; W-b, *Cb, Ta, V*)

397-M.* (German.) Electron Microscopy of Thin Metal Slices Cut by Diamond Knife. Ludwig Reimer. *Zeitschrift fur Metallkunde*, v. 50, Jan. 1959, p. 37-41.

Thin metal slices (100 - 300 Å.) were cut of Al, Ni, Cu, Au, Pd, Ag, Pt and Fe with an "Ultramikrotom". Possibilities resulting from using slices instead of

replicas. (M20, M21e; Al, Ni, Cu, Pd, Ag, Pt)

398-M.* (German.) Lithium-Silicon System. Horst Boehm. *Zeitschrift fur Metallkunde*, v. 50, Jan. 1959, p. 44-46.

The constitution of Li-Si system investigated by thermal analysis. A compound Li_4Si (or $Li_{15}Si_4$) is formed peritectically at 633 ± 5° C. Li_2Si melts without decomposition at 752 ± 5° C. A eutectic is formed of Si and Li_2Si at 39.4 ± 0.5% and at 635° ± 5° C. (M24b, M23r; Li-b, *Si*)

399-M. Radioactive Cobalt-60. The Pill for Industrial Headaches. Maurice Daly. *Modern Castings*, v. 35, June 1959, p. 27-30.

Use of radioactive isotopes in testing casting hemogeneity. 6 ref. (M23q)

400-M.* (English.) A Survey of the Molybdenum-Platinum System. A. G. Knapton. *Planseeberichte fur Pulvermetallurgie*, v. 7, Apr. 1959, p. 2-3.

Constitution diagram based on melting point determinations, X-ray analysis and metallography. Existence of a congruently melting sigma phase with a wide homogeneity range and tetragonal alpha prime phase stable only below 1400° C. is established. (M24b; Mo-b, *Pt*)

401-M.* (Japanese.) Equilibrium Diagram of Iron-Carbon-Silicon Alloys. Ichiroh Iitaka. *Japan Foundrymen's Society, Journal*, v. 31, Mar. 1959, p. 165-171.

Stable Fe_3C can exist only when the alloy is solidified rapidly, although the compound Fe_3C can be observed only in the supercooled state. (M24c; Fe-b, *Si, C*)

402-M. (Japanese.) Banded Structure in Bearing Steel. K. Hurusawa and E. Yajima. *Nagoya Institute of Technology, Report*, no. 10, 1958, p. 208-212.

Even if specimens are quenched to dissolve the carbide into an austenite base, etched banded structure, due to elongated segregated area, is still observed. If spheroidal carbide is converted into lamellar carbide, banded structure becomes indistinct. (M27, N8r; ST, SGA-c, 9-69)

403-M. (Book.) Elements of Materials Science. Lawrence H. Van Vlack. 528 p. 1959. Addison-Wesley Publishing Co., Inc., Reading, Mass. $8.50.

Elementary text dealing with atomic structure, crystal structure, macrostructure and properties of metals and other materials. (M-general)

404-M.* (Translation—AIP.) Morphology of Spherulitic Graphite in High-Strength Cast Iron. I. Ezhek, I. Koritta and K. Lebl'. *Soviet Physics, Crystallography*, v. 2, no. 5, 1958, p. 653-658.

Investigation of segregations of graphite in gray high-strength and malleable cast iron showed differences in the mutual orientation of separate graphite plates. 8 ref. (M27; CI-n, CI-s, NM-k36)

405-M.* Inclusions in Uranium Metal. K. E. G. Meredith and M. B. Waldron. *Institute of Metals, Journal*, v. 87, June 1959, p. 311-317.

Occurrence and identity of inclusions due to the presence of carbon, nitrogen, hydrogen, Fe, Si and Al. A complex of oxygen, carbon and nitrogen with uranium can exist in normal-purity uranium owing to the isomorphous nature of the individual compounds UO, UC and UN. The metallic impurity elements Fe, Si and Al all form compounds with uranium which precipitate on cooling. 39 ref. (M27; U, *O, C, N, Fe, Si, Al, H*, 9-69)

406-M.* An Investigation of the Reported Occurrence of a Metastable Phase Y in Aluminium-Rich Alloys of the System Aluminium-Manganese-Nickel. A. R. Harding and J. W. H. Clare. *Institute of Metals, Journal*, v. 87, June 1959, p. 317-320.

Micrographic examination of both annealed and slowly cooled alloys has failed to confirm the presence of the Y phase and only alpha solid solution, $NiAl_3$, and the stable ternary compound X have been observed. Suggestions are made to account for the previous identification of an additional phase. (M24c; Al-b, *Mn, Ni*, 14-67)

407-M. (Russian.) New Materials for the Study of Crystallization Processes of Metals and Alloys. A. A. Kotovshchikov. *Liteinoe Proizvodstvo*, May 1959, p. 38-39.

A group of halogen salts of Ag, Ti and Cs, called "transparent metals", possessing optical and mechanical properties as well as cubic crystalline lattices similar to metals and capable of withstanding such operations as forging, rolling, hardening, cold working and annealing, are a good medium to study analogous structures of ferrous and nonferrous metals. 5 ref. (M26, Q24)

408-M.* The Structure and Phase Constitution of the Coating in the Hot Tinning of Sheet Iron. P. G. Morgan. *Sheet Metal Industries*, v. 36, June 1959, p. 445-446.

Intermediate layer on hot tinned plate consists of light and porous dark areas representing the same structural phase but differing in the closeness of the packing and development of crystals of FeSn. 11 ref. (M26, L16, 1-66; Fe-b, *Sn*, 4-53)

409-M.* (French.) Nondestructive Technique for the study of Fractured Surfaces With the Electron Microscope. Edmond Mencarelli and Pierre A. Jacquet. *Comptes Rendus*, v. 248, Apr. 17, 1959, p. 2477-2479.

The double print plastic carbon method is the preferred technique. (M21e, Q26)

410-M.* (French.) Comparative Study of Complex Structures AuCuII and $AuCu_3II$ of Au-Cu Alloys. Antoine Pianelli. *Comptes Rendus*, Apr. 27, 1959, p. 2475-2476.

Au-Cu alloys in the region of $AuCu_3$. (M24b; Al-b, *Cu*)

411-M.* (French.) Crystallographic Relationship Between Austenite and Alpha Phase Produced by Cold Working of Unstabilized Stainless Steel. Paul Bastien and Rene Margerand. *Comptes Rendus*, v. 248, Apr. 27, 1959, p. 2480-2482.

X-ray diffraction study of preferred orientation of alpha and gamma phase. (M26c, N8; SS)

412-M.* (French.) Direct Observation by the Electron Microscope of Mutual Cancellation of Dislocations During Restoration Annealing of a Work Hardened Al-Mn Alloy. A. Saulnier and P. Mirand. *Comptes Rendus*, v. 248, May 20, 1959, p. 2871-2872.

Individual dislocations at subgrain boundaries move rapidly along their slip planes between opposite walls. This results in mutual cancellation of dislocations located in the same plane. During prolonged heating the subgrain boundary disappears. Restoration of plasticity appears to be related to an increase in average free movement of dislocations. (M26b, 2-64; Al-b, *Mn*)

413-M. Distribution of Magnetic Domains Between the Two Phases in a Single-Crystal Flat Disk of Iron. K. F. Niessen. *Philips Research Reports*, v. 14, Apr. 1959, p. 101-110.

In a single-crystal flat disk of Fe, whose plane is a (001) plane of the crystal, there are four preferential directions lying in this plane, viz. [100], [010], [100], and [010], each occupied by 1/6 N domains when no external field is present. (M27g; Fe, 14-61)

414-M.* The Effect of the Method of Preparation on Surface Structure. A. J. W. Moore. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 19-21.

Applications of thermal etching and cathodic ion bombardment. The removal of foreign atoms from a surface makes ion bombardment particularly useful in rapidly freeing a surface from the monomolecular film of grease which may be retained after conventional degreasing processes. 6 ref. (M20q)

415-M.* Observations of Dislocations and Precipitates in Aluminium Alloys. G. Thomas. *Philosophical Magazine*, v. 4, May 1959, p. 606-611.

Electron transmission micrographs of quenched Al alloys show that the specimens contain many complex dislocations and large dislocation loops with diameters up to 2000 Å. These dislocations could not be moved by heating the foils in the electron beam and their immobility is thought to be due to substitutional atmospheres of solute atoms which form at, and lock, the dislocations by vacancy-aided diffusion. 12 ref. (M26b; Al-b)

416-M.* On the Crystal Perfection of Iron Whiskers. Paul D. Gorsuch. *Journal of Applied Physics*, v. 30, June 1959, p. 837-842.

Density and distribution of dislocations in tip grown iron whiskers produced by hydrogen reduction of liquid iron halide salts was measured by means of X-ray rocking curves. No evidence of large elastic twist was found in any of the whiskers as would be expected for whiskers grown by a screw dislocation mechanism. 18 ref. (M26b, N3r; Fe, 14-61)

417-M.* On the Determination of Preferred Orientations. C. G. Dunn. *Journal of Applied Physics*, v. 30, June 1959, p. 850-857.

Orientations of individual grains in cold rolled and annealed Si-Fe strip were obtained for single and a multiple-component textures to determine the preferred orientations in the two textures and investigate the nature of formation of textures. 11 ref. (M26c; Fe-b, *Si*, 4-53)

418-M.* X-Ray Measurement of Microstrains in Germanium Single Crystals. L. P. Hunter. *Journal of Applied Physics*, v. 30, June 1959, p. 874-884.

Effect of strains on anomalous transmission of X-rays. Some apparently dislocation-free crystals show a greater degree of crystalline imperfection than

crystals with a finite dislocation count. 10 ref. (M26b, 3-68; Ge)

419-M.* Anisotropic Mobilities in Plastically Deformed Germanium. R. A. Logan, G. L. Pearson and D. A. Kleinman. *Journal of Applied Physics*, v. 30, June 1959, p. 885-895.

Effects of edge dislocations on carrier mobility in n-type Ge and extent to which they can be explained by existing theory. 23 ref. (M26b, P15, 3-68; Ge)

420-M. Preferred Orientation in Rolled and in Recrystallized High-Purity Uranium Rod. M. H. Mueller and H. W. Knott. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-5887, Apr. 1959, 16 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Results indicate that the as-rolled texture could be described as a duplex (041) and (352) with the (041) being the major component and with considerable spread about each component. The recrystallized rod showed approximate (041) and (392) components with considerable spread. 8 ref. (M26c; U, 4-55)

421-M. Reactions in the Niobium-Hydrogen System. William M. Albrecht, W. Douglas Goode, Jr., and Manley W. Mallett. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1332, Apr. 1, 1959, 20 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Investigation showed that a solid solution of hydrogen in Cb is produced throughout most of the system. a miscibility gap was found at low temperatures and pressures, with a critical point at about 140° C., a hydrogen pressure of 0.01 mm. of Hg, and a hydrogen/Cb ratio of 0.3. 12 ref. (M24b; Cb, H, 14-67)

422-M. The Etching of Plutonium and Its Alloys by Cathodic Bombardment. Katherine Imlah. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission*, LA-2287, Apr. 22, 1959, 43 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Cathodic bombardment is a particularly useful technique where remote handling of specimens is required, conventional methods fail or specific features such as inclusions, phase demarcation, grain size, deformation are of interest. (M20q; Pu)

423-M.* (German.) Vanadium-Boron System. Hans Nowotny, Friedrich Benesovsky and Riehard Kieffer. *Zeitschrift fur Metallkunde*, v. 50, May 1959, p. 258, p. 258-261.

Pressure-sintered, conventionally sintered, and molten specimens were investigated. Melting point determination, structure analysis and X-ray examination were carried out to produce a preliminary constitutional diagram. The compounds V_3B_2, VB, V_3B_4 and VB_2 were observed. 21 ref. (M24b, V, B)

424-M.* (German.) Silicon-Phosphorus System. Bill Giessen and Rudolf Vogel. *Zeitschrift fur Metallkunde*, v. 50, May 1959, p. 274-277.

Thermal analysis and structural examination indicate that Si and phosphorus can form only a SiP compound which dissociates into a liquid and a vapor phase on heating over 1131° C. 7 ref. (M24b; Si, P)

425-M.* (German.) Effect of Iron and Silicon Additions on Texture and Earing of Pure Aluminum. Wolfgang Bunk and Paul Esslinger. *Zeitschrift fur Metallkunde*, v. 50, May 1959, p. 278-287.

The tendency to 45° earing after soft annealing increases in proportion to an increase of Fe in relation to Si. The dependence of earing height and earing direction of soft strip is more distinctly evident with increasing degree of cold rolling and with increasing Si content. 33 ref. (M26c, F23, 2-60; Al-a, *Fe, Si*, 9-71)

426-M.* Absolute Interfacial Energies of [001] Tilt and Twist Grain Boundaries in Copper. N. A. Gjostein and F. N. Rhines. *Acta Metallurgica*, v. 7, May 1959, p. 319-330.

Analysis of the results obtained for small-angle, lineage boundaries, in terms of the appropriate dislocation model, shows that the Read-Shockley equation predicts the energy up to misorientations of 5 to 6, but that for larger misorientations, it gives much too small an energy. 40 ref. (M26b; Cu)

427-M.* (Russian.) Use of Color-Etching Metallography in Studying Iron-Chromium Alloys. S. A. Kisileva and G. A. Faivilevich. *Zavodskaya Laboratoriya*, v. 25, May 1959, p. 570-571.

Structural transformation caused by heat treating an Fe-Cr alloy with 39.15% Cr and 0.035% C. Color etching effectively delineates the heterogeneity within the grain and detects minute quantities of phases. Etching reveals that the isolated alpha phase is concentrated around carbide particles and that during prolonged

annealing a partial penetration of alpha phase into the grain body occurs. (M20q, N-general, 2-64; Fe-b, *Cr*)

428-M.* The Crystal Structures of $NbBe_2$ and $NbBe_3$. Donald E. Sands, Allan Zalkin and Oscar H. Krikorian. *Acta Crystallographica*, v. 12, June 1959, p. 461-464.

$CbBe_2$ has a face-centered cubic cell, with eight formula units in the unit cell. $CbBe_3$ has a rhombohedral cell with three formula units in the unit cell. 13 ref. (M26; Cb-b, *Be*, 14-68)

429-M.* The Structure of Thin Films of CuAu at Room and Elevated Temperatures. Eileen I. Alessandrini. *Acta Crystallographica*, v. 12, June 1959, p. 471-472.

The low-temperature CuAu ordered structure is made up of domains wherein the c-axes of the tetragonal unit cells are parallel with each other but perpendicular to the c-axes in adjacent domains. The disordered lattice has a face-centered-cubic structure. 4 ref. (M26; Cu-b, *Au*, 14-62, 14-68)

430-M.* Structure of Quenched and Irradiated Metals. R. E. Smallman and K. H. Westmacott. *Journal of Applied Physics*, v. 30, May 1959, p. 603-616.

Electron transmission microscopy and small-angle X-ray scattering techniques employed to study structure of quenched Cu and Al after aging. Alpha-irradiated Cu after annealing and neutron irradiated Cu. 38 ref. (M26s, M26b, M22g, 2-64, 2-65, 2-67; Cu, Al)

431-M.* Small Angle Scattering of X-Rays by Plastically Deformed Single Crystals. W. H. Robinson and R. Smoluchowski. *Journal of Applied Physics*, v. 30, May 1959, p. 617-621.

Small angle scattering from single crystals of Mg plastically deformed in simple shear. 16 ref. (M22g, M26s, 3-68; Mg, 14-61)

432-M.* Internal Double Reflection in a Perfect Crystal. A. Guinier and E. Guyon. *Journal of Applied Physics*, v. 30, May 1959, p. 622-628.

Theory of double Bragg reflections in single crystals derived on kinematical and dynamical basis. Double reflections in Al-Cu alloy and nonmetallic single crystals. 12 ref. (M22g, M26s; Al-b, *Cu*, 14-61)

433-M.* Small Angle Scattering From Dislocations in Deformed Single Crystals. Alfred K. Seeger. *Journal of Applied Physics*, v. 30, May 1959, p. 629-636.

Theoretical expression for small angle X-ray scattering from piled-up groups of dislocations in deformed single crystals. Conditions for experimental observation in face-centered cubic crystals. 18 ref. (M26b, M22g, 3-68; Cu, Ni, Co, 14-61)

434-M.* Small-Angle Scattering of X-Rays and Neutrons From Deformed Metals. H. H. Atkinson. *Journal of Applied Physics*, v. 30, May 1959, p. 637-645.

Theoretical consideration of scattering from deformed metals due to "true" small-angle scattering from dislocations and to double Bragg reflections. Scattering of X-ray and cold neutrons from cold worked or fatigued Cu and Al. 22 ref. (M22g, M22j, 3-68; Al, Cu)

435-M.* Small-Angle Scattering of X-Rays From Neutron Irradiated Copper. H. H. Atkinaon, R. E. Smallman and K. H. Westmacott. *Journal of Applied Physics*, v. 30, May 1959, p. 646-649.

Scattering from irradiated polycrystalline Cu. Interpretation in terms of double Bragg reflections and "true" small-angle scattering. Possible nature of irradiation damage. 6 ref. (M22g, M26s, 2-67; Cu)

436-M.* Study of X-Ray Scattering From Fatigued Metals. K. Thomas and A. Franks. *Journal of Applied Physics*, v. 30, May 1959, p. 649-655.

Examination of individual grains in fatigued polycrystalline Al and Cu specimens. Interpretation of low-angle patterns. 24 ref. (M26s, M22g, 3-66; Cu, Al)

437-M.* On the Mechanism of the Small Angle X-Rays Scattering From Cold Worked Metals. R. H. Neynaber, W. G. Brammer and W. W. Beeman. *Journal of Applied Physics*, v. 30, May 1959, p. 656-661.

Scattering from cold worked polycrystalline foils of Cu, Al and Ni. Temperature dependence of scattering. 7 ref. (M22g, 2-61, 3-68; Al, Cu, Ni, 4-56)

438-M.* Experiments on Double Bragg Reflections in Deformed and Undeformed Metal Foils. H. Fricke and V. Gerold. *Journal of Applied Physics*, v. 30, May 1959, p. 661-667.

X-ray scattering in the angular range from 1-50° in polycrystalline foils and single crystals of Al and Cu and in annealed Cu powder. 19 ref. (M22g, 3-68; Cu, Al, 14-61, 4-56)

439-M.* Small Angle X-Ray Scattering From Copper and Aluminum Under Cyclic Stress. J. C. Grosskreutz and F. R. Rollins. *Journal of Applied Physics*, v. 30, May 1959, p. 668-674.

Small-angle scattering at various stages of fatigue life, double Bragg scattering mechanism. Formation of subgrains. 15 ref. (M22g, Q7b, 3-66, Al, Cu)

440-M.* On the Kinetics of Quenched-In Lattice Vacancies in Platinum. G. L. Bacchella, E. Germagnoli and S. Granata. *Journal of Applied Physics*, v. 30, May 1959, p. 748-752.

Activation energy for formation and migration of vacancies calculated from quenching experiments and subsequent annealing behavior. 13 ref. (M26s, N1d, P15g, J23, J26; Pt)

441-M.* Magnetic Domain Observations by Electron Microscopy. M. E. Hale, H. W. Fuller and H. Rubinstein. *Journal of Applied Physics*, v. 30, May 1959, p. 789-791.

Domain patterns of thin Fe and Fe-Ni films observed by electron transmission microscopy. (M27g; Fe, Fe-b, *Ni*, 14-62)

442-M.* Morphology of the Pearlite Examined by the Direct Observation Method of Electron Microscopy. Zenji Nishiyama, Atsuo Kore'eda and Ken'ichi Shimizu. *Journal of Electronmicroscopy*, v. 7, annual edition, 1959, p. 41-47.

Pearlite in electrolytically polished high-carbon steel foil. 5 ref. (M27d, M27f, N8h; Cn-r)

443-M.* (French.) Dislocations and Strength of Metals and Alloys. Adrien Saulnier. *Revue de l'Aluminium*. v. 36, April 1959, p. 435-444.

Outline of theory of dislocations. Attempts to resolve the contradiction in that the strain necessary for plastic deformation of metals with regular lattice is about 10,000 times higher than the strain which can be determined experimentally, by assuming that metals are not formed by perfectly regular atomic arrangements but instead that they contain linear defects and dislocations. 4 ref. (M26b, M26s)

444-M.* (German.) Subgrain Boundary Dislocations of Iron-Chromium Alloys Made Visible by Ion Bombardment. Alois Masin and Vladimir Havel. *Acta Physica Academiae Scientiarum Hungaricae*, v. 9, no. 4, 1959, p. 471-474.

Treatment of an alloy with 24% Cr in a vacuum tube. The sample is fastened opposite an Al anode and a current of 3 Milliamp. and 1700-1900 volts is passed. 12 ref. (M20q, M26b, M27f; Fe-b, *Cr*)

445-M.* (German.) The Texture of Electrolytic Copper After Rolling at Low Temperatures. E. Schmid. *Osterreichische Akademie der Wissenschaften-Mathematisch-Naturwissenschaffliche Klasse-Anzeiger*, v. 95, no. 1-15. 1958, p. 117-119.

Texture patterns obtained after 95-98% deformation produced by rolling at -183° C. (M26c, F23, 2-63, Cu)

446-M. (French.) Field-Emission Microscopy. Rene Simon. *Metaux-Corrosion-Industries*, v. 34, Apr. 1959, p. 162-178.

Investigation of the secondary emission of a target bombarded with ions. (M21e)

447-M.* The Electron Structure of Metals. G. V. Raynor. Paper from "The Structure of Metals". Interscience Publishers, Inc., New York, 1959, p. 3-27.

Electronic structure theory, energy band system concepts and interpretation of metallic phenomena. 14 ref. (M25, P-general)

448-M.* Experimental Aspects of the Electron Theory of Metals. J. A. Catterall. Paper from "The Structure of Metals". Interscience Publishers, Inc., New York, 1959, p. 31-58.

Experimental techniques used in establishing energy range of outermost electrons, distribution of electrons over energy range, shape of Fermi surface, signs and numbers of charge carriers in electrical conduction and change of properties with alloying. 12 ref. (M25, P-general, P15)

449-M.* Dislocations in Metals. A. G. Quarrell. Paper from "The Structure of Metals". Interscience Publishers, Inc., New York, 1959, p. 61-83.

Basic concepts of dislocation theory and application to metallurgical problems. 3 ref. (M26b, Q24, Q22)

450-M.* Seeing Dislocations. J. Nutting. Paper from "The Structure of Metals". Interscience Publishers, Inc., New York, 1959, p. 87-113.

Decoration techniques, etch pit, X-ray diffraction and electron transmission microscope methods of revealing dislocations. 31 ref. (M26b, M20q, M22g, M22h)

451-M.* (German.) Determination by Residual Resistance Measurements of Lattice

Imperfections in Tungsten After Cold Deformation. Hermann Schultz. *Zeitschrift fur Naturforschung*, v. 142, April 1959, p. 361-373.

Recovery within the range of 300-400° C. is explained by the migration of imperfections. Decrease of dislocations occurs at 400-1100° C., while at higher temperatures, recrystallization takes place. 23 ref. (M26s, Q22n, N5, P15g, 3-68; W)

452-M.* Equilibrium Diagram, Activities and Densities in the Indium-Cadmium System. Th. Heumann and B. Predel. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 10 p.

Activities of In and Cd in their liquid binary alloys at 426 - 580° C. Partial and integral heat and entropy of mixing. Examination of equilibrium diagram using differential thermo-analysis, dilatometric measurement, metallographic and X-ray methods. 5 ref. (M24b, P12, P10a, P10d; Cd, In)

453-M.* The Non-Stoichiometry of Tantalum Carbide. D. A. Robins. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 10 p.

X-ray diffraction and chemical analysis of Ta carbide prepared by gaseous carburization of metal filaments or by reaction of Ta and C in molten bath of Fe or Al. Maximum percentage of carbon existing in carbide. Interpretation of lack of stoichiometric in terms of electronic structure. 14 ref. (M26r; M26q, Ta, *C, Fe, Al*, 14-68)

454-M.* Atomic Distribution in Liquid Bi, SnSb and InSb. H. Krebs, M. Haucke and H. Weyand. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds," v. 2. Her Majesty's Stationery Office, London, 1959, 12 p.

Calculation of atomic distribution in liquid Bi, SnSb and InSb from intensity of X-ray scattering. Structural interpretation in terms of system of resonance bonds of electrons in p state. 28 ref. (M25; Bi, Sb, Sn, In, 14-60)

455-M.* Significance of Non-Stoichiometry in Metal Compounds. J. A. Anderson. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 29 p.

Theoretical interpretations of non-stoichiometric phase formation in terms of thermodynamic models. Relation to defects in crystal lattice. 131 ref. (M26s, M26q, M24a, P12, P13; 14-68)

456-M.* Thermodynamical Calculation of Phase Diagrams. J. L. Meijering. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 20 p.

Expressions for calculation of binary miscibility gaps, solid-liquid equilibria, ferrite-austenite equilibria and ternary miscibility gaps from thermodynamic data. 47 ref. (M24, P12)

457-M.* (Ukrainian.) Crystal Structure of Barium Silicate and Cerium Germanium. E. T. Gladishevskii. *Dopovidi Akademii Nauk Ukrain'skoi R.S.R*, no. 3, 1959, p. 294-296.

Types of structure and lattice constants are given for $BaSi_2$ and $CeGe_2$. (M26q; Ba, Si, Ge, Ce)

458-M. (German.) Theoretical Development of the Cast Iron System From the Maurer Diagram to the Collaud Graph. Hans Jungbluth. *Neue Hutte*, v. 4, May 1959, p. 267-276.

Summary of cast iron constitution diagrams formulated by Maurer, Holtzhausen, Ulitzsch, Weichelt, Schwarz, Vaeth, Greiner, Klingenstein, Sipp, Laplanche, Maruyama, Appel, Heller and Collaud. (M24; CI)

459-M.* Sulphur Printing—A New Evaluation. S. Ramachandran and W. G. Renshaw. *Metal Progress*, v. 76, July 1959, p. 101-104.

Normally quite accurate in outlining sulphide distribution in steels, sulphur prints can be adversely affected by tiny electrical currents generated between inclusion and base metal. The misleading indications which occur are explained by corrosion theory. (M23, 9-69; ST)

460-M.* (German.) Constitution Diagram of the Indium-Cadmium System. Theo Heumann and Bruno Predel. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 309-314.

Observation of a peritectic reaction forming the phase $InCd_3$. In the presence of 4 to 5 at.% Cd, In changes from a tetragonal face-centered to a cubic face-centered lattice. (M24b; In, Cd)

461-M.* (German.) Textures of Hafnium After Rolling and Recrystallization. Herbert

Muller. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 346-350.

After cold rolling, a characteristic change in the (0001)-pole figure is observed. Recrystallization at 800 C. causes a mixed (0001) [1120] texture. 25 ref. (M26c, N5, 3-68; Hf)

462-M. (Czech.) Development of the Equilibrium Diagram Fe-Cr-C. Jaroslav Koutsky. *Hutnicke Listy*, v. 15, June 1959, p. 527-531.

Literature review. 22 ref. (M24c; Fe, Cr, C)

463-M. (German.) Preparation of Tin and Tin Alloys for Metallographic Investigation. B. L. Eyre and Bernhard Keysselitz. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 338-346.

11 ref. (M20; Sn)

464-M. (German.) S-Shaped Kink Bands in Deformed Metal Crystals. Pt. 2. Hartwig Muller. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 351-363.

A theory is developed explaining the formation of kink bands. 71 ref. (M26s)

465-M.* The Thorium-Aluminium System. J. R. Murray. *Institute of Metals, Journal*, v. 87, June 1959, p. 349-352.

Investigated by thermal, X-ray and metallographic methods. Six intermetallic compounds occur; Th_2Al, Th_3Al_2 and $ThAl_2$ are formed directly from the liquid, while ThAl, $ThAl_3$, and a compound of approximate composition Th_2Al_3 are formed by peritectic reactions. (M24b; Al, Th, 14-68)

466-M.* (Slovakian.) Effects of Cold Deformation on the Inner Structure of Austenitic Grain. Ivan Hrivnak. *Hutnicke Listy*, v. 15, June 1959, p. 507-511.

Micrographs showing block-shaped and other structures and resulting modifications during cold deformation. Values for elementary slip, 10 ref. (M26, Q24a; SS-e)

467-M. (Book.) Elements of X-Ray Diffraction. B. D. Cullity. 514 p. 1956. Addison-Wesley Publishing Co., Inc., Reading, Mass.

Theory, experimental methods and main applications of the technique. (M22g)

468-M. (Book.) The Structure of Metals, A Modern Conception. 118 p. 1959. Interscience Publishers, Inc. 250 Fifth Ave., New York 1. 25s.

Lectures delivered at Institution of Metallurgists refresher course, England, 1958. Papers abstracted separately. (M25, M26)

469-M. (Book.) Vector Space and Its Applications in Crystal-Structure Investigation. Martin J. Buerger. 347 p. 1959. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

(M26)

470-M. (Book.) The International Bibliography of Electron Microscopy. v. 1. 166 p. 1959. The New York Society of Electron Microscopists, 2 East 63 St., New York 21.

(M21e, 11-65)

471-M.* (French.) Interrelationship and Calculation of Thermodynamic Data. E. Bonnier, R. Caboz and M. De Fromont. *Bulletin de la Societe Chimique de France*, Mar. 1959, p. 537-543.

Thermodynamic properties of Au-Sn, Mg-Pb, Fe-Si and Mg-Sb binary systems can be determined if some properties are known. The relationship between phase diagrams and free enthalpy data are studied. 51 ref. (M24, P12; Au-b, Mg-b, Fe-b, *Pb, Si, Sb*)

472-M.* (French.) Structures Resulting From Deformation by Rolling or Tensile Deformation. Importance of Grain Boundaries and Subboundaries. Aurel Berghezan. *Comtes Rendus*, v. 248, June 22, 1959, p. 3560-3561.

After tensile deformation of an Al-Ag alloy, dislocations and slip planes, made visible by precipitation, appeared at the grain boundaries. Rolling causes dislocations which appear to be distributed equally over the grain. 7 ref. (M26b, Q24a; Al-b, *Ag*)

473-M.* Structure and Density of Iron Films Formed by Thermal Evaporation. O. S. Heavens, M. M. Brown and V. Hinton. *Vacuum*, v. 9, Mar. 1959, p. 17-20.

Method of evaporation employing a pendant drop heated by electron bombardment. Mass of Fe films determined by microchemical colorimetric techniques. Electron diffraction examination shows films to be in a crystallographically ordered state and electron micrographs show no voids or grain boundaries. 8 ref. (M26, P10a, 2-62; Fe, 14-62)

474-M.* (English.) Charts for Determination of Crystal Orientation by Surface Traces in Cubic Crystals. Sakae Takeuchi, Toshio Honma and Susumu Ikeda. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Apr. 1959, p. 81-93.

Method for determination of orientations of microscopic grains in polycrystalline specimens from angles between surface traces in (111) or (100) planes such as slip lines, annealing twins or etch pits. 4 ref. (M26c)

475-M.* (Chinese.) Formation of Cubic Texture in Nickel-Iron Alloy. L. C. Tai, S. Y. Change and R. P. Liu. *Acta Metallurgia Sinica*, v. 4, Mar. 1959, p. 52-59.

Rolling and recrystallization textures in a 50% Ni-Fe alloy are studied by the X-ray pole figure method. Formation of the cubic texture was found to begin at 600° C., becoming intensified at higher temperatures. 11 ref. (M26c; Ni-b, *Fe*)

476-M.* Retained Austenite by X-Rays. Robert E. Ogilvie. *Norelco Reporter*, v. 6, May-June 1959, p. 60-61.

X-ray spectrometer method of measuring the amount of retained austenite. Diffraction patterns are presented for quenched 52100 steel. (M22g, N8n; AY)

477-M.* Microradiographic Techniques as Applied to the Study of Metals and Ores. E. Niskanen. *Norelco Reporter*, v. 6, May-June 1959, p. 70-71.

Microradiograph of an Al alloy containing 2% Ni, 0.5% Fe and 0.2% Si. The radiographic exposure was made with unfiltered radiation from a Cu anode diffraction tube operated at 30 kv. and 20 ma. Microradiograph of an oolitic iron ore showing the concentric shells of varying iron concentration with the ooliths. (M23n; Al-b, *Ni, Fe, Si*, Fe, RM-n)

478-M.* Recent Developments in the Field of Silicides and Borides of the High-Melting-Point Transition Metals. R. Kieffer and F. Benesovsky. *Powder Metallurgy*, no. 1-2, 1958, p. 145-171.

Composition, crystal structure and equilibrium diagrams of silicides and borides of Ti, Zr, Hf, V, Cb, Ta, Cr, Mo, and W. 75 ref. (M26; Hf, Cb, Cr, Mo, Si, Ta, Ti, V, W, Zr, 14-68, 6-70)

479-M.* Bonding in Carbides, Silicides and Borides. D. A. Robins. *Powder Metallurgy*, no. 1-2, 1958, p. 172-188.

Bonding in carbides, silicides and borides of Ti, Zr, Hf, V, Cb, Ta, Mo and W explained in terms of a relationship between coordination of metal atoms and number of bonding electrons per atom. 18 ref. (M25h, M26r; Ti, Zr, Hf, V, Cb, Ta, Mo, W, C, B, Si, 14-68)

480-M.* Equilibrium, Diffusion and Imperfections in Semiconductors. J. N. Hobstetter. Paper from "Progress in Metal Physics". v. 7. Pergamon Press Inc., New York, 1958, p. 1-63.

Effects of vacancies on electrical properties and solubility of solutes. The precipitation is influenced by dislocations. 88 ref. (M26b, P15g, N7b; EG-j)

481-M. Annealing Effects in Thorium-Uranium Alloys. G. G. Bentle. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-2969, June 1, 1959, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Microstructural changes were studied metallographically on long-time annealing of unirradiated Th alloys containing up to 10 wt.% U. These changes, an agglomeration of uranium phase and grain growth, have little effect on the irradiation stability. 12 ref. (M27, N3, 2-64, 2-67; Ph-b, *U*)

482-M.* (English.) Structure and Low-Temperature Annealing Effect in Cold-Rolled Alpha Brass. Pt. 2. Structures Cold-Rolled and Annealed at Low Temperatures. Osamu Izumi. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Apr. 1959, p. 131-144.

X-ray and microscopic observation of structural changes in 70-30 brass due to cold rolling with reductions of 10-90% and annealing at 150-450° C. for various time intervals. Influence of grain size. 6 ref. (M27d, N5, J23, F23, 1-67, 2-59; Cu-n)

483-M.* (German.) Properties of Unalloyed and Alloyed Zirconium and Its Processing. K. Anderko and E. G. Hess. *Metall*, v. 13, July 1959, p. 638-643.

Crystal structure and degree of scaling in air, oxygen or nitrogen as affected by temperature. Procedures forging, extruding, cold rolling and pilgering. 11 ref. (M26, R2q, F-general, 2-61; Zr)

484-M.* (Italian.) Constitution of Ternary Iron Alloys Containing Phosphorus or Sulphur. R. Vogel. *Metallurgia Italiana*, v. 51, May 1959, p. 173-178.

Compilation of constitution diagrams. Effect of sulphur and phosphorus on the equilibrium. (M24c, 2-60; Fe-b, *S, P*)

485-M.* Magnetic Annealing in Permivar. Pt. 1. Structural Origin. R. D. Heidenreich, E. A. Nesbitt and R. D. Burbank. *Journal of Applied Physics*, v. 30, July 1959, p. 995-1000.

Electron diffraction investigation of the structure of soft magnetic materials which exhibit magnetic annealing. Heat treatment in a magnetic field depends upon the oxygen content present as an impurity and is associated with distinct diffraction phenomena. Structural model is based on interpretation of diffraction results, magnetic properties and oxygen content. (M26, P16, J23, 2-60; Ni-b, *Fe, Co*, SGA-m)

486-M.* Interstitial Structures. Roland Kiessling. *Powder Metallurgy*, no. 3, 1959, p. 177-180.

Behavior of various interstitial atoms. Structure of interstitital compounds formed with transition metals. 5 ref. (M26q, M26r)

487-M.* (German.) Iron-Carbon Casting Alloys. Adalbert Wittmoser. *VDI-Zeitschrift*, v. 101, July 11, 1959, p. 817-823.

Composition phases and crystal structures of materials for iron and steel castings. 27 ref. (M26, M24, 2-60; Fe-b, *C*, CI, ST, 5)

488-M. Transformation Temperatures and Structures in Uranium-Fissium Alloys. M. V. Nevitt and S. T. Zegler. *Journal of Nuclear Materials*, v. 1, Apr. 1959, p. 6-12.

The constitution diagram of uranium with its fission products is studied to reveal the solid-state transformation temperatures and the phase constitution of various U-Zr-Cb-Mo-Ru-Rh-Pd alloys. 9 ref. (M24d, T11g; U-b, *Zr, Cb, Mo, Ru, Rh, Pd*)

489-M.* (French.) Dilatometry of Gallium at Atmospheric Pressure. Andre Defrain and Israel Epelboin. *Comptes Rendus*, v. 249, July 6, 1959, p. 50-52.

Confirmation of the presence of a solid phase that is unstable at atmospheric pressure and melts at $-17 \pm 1°$ C. (M23b, M24; Ga)

490-M.* (Russian.) X-Ray Band Width of Metals Deformed at Various Temperatures. N. N. Davidenkov and B. I. Smirnova. *Izvestiya Akademii Nauk, Seriya Fizicheskaya*, v. 23, May 1959, p. 624-628.

Experimental deformations at various temperatures showed that the width of the X-ray band is not a well-defined function of the temperature and may be dependent on the temperature of previous heat treatments. 8 ref. (M26, 3-68, 2-61, 2-64)

491-M.* (Russian.) The Palladium-Ruthenium System. A. A. Rudnitskii and R. S. Polyakova. *Zhurnal Neorganicheskoi Khimii*, v. 4, June 1959, p. 1404-1414.

Phase diagram of hardened and tempered Pd-Ru alloys constructed by means of X-ray phase analysis, absolute thermo-emf., thermal analysis, hardness and electric resistance measurements. 5 ref. (M24n, Pd-b, *Ru*)

492-M.* (Russian.) The Zirconium Corner in the Zirconium-Tin-Molybdenum System. O. S. Ivanov and A. T. Semenchenkov. *Zhurnal Neorganicheskoi Khimii*, v. 4, June 1959, p. 1420-1427.

The phase diagram of Zr with total amounts of Mo and Sn up to 4 at.% showed alpha and beta solid solutions with intermetallic phases of $ZrMo_2$ and Zr_4Sn. The horizontal eutectic line corresponding to the transformation beta $\rightleftharpoons$ alpha + $ZrMo_2$ is located at 680° C. 7 ref. (M24c, M26q; Zr-b, *Mo, Sn, Sb, Mg*, 14-67, 14-68)

493-M.* (Russian.) Aluminum-Yttrium Diagram. E. M. Savitskii, V. F. Terekhonova and V. A. Zikalov. *Zhurnal Neorganicheskoi Khimii*, v. 4, June 1959, p. 1460-1462.

The phase diagram of an Al alloy with 60% yttrium is a complex system in which the region of the eutectic alloy is stretched up to 50% yttrium. In the hypereutectic alloys, containing 13.5 to 42% by weight of yttrium, crystals of chemical compounds appear and the number of these grows as the amount of yttrium is increased. (M24b; Al-b, *Y*)

494-M.* (Russian.) Phase Diagram of Columbium Alloys With Lanthanum and Cerium. E. M. Savitskii, V. F. Terekhova and I. B. Burov. *Zhurnal Neorganicheskoi Khimii*, v. 4, June 1959, p. 1462-1463.

La and Ce with Cb form a diagram with a wide range of immiscibility in liquid and solid solutions. Mono-eutectic horizonal

with Ce is at 2870 ± 20° C., and Cb with La is at 2400 ± 20° C. (M24c; Cb-b, *La, Ce*)

495-M.* (Ukrainian.) Vacancies in Metals and Alloys. S. D. Gertsriken and B. F. Slyusar. *Ukrainskii Fizicheskii Zhurnal*, v. 4, Feb. 1959, p. 137-149.

Formation of vacancies in pure Au, Al, Zn, Sb, Pb and Sn by measuring the increase of electrical resistance over a wide range of temperatures and the changes in the relative elongation caused by temperature variations. 33 ref. (M26s, 2-61; Au, Al, Zn, Sb, Pb, Sn)

496-M.* (Ukrainian.) Determination of Dislocation Density in Strained Metals From Microhardness Measurements. S. D. Hertzricken and N. N. Novikov. *Ukrainskii Fizicheskii Zhurnal*, v. 4, Feb. 1959, p. 247-252.

From the relationship between the interaction of dislocation stress and the tensile strength of a metal, the dislocation density can be computed for a given deformation. Dislocation densities in Al, Cu, Ag and Ni at various degrees of deformation caused by torsion. 17 ref. (M26h, Q29q, 3-66; Al, Cu, Ag, Ni)

497-M. (Czech.) Methods of Stereometric Metallography. Jiri Likes. *Hutnicke Listy*, v. 14, July 1959, p. 573-580.

15 ref. (m23c)

498-M. (Czech.) Metallography of Zirconium and Titanium. Frantisek Plzak and Helena Hubackova. *Hutnicke Listy*, v. 14, July 1959, p. 580-583.

Specimen preparation, chemical polishing, etching and coloring. 6 ref. (M20; Zr, Ti)

499-M. (Czech.) X-Ray Testing of Metals at Elevated Temperatures. Miroslav Cermak. Hutnicke Listy, v. 14, July 1959, p. 593-598.

Equipment and methods. (M22g, 2-62)

500-M.* Equilibrium Shape of an Edge-Dislocation Loop in the Presence of a Supersaturation of Vacancies. G. Saada. *Acta Metallurgica*, v. 7, June 1959, p. 367-373.

Dislocations climb out of the slip plane with the aid of jogs. With reasonable energies of formation and interaction of these jogs, the shape of the loops depends strongly on the crystalline structure at normal temperatures. At very high temperatures the shape of the loop approaches that of a circle. 6 ref. (M26b, M26s)

501-M.* Appearance of Dislocations in Metal Crystals on Evaporation: Twinning Dislocations and Their Relation to Annealing Twins in Copper. E. Votava and A. Berghezan. *Acta Metallurgica*, v. 7, June 1959, p. 392-398.

Evaporation of Cu surfaces produces a step structure which is related to the orientation of the crystals. On noncoherent twin boundaries this step structure has a characteristic aspect in which two cases can be distinguished by simple or multiple evaporation spirals, or evaporation channels. 35 ref. (M26b, N16n; Cu)

502-M.* Observations on Regular Arrays of Etch Pits in a Titanium-10% Molybdenum Alloy. T. H. Schofield and A. E. Bacon. *Acta Metallurgica*, v. 7, June 1959, p. 403-406.

Regular arrays of etch pits observed in rapidly cooled alloys are considered to indicate the sites of unstable groups of dislocations which collapse, at slower rates of cooling, into a more stable network of sub-grain boundaries. 6 ref. (M26b; Ti-b, *Mo*)

503-M.* (German.) Metallurgical Considerations of Steels Used for Weldments and Effect of Alloy Additions. K. L. Zeyen. *Industrieblatt*, v. 59, June 1959, p. 227-238.

Changes in microstructure caused by welding and their influence on mechanical properties. Composition and properties of new-type construction steels and welding electrodes. 30 ref. (M27, Q-general, W29h, 2-60; ST, 7-51, SGB-a, SGB-s)

504-M.* (Slovakian.) Effect of Cold Deformation on the Block Structure of 99.999% Aluminum. Dasa Hrivnakova. *Hutnicke Listy*, v. 14, July 1959, p. 598-602.

In regions of increased flow, block fragmentation is observed in electron micrographs. Slight deformation causes changes in shape and angular disorientation of blocks. After recrystallization, fragmentation along the grain boundaries appears. 8 ref. (M26n, 3-68, N5; Al)

505-M. (French.) Field Emission Microscope. Rene Simon. *Metaux Corrosion Industries*, v. 34, May 1959, p. 204-219.

Secondary emission of a target under ion bombardment. (M21e)

506-M.* Ternary Carbides of the Transition Metals Nickel, Cobalt, Iron, Manganese With Zinc and Tin. H. H. Stadelmaier

and L. J. Huetter. *Acta Metallurgica*, v. 7, June 1959, p. 415-419.

In the ternary systems Co-Sn-C, Ni-Zn-C, Co-Zn-C and Fe-Zn-C, double carbides were found that correspond to the formula T_3BC_2 where T is the transition metal. These compounds have an ordered fcc. structure. 17 ref. (M24c; Co, Ni, Fe, Mn, *Zn*, *Sn*)

507-M. The Role of Vacancies and Dislocations in the Nucleation and Growth of Gas Bubbles in Irradiated Fissile Material. G. W. Greenwood, A. J. E. Foreman and D. E. Rimmer. *United Kingdom Atomic Energy Authority*, AERE-R 2863, 1959, 43 p.

Bubbles nucleate either homogeneously with a spacing less than a micron or on any suitable nucleation sites that may exist on this or a finer scale. The bubbles when once nucleated grow by a vacancy diffusion mechanism, the vacancies being created by the fission process or possibly diffusing from the grain boundaries in very small grains. 38 ref. (M26b, N1, 2-67, P10d; U)

508-M. Tabulation, Bibliography and Structure of Binary Intermetallic Compounds. Pt. 5. Compounds of Aluminum and Indium. A. E. Ray, J. A. Kingston and J. F. Smith. Ames Laboratory. *U. S. Atomic Energy Commission*, ISC-1155, Apr. 23, 1959, 41 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Crystal class, lattice parameters, structure and general observations of several hundred compounds. (M26q, 14-68)

509-M.* (French.) Statistics and Grain Measurements. A. H. Bazin. *Cuivre Laitons Alliages*, no. 49, May-June 1959, p. 33-41.

Application of statistical methods in measuring grain size and determination of homogeneity and heterogeneity of Cu, brass and Al crystal structures. (M27c, M26, S12; Cu, Al, Cu-n)

510-M. (German.) Line Broadening in Stress Measurement Radiography. Ulrich Wolfstieg. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 447-450. (M22g, Q25)

511-M. (German.) Use of a New Electric Counting Instrument in the Determination of Microscopic Grain Size. Gunther Schneider and Walter Laux. *Freiberger Forschungshefte*, B39, 1959, p. 1-52.

Description of the Eltinor electric counting instrument, used in conjunction with a microscope. 14 ref. (M27c, 1-53)

512-M. (Russian.) A New Type X-Ray Spectrograph. Ivan Solc. *Czechoslovak Journal of Physics*, v. 9, no. 3, 1959, p. 366-373.

4 ref. (M23n, 1-53)

513-M.* Effects of Irradiation Upon Metals. Frederick Seitz. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 354-367.

Generation and properties of point imperfections (vacant lattice sites and imperfections) in the noble metals, particularly Cu, which is gained from the studies of effects produced by bombardment. Interstitial atoms migrate at temperatures well below that of liquid nitrogen with activation energies near 0.1 ev. Lattice vacancies can be generated with less energy under equilibrium conditions. 32 ref. (M26s, 2-67; Cu)

514-M.* Description of the Sigma Phase as a Structure With Sphere Packing. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 408-411.

Investigation as to whether a model of sphere packing permits the computation of the lattice parameters; their variation with concentration in various sigma phases shows that it does, except in sigma phases containing Si. Observations indicate that a particular role is played by the "E-atoms" in the lattice. 15 ref. (M26)

515-M.* The Constitution of Aluminum-Rich Alloys of the Aluminum-Chromium-Manganese System. J. W. H. Clare. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 429-433.

Equilibrium isotherm at 550° C. for ternary alloys rich in Al containing 0 to 15% Cr and 0 to 20% Mn. Phases encountered are: Al solid solution; theta, eta; a stable ternary compound G; $MnAl_6$. Experiments limited the composition of the G phase at 550° C. and established that the G phase is not stable above 590 $\pm$ 1° C. 5 ref. (M24c; Al, Cr, Mn)

516-M. Aluminum-Silicon Eutectic. R. A. Meussner. *U.S. Naval Research Laboratory*, NRL Report 5331, June 26, 1959, 10 p.

A new eutectic composition of 12.7% Si at 577.2° C. is determined with the

aid of phase transformation studies, quenching experiments and equilibration processes. 8 ref. (M24b; Al-b, *Si*)

517-M.* (German.) The Ternary System Iron-Molybdenum-Oxygen. Willi Juger, Alfred Rahmel and Klaus Becker. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 435-439.

Radiographic proof for the presence of the Fe_2MoO_4, $Fe_2(MoO_4)_3$, $FeMoO_4$ and $Fe_4Mo_5O_{16}$ phases. Determination of their respective boiling points. 22 ref. (M24c, P12p; Fe-b, *Mo, O*)

518-M.* The Observation of Dislocations and Other Imperfections by X-Ray Extinction Contrast. J. B. Newkirk. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 483-497.

The Berg-Barrett method for making X-ray diffraction micrographs is capable of revealing individual undecorated dislocations in crystals of Si and Li fluoride. Not only can the positions of the dislocations be seen with respect to the topography of the crystal, but also the direction of their Burgers vector can be determined by a relatively simple procedure. 26 ref. (M26b, M22g; Si)

519-M.* Quantitative Deformation Textures of Aluminum, Copper, Silver, and Iron Wires. August Freda and B. D. Cullity. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 530-535.

Quantitative measurements of the skin testure of Al and the inside texture of Al, Cu, Ag, and Fe by a new diffractometer method. Double <111> + <100> textures were observed for the three fcc. metals, and a single <110> texture for Fe. The results on Cu show that the starting texture can control the deformation texture, and that a strong <100> texture can be obtained by starting with a texture having a strong <100> component. 18 ref. (M26c, 3-68; Al, Cu, Ag, Fe)

520-M.* The Crystallographic Angles of Indium. E. A. Cisney. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 538-539.

Formula for calculating the crystallographic angles of a tetragonal lattice. Angles between the crystallographic planes have been calculated for In. (M26; In)

521-M.* (Russian.) Phase Structure of Chromium-Nickel Steels With Solution Strengthening. K. P. Sorokina, N. I. Blok and N. F. Lashko. *Zavodskaya Laboratoriya*, v. 25, June 1959, p. 659-661.

The phase structure of Cr-Ni Steel forms a six-component system consisting of a strengthening phase beta-Ni_3Ti, two primary phases TiC and TiB_2, two phases Fe_2Ti and alpha-Ni_3Ti and a solid solution. (M24b, N7; SS, *Cr, Ni, B, Ni, Ti*)

522-M.* (Russian.) Split Film Etching of Binary and Ternary Eutectics in Cast Iron. L. P. Zyaitseva and N. P. Simasheva. *Zavodskaya Laboratoriya*, v. 25, June 1959, p. 705-707.

Chemical and electrochemical experiments with etchings to attain a difference in the film appearance of binary and ternary phosphides in the Fe-P, Fe-C and Fe-C-P systems, showed that alternate electrochemical etching in a neutral solution of $K_3Fe(CN)_6$ (potassium ferrocyanide) followed by etching in an alkaline solution of $K_3Fe(CN)_6$ produced best results. (M20q; CI-p)

523-M. (French.) Direct Testing of Thin Metal Foils Under the Electron Microscope. Claude Beauvais. *Metaux Corrosion-Industries*, v. 34, June 1959, p. 247-257.

Specimen preparation. (M21, M20)

524-M. (Book—German.) The Bases of Metal Microscopy. Wolfgang O. Oettel. 216 p. 1959. Akademische Verlagsgesellschaft Geest & Portig K-G., Leipzig, Germany. D.M. 27.

General information on optical instruments. Microscopic techniques using incident light. Light sources, filtered light, polarized light and invisible light. Equipment and apparatus. (M21, X4a)

525-M. (Translation—BWRA.) Determination by the Magnetic Method of the Alpha-Phase Content of Austenitic Weld Metal. N. I. Kopersak. *Avtomaticheskaya Svarka*, v. 66, Jan. 1959, p. 52-58.

Procedure for magnetic determination of alpha-phase in austenitic stainless steel welds. Empirical equation for calculating the saturation magnetization of complex alloy ferrite taking into account influence of alloy elements. 5 ref. (M23a, P16r; SS-e, 7-51)

526-M.* An Investigation on the Titanium-Iron-Carbon System. Yotaro Murakami, Hirozo Kimura and Yoshio Nishimura. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 7-21.

Microscopic examination, melting point determination and X-ray analysis of phase relationships; phase regions of TiFe and $TiFe_2$ in TiFe binary systems. 13 ref. (M24b, M24c, M26; Ti-b, Fe-b, C, 14-68)

527-M.* Electron Diffraction Study of Oxide Films Formed on Molten Alloys. Pt. 1. Lead-Tin, Lead-Zinc, Lead-Cadmium, Lead-Antimony, and Lead-Bismuth Alloys. Goro Shimaoka. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 72.

Structure and orientation of oxidation products formed at 340 to 600° C. (M22h, M26c, R1h, 2-62; Pb-b, *Sn, Zn, Cd, Sb, Bi*)

528-M.* Electron Diffraction Study of Oxide Films Formed on Molten Alloys. Pt. 2. Cadmium-Zinc and Cadmium-Tin Alloys. Goro Shimaoka. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 72.

Texture and orientation of oxide films formed in air at 280 to 500° C. (M22h, M26c, R1h, 2-62; Cd-b, *Zn, Sn*)

529-M.* (Italian.) Microradiographs of Aluminum-Uranium Alloys. D. Gualandi, M. Paganelli and G. Schileo. *Alluminio*, v. 28, no. 7-8, 1959, p. 331-336.

Microradiographic investigation of structures after casting, and after rolling followed by heat treatment. (M23n, N5, M27d, 3-68, 2-64; Al-b, U, *Li*)

530-M. A Study of the Mode of Omega Precipitation From a Ti-13Mo Crystal by Use of an X-Ray Precession Camera. S. A. Spachner and W. Rostoker. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 463-465.

Precipitate platelets exist which possess a variety of orientations with respect to each other which can be represented as a pole figure symmetric about the [110] zone axis in the parent crystal. (M26, N7, M22g; Ti-b, *Mo*, 14-61)

531-M. Transmission Quantitative Metallography. John W. Cahn and Jack Nutting. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 526-528.

The number of particles per unit volume, the volume fraction and the surface-to-volume ratio of a second phase are related to quantities obtained in the examination of micrographic specimens by transmission. For convex particles of any shape the relations hold true for slice thicknesses which vary from infinitesimally thin to such thickness where overlap of particles on the projected plane becomes important. (M21e)

532-M.* (French.) Mottled Structure of Vapor Deposits on a (111) Face of a Copper Single Crystal. Lucien Lefourcade, Paul Larroque and Nguyen Quat Ti. *Comptes Rendus*, v. 249, July 20, 1959, p. 390-391.

Effect of the angle of vapor jet with the surface, on the structure of Au deposited on the surface. (M26, L25; Cu, 14-61, *Au*)

533-M.* (French.) Orientation of a Germanium Layer on a Calcium Fluoride Single Crystal. Jean Marucchi and Nicolas Nifontoff. *Comptes Rendus*, v. 249, July 20, 1959, p. 435-437.

Vapor deposition of Ge on a cleavage plane of a CaF_2 crystal. Structure of the Ge layer is influenced by the direction of vapor jet with reference to the crystal. 4 ref. (M26, L25; Ge)

534-M.* (French.) Direct Observation of Thin Metal and Alloy Foil With the Electron Microscope. Claude Beauvais. *Metaux Corrosion-Industries*, no. 407-408, July-Aug. 1959, p. 291-301.

Micrographs of 18-8 type stainless steel, carbon steel, aluminum bronze, Cu-Be and Ni-Cr-Co alloys and duralumin in the normalized, hardened and tempered conditions. 12 ref. (M21e, N-general, M27d, 2-64; Cu-b, Cu-s, *Al, Be*, Ni-b, *Cr, Co*, Al-b, SS, CN, 4-56)

535-M. Preparing Foil for Micro-Examination. Dorothy J. Rahn. *Metal Progress*, v. 76, Aug. 1959, p. 109-111.

The problem was to prepare cross sections of foil less than 1/16 in. thick for metallographic study. The procedure is based on a mounting medium which cures at room temperature and on careful control of polishing. (M20; 4-56)

536-M. Mounting Thin Tungsten Wire and Sheet. U. E. Wolff and L. B. Fradette. *Metal Progress*, v. 76, Aug. 1959, p. 111-112.

Fusing tungsten wire in glass prior to mounting improves the flatness of transverse and longitudinal samples for metallographic study. (M20; W, 4-53, 4-61)

537-M.* (German.) Constitution of the Aluminum-Manganese-Silicon Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 11 p.

$MnAl_4$ and $MnAl_6$ phases. Existence of a ternary metallide ("T") with 40% Mn

and 15% Si. Primary field of the Al crystals from 0-11% Si. From the Mn side the solubility of Al-Si melts increases from 1% at 577° C. to 2% at 660° C. Vertical section of Al-Mn-Si alloys with 1.5% Mn, 6% Mn, 1% Si and 4% Si. Equilibrium diagram of the Al-Mn-Si alloy at 460° C. (M24c; Al, Mn, Si)

538-M.* (German.) Constitution of the Aluminum-Magnesium-Silicon Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 4 p.

The binary Mg-Si system is characterized by the dominant position of the stable and high-melting Mg_2Si phase. Solubility of Mg_2Si with increasing temperatures; phase equilibrium of the Al-Mg-Si alloy at room temperature. (M24c; Al, Mg, Si)

539-M.* (German.) Constitution of the Aluminum-Manganese-Zinc Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 4 p.

In the crystalline stage two ternary equilibrium phases exist between $MnAl_6$ and the Zn-containing crystals. Mn is dissolved in Al crystals up to 0.4%. With increments up to 2% Zn, the Mn solubility is decreased to 0.1%. The existence of the $MnAl_4$ phase on the Al side of the diagramatical section cannot be explained by heterogenic equilibrium laws. (M24c; Al, Mn, Zn)

540-M.* (German.) Constitution of the Aluminum-Copper-Zinc Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 17 p.

Liquidus areas of the system with 40 to 100% Cu. Equilibrium diagrams at 200, 300, 370 and 385° C. Isotherms at solidification. Section diagrams at constant Al concentration from 300 to 1000° C. Vertical section for constant Zn concentrations. Solubility limits at 800, 600, 475 and 410° C. (M24c; Al, Cu, Zn)

541-M.* (German.) Constitution of the Aluminum-Iron-Zinc Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 2 p.

In the vicinity of the binary eutectic point of Al-Zn at 380° C., the Al_3Fe phase is present. The eutectic ternary decomposition is reached only later at 363° C. The Fe present exists in the Al_3Fe form. The primary Al_3Fe crystals are of a rhombic nature. (M24c; Al, Fe, Zn)

542-M.* (German.) Constitution of the Aluminum-Iron-Manganese Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 6 p.

In the Al-Fe-Mn ternary system the binary system of Fe with an open gamma field is combined with a second binary system in a closed gamma field. A closed binary space system is thus created. The ternary equilibrium between the melt, the alpha-Al-Fe crystal and the gamma-Mn-Fe crystal develops with the addition of Al to a higher Mn concentration and decreases at the Mn-Al side of the space diagram. The melting curve cannot be positively indicated. (M24c; Al, Fe, Mn)

543-M.* (German.) Constitution of the Aluminum-Magnesium-Manganese Ternary System. W. Guertler. *Konstitution der Ternaren Metallischen Systeme*, no. 7, 1959, 9 p.

Positions of the peritectic space curves between liquidus areas in the Al-Mg-Mn system. Semi-binary sections in the Al corner between the $Al\text{-}MgAl_3\text{-}MnAl_4$ and $MnAl_6$ corners. Solubility of Mn in liquid Mn is decreased by Al additions. The solidification temperature of the alloy in the Mg corner decreases in proportion to increasing Al content. (M24c; Al, Mg, Mn)

544-M.* Metals and Alloys of the Platinum Group. Ernst Raub. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 3-18.

Atomic and crystal structures; transformation behavior. 35 ref. (M25, M26, N-general; EG-c)

545-M.* Tungsten Alloys of High Melting Point. R. Kieffer, K. Sedlatschek and H. Braun. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 19-33.

Atomic and crystal structures, mechanical and physical properties of alloys of W with V, Cb and Ta. 20 ref. (M25, M26, Q-general, P-general; W-b, *V, Cb Ta*)

546-M.* Factors Affecting the Grain Structure of As-Cast Molybdenum Ingots. A. R. Moss. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 34-41.

Effect of thermal factors such as arc voltage and current, arc length, geometric position of the arc in relation to the mold walls, partition of the arc's energy at the positive and negative poles and heat losses; electromagnetic stirring; physical factors; ingotism and undercooling. 6 ref. (M27c, C5h; Mo, 5-59)

547-M.* An Examination of Part of the Titanium-Carbon System. R. L. Bickerdike

and G. Hughes. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 42-49.

Data on the liquidus at the Ti-rich end of the phase diagram up to 1763° C. The eutectic exists at 4.39 at.% C. and 1645 ± 8° C. The solubility of carbon in beta-titanium at the eutectic temperature and at 1558° C. is 0.55 at.%. 4 ref. (M24b; Ti-b, *C*)

548-M.* Techniques Used in Alloy Investigations at Temperatures Above 1200° C. J. R. Murray and G. K. Williamson. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 73-76.

Problems related to U and Th and their alloys. Data on thermal analysis and use of the arc furnace for casting various shapes and determination of melting points. (M23r, 2-62, C5h, P12n; U, Th)

549-M. (Russian.) Phase Structure of Cobalt-Boron Alloys. P. T. Kolomytsev. *Doklady Akademii Nauk, SSSR*, v. 125, June 1959, p. 1247-1250.

Cobalt-boron system has four compounds: Co_3B; Co_2B, CoB and eta-phase in the form of CoB_2. Phase structure of alloys with 4 to 5.76% boron is a eutectic alpha + Co_3B and an excess of Co_3B crystals. 7 ref. (M26q, M24b; Co-b, *B*)

550-M.* (German.) Effect of Chromium Carbide Additions to Sintered Hard Metals. Vladimir Dufek. *Neue Hutte*, v. 4, July 1959, p. 425-428.

Effects on structure, bend strength, hardness, wear resistance, corrosion resistance, sintering properties, specific weight and resistivity. (M26r, Q5g, Q29n, Q9n, R1h, P10a, P15g, 2-60; 6-70)

551-M.* (Russian.) The Formation of Sigma Phase in the Rhenium-Manganese and Rhenium-Iron Systems. Ch. V. Kopetskii, N. Ageev, V. Sh. Shekhtova and E. M. Savitskii. *Doklady Akademii Nauk SSSR*, v. 125, Jan. 1959, p. 87-88.

X-ray analysis of a Re-Fe alloy (25% Fe) annealed at 1500° C. for 6 hr. reveals that the epsilon phase Re-Fe has a crystal structure similar to the sigma phase. Re-Mn containing 21.3% Mn, after annealing in vacuum for 360 hr. at 1000° C., has a crystal lattice of the sigma phase. 4 ref. (M26, M24b; Re-b, *Mn, Fe*)

552-M.* (Russian.) Stability of Beta Phase in Titanium-Iron and Titanium-Nickel Systems. N. V. Ageev and L. A. Petrova. *Zhurnal Neorganicheskoi Khimii*, v. 4, May 1959, p. 1092-1099.

Metastable diagrams of phase composition of Ti-Fe and Ti-Ni alloys established by subjecting them to a tempering temperature of 700-1000° C. Beta phase is stable at +20° C. for 100 hr. and at −196° C. for 2016 hr. Beta solid solution of both alloys disintegrates at 100-400° C. with precipitation of omega phase, which is transformed into alpha phase. 6 ref. (M24b, N6p; Ti-b, *Fe, Ni*)

553-M.* (Russian.) Stabilizing Conditions for Beta Phase in Titanium-Molybdenum-Manganese Alloys. N. V. Ageev and Z. M. Smirnova. *Zhurnal Neorganicheskoi Khimii*, v. 4, May 1959, p. 1100-1105.

Phase composition of Ti-Mo-Mn ternary alloys, tempered at 700-1000° C. Stability of metastable beta phase is achieved by heating to 100-600° C. With 17.87% Mn and 4.56% Mo heated at 100-500° C. beta phase of the alloy is retained for 100 hr. With other amounts of Mn and Mo, beta phase is unstable and decomposes during heating into beta→beta + omega→beta + alpha. 5 ref. (M24c, N6p, 2-60; Ti-b, *Mo, Mn*)

554-M.* (Russian.) Investigation of the Antimony-Aluminum Tellurium System. M. S. Mirgolovskaya and E. V. Skudnova. *Zhurnal Neorganicheskoi Khimii*, v. 4, May 1959, p. 1113-1119.

By establishing a relationship between temperature and electroconductivity the solidus line was constructed for a section of AlSb-Al_2Te_3. The solubility limit of Al_2Te_3 in AlSb was established by X-ray analysis and this showed that the solubility of Al_2Te_3 in AlSb is a heterovalent displacement. 11 ref. (M24d; Al-b, *Sb, Te*)

555-M. (Russian.) The Structure of Liquid Gold-Tin Alloy. A. S. Lashko. *Doklady Akademii Nauk SSSR*, v. 125, Jan. 1959, p. 126-128.

There is no interdispersing of atoms during melting. However, one half of the atoms near the melting temperature retain the short-range order of the same type as is found in the crystalline state. 5 ref. (M25n, N10; Au-b, *Sn*, 14-60)

556-M. (Russian.) Continuous Metalloid Solid Solutions in the Ternary System Cobalt-Nickel-Boron. I. I. Kornilov and P. T. Kolomultsev. *Doklady Akademii Nauk SSSR*, v. 125, Feb. 1959, p. 325-326.

With the aid of metallographic and X-ray structure analysis of the system Co-Ni-B the existence was established of

continuous solid solutions between the low borides Co_3B and Ni_3B and between Co_2B and Ni_2B. 8 ref. (M27b, M24c; Co-b, *Ni, B*)

557-M. (Russian.) The Selective Penetration of Elements From the Liquid Phase Into Crevices. V. A. Movchan and I. Ya. Dzykovich. *Doklady Akademii Nauk SSSR*, v. 125, Feb. 1959, p. 354-355.

Investigation to determine the penetration of a liquid alloy into crevices which appear on the dividing interphase boundary, in Al-Cu and Al-Zn alloys. The amount of Al and Zn which appears in the crevices corresponds to the alloy concentrations which are determined by the liquidus line of their phase diagram. The selective penetration of the dissolved elements into the crevices is explained by their inclination to establish an equilibrium between phases. 9 ref. (M24b; Al-b, *Cu, Zn*)

558-M.* (German.) Liquid-Like Atomic Distribution in Solid Amorphous Substances and in Mono-Atomic Metal Melts. Hans Richter and Siegfried Steeb. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 369-378.

Radiographic determination of the atom distribution in noncrystalline solid Ge, I, B, Si, As, Sb and Ga and in molten Bi, Ga, In and Sn. Amorphous Bi and Ga show, in the solid state, a distribution of atoms as in a liquid, while Si, Ge, As, Sb and I show a lattice-like atomic arrangement. 50 ref. (M25, M27a; Ge, I, Bi, Si, As, Sb, Ga, 14-66, 14-60)

559-M.* (German.) The Ternary System Sb-Cu-Mg. Raymund Dobbener and Rudolf Vogel. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 412-416.

Equilibrium conditions resulting from transformation in the solid state. 4 ref. (M24c, 2-60, 2-61; Sb-b, *Cu, Mg*)

560-M.* (German.) The Systems Cb-B and Ta-B. Hans Novotny, Friedrich Benesovsky and Richard Kieffer. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 417-423.

A preliminary constitution diagram based on results of X-ray tests and melting point determinations and micrographs. 31 ref. (M24b, 2-60, 2-61; Cb-b, B, Ta-b, *B*)

561-M.* (German.) Palladium-Rhodium Alloys and Allotropy of Rhodium. Ernst Raub, Hans Beeskow and Dorothea Menzel. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 428-431.

Effects of composition, temperature, quenching or slow cooling from 1300° C. and various heat treatments on the lattice constant. At 845° C. a miscibility gap was observed. (M26p, N6p, 2-61, 2-60, 2-64; Pd-b, *Rh*)

562-M. Technique for Preparing Thin Films of Alpha-Iron. D. G. Brandon and J. Nutting. *British Journal of Applied Physics*, v. 10, June 1959, p. 255-256.

Preparation of foils of alpha-iron which are suitable for direct-transmission examination in an electron microscope. (M20; Fe, 14-62, 4-56)

563-M.* (French.) Nondestructive Metallography Using Large-Size Replicas. Pierre A. Jacquet. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 101-110.

Replica method using nitrocellulose lacquer permits optical examination of surfaces inaccessible for direct observation. Used in conjunction with new method of local electrolytic polishing, with a plug-type polisher, procedure allows the study of specimens and objects of any size and shape. 13 ref. (M20p, M20r)

564-M.* (French.) Arrangement of Dislocations in Polycrystalline Metals and Their Relationship to the Stress-Strain Curve. M. J. Whelan. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 153-162.

Dislocations in austenitic stainless steel studied by transmission electron microscopy. For low deformations (less than 1% strain), arrangement consists mainly of stacking at grain boundaries. Strain of 1 or 2% or more produces irregular lattice which appears to be formed by stacking caused by stress-relaxation mechanism involving interaction between stacked and isolated dislocations or slip systems which intersect them. 17 ref. (M26b; SS-e, Al, Au, Ni)

565-M.* (French.) New Applications of the Castaing Electronic Microprobe. J. Philibert and H. Bizouard. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 187-200.

Results of recent studies pertaining to dendritic segregation, fine precipitates, refractory steels, samples taken during bessemer conversion, identification of oxide films and analysis of nonconductors. 19 ref. (M21e, 1-52)

566-M.* (French.) Relationship Between Processing Conditions, Structure and Properties of 1.25% Manganese Aluminum Alloys. M. K. B. Day. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 201-220.

Electrical resistivity measurements were used in conjunction with optical and electron microscopy to follow changes in structure of alloys rolled from semi-continuously cast ingots and given a homogenizing anneal. 28 ref. (M27c, J21, P15g; Al-b, *Mn, Fe, Si*)

567-M.* (German.) "Imaginary" Chemical Compounds in Solid and Molten Eutectic Systems. Anton Hrbek. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 431-433.

Dependence of the reduced activation energy in the Bi-Sn system on concentration and temperature of superheating. Changes in activation energy are explained by the existence of a chemical compound of Bi with Sn. 12 ref. (M24e, N14, 2-61; Bi-b, *Sn*, 14-60)

568-M.* The Equilibrium Diagram of the System Bismuth-Palladium. J. Brasier and W. Hume-Rothery. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 157-164.

The freezing point of Bi is depressed by the addition of Pd and sinks to a eutectic at 5.83 at.% Pd and 256° C. The liquidus then rises to 485.4° C., at which temperature the compound Bi_2Pd melts without change of composition. The compound BiPd gives rise to a pronounced max. in the liquidus curve at 618° C., and there is a Pd-rich eutectic at 577° C. At low temperatures the composition of the Bi_2Pd is about 34 at.% Pd. 5 ref. (M24b)

569-M.* Equilibrium Diagrams With InSb as One Component. J. C. Woolley and D. G. Lees. *Journal of the Less-Common Metals*, v. 1, June 1959, p. 192-198.

Three equilibrium diagrams formed from InSb with Sn, Ge, GaSb respectively. The InSb-Sn system shows a peritectic form with a peritectic line at 235° C. No solid solution of InSb in Sn is detected but the limit of solid solution at the Sn end of the diagram is estimated to be 92 at.% Sn. The InSb-Ge system shows eutectic behavior, with eutectic temperature of 512.5° C. and eutectic composition of 5 at.% Ge. No solid solution of InSb in Ge is detected but there is approximately 0.75 at.% solution of Ge in InSb. 14 ref. (M24d; In, Sb, *Sn, Ge, Ga*, 14-68)

570-M.* Equilibrium Diagram of the Ga_2Te_3-In_2Te_3 System. J. C. Woolley, D. G. Lees and B. A. Smith. *Journal of the Less-Common Metals*, v. 1, June 1959, p. 199-205.

Complete solid solution occurs throughout the whole range of composition, but the form of the liquidus and solidus curves shows that the section is not quasi-binary and must be treated as a general section of the ternary system. 7 ref. (M24d; Ga, Te, In, 14-67)

571-M.* The Uranium Monocarbide-Uranium Mononitride System. J. Williams and R. A. J. Sambell. *Journal of the Less-Common Metals*, v. 1, June 1959, p. 217-226.

From 1200° C. upward, the carbide and nitride form a continuous series of solid solutions. At 1200° C. the alloys prepared by solid-state diffusion obey Vegard's law but those prepared by fusion deviate from this law in a systematic fashion. The results of X-ray diffraction studies of the diffusion process suggest that homogenization occurs by solution of the carbide in the nitride, but not by the reverse process. (M24d; U, NM-a35, NM-a36)

572-M.* 1300° C. Isotherm in the System Iron-Chromium-Nickel. Peter E. Price and Nicholas J. Grant. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 635-637.

Limits of the two-phase ferrite-austenite field at 1300° C. The shape of this region, predicted from the Fe-Cr and Cr-Ni binary diagrams, is simply a narrow two-phase field originating close to the Fe corner of the Fe-Cr binary and broadening across the middle of the ternary diagram to meet the Cr-Ni side. 10 ref. (M24c; Fe, Cr, Ni)

573-M.* Comments on the Determination, Analysis and Representation of Preferred Orientation. Robin O. Williams. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 646-647.

Use of inverse pole figures for sheet textures. 7 ref. (M26c)

574-M.* Solid-Liquid Phase Equlibria in the Pseudo-Binary System Bi_2Te_3-Bi_2Se_3. J. P. McHugh and W. A. Tiller. *Metallurgical*

Society of AIME, Transactions, v. 215, Aug. 1959, p. 651-655.

The liquidus and solidus surfaces for the pseudo-binary system Bi_2Te_3-Bi_2Se_3 are determined by conventional cooling and heating-curve techniques and by a new controlled solidification technique. Partition coefficients for Te and Se were also determined. Results of the two methods are in excellent agreement. (M24d, N12; Bi, Te, Se)

575-M.* (French.) Thin Metal Films. Adrien Saulnier and Paul Mirand. *Revue de l'Aluminum*, no. 266, June 1959, p. 687-697.

Methods of preparing thin films used in electron microscopy allowing the production of micrographs and electron diffraction patterns. Data on Al-Cu, Ti-V, Cu-Be, Al-Mg and U-O Alloys. 10 ref. (M20, M21e, M22h, M26; Al-b, *Cu, Be, Mg*, U, *O*, 14-62)

576-M.* (Polish.) Crystallographic Orientation of Iron Single Crystals. Z. Bojarski. *Prace Instytutow Hutniczych*, v. 11, no. 1, 1959, p. 19-23.

Crystallographic orientation as determined by means of back-reflection Laue patterns. 8 ref. (M26c, M22g; Fe, 14-61)

577-M.* Transformation Twins in Alpha Iron. D. S. Hutton, G. L. Coleman and W. C. Leslie. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 680-681.

Transformation twins, identified by their appearance on a polished and etched section, were found in zone-refined iron, in several "high-purity" irons, in Fe-Mn alloys containing up to 0.5% Mn, in enameling Fe, and in low-carbon openhearth steels. They were observed after heating above the Ae_3 temperature, followed by cooling at various rates from furnace cooling to quenching in iced brine. 9 ref. (M27e; Fe-a, Fe-b, *Mn*, ST-e)

578-M.* An X-Ray Method for the Determination of Beta Phase in a Titanium Alloy. B. L. Averbach, M. F. Comerford and M. B. Bever. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 682-685.

The volume fraction of beta phase was determined in a Ti-6Al-4V alloy by measurements of integrated diffraction intensities. A specimen quenched from 1475° F. (800° C.) contained approximately 5% beta, but in specimens quenched from higher temperatures no beta was found. The beta phase formed during aging, and in specimens solution treated at 1570° F. (855° C.) approximately 10% beta was present after aging at 1000° F. (540° C.) for 24 hr. 20 ref. (M22g, J27; Ti-b, *Al, V*)

579-M.* The Constitution of Delta-Phase Alloys of the System Uranium-Zirconium-Molybdenum. M. S. Farkas, A. A. Bauer and F. A. Rough. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 685-693.

In uranium alloys a ternary cut joining 31.5 at.% Mo to 74 at.% Zr is presented on the basis of differential thermal analysis, metallographic and X-ray diffraction data. Hypothetical isothermal ternary sections, inferred from the determined delta-phase relationships, are presented for the U-Zr-Mo system. A ternary eutectoid at 454° C. was found in Zr-rich alloys. 8 ref. (M24c; U-b, *Zr, Mo*)

580-M.* Observations on the Niobium (Columbium)-Hydrogen System. H. W. Paxton, J. M. Sheehan and W. J. Babyak. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 725-727.

Martensitic transformation phenomena. 11 ref. (M24b, N6q; Cb-b, *H*)

581-M.* The Epitaxial Relationships of Cuprous Oxide Formed on Copper Single Crystals Immersed in an Aqueous Solution of Copper Sulfate. Kenneth R. Lawless and G. Tyler Miller, Jr. *Acta Crystallographica*, v. 12, Aug. 10, 1959, p. 594-600.

Shape and orientation of oxide polyhedra on five crystal faces of Cu observed by electron diffraction and electron microscopy techniques. 11 ref. (M26r, R1h; Cu, 14-61, 14-68)

582-M.* Seeing the Invisible With Electrons. F. W. C. Boswell and E. Smith. *Design Engineering*, v. 5, Aug. 1959, p. 23-25.

Applications of electron microscopy in studying the microstructure of steel. (M21e; ST)

583-M.* The Equilibrium Phase Diagram. Its Significance to Foundrymen in Solidification and Heat Treatment. John F. Wallace. *Foundry*, v. 87, Sept. 1959, p. 84-89.

Use of equilibrium diagrams in predicting fluidity, mode of solidification, amount of segregation, feeding distance of risers and type of shrinkage defects.

Effectiveness of grain refiners and influence of heat treatment. 10 ref. (M24, N12, J-general, E25n, E25p; 5-60)

584-M.* Solidification and Heat Treatment. Aluminum and Magnesium Alloys. E. E. Stonebrook. *Foundry*, v. 87, Sept. 1959, p. 90-101.

Equilibrium phase diagrams of Al-Cu, Al-Mg, Al-Si, Al-Zn, Mg-Ce, Mg-La and Mg-Th systems. Appraisal of solidification characteristics, grain refinement and heat treatment using cooling curves and equilibrium diagrams. 12 ref. (M24b, N12, E25n; Al-b, *Cu, Mg, Si, Zn*, Mg-b, *Ce, La, Th*)

585-M.* Solidification and Heat Treatment. Copper-Base Alloys. William L. Rudin. *Foundry*, v. 87, Sept. 1959, p. 102-107.

Cu-Sn, Cu-Al and Cu-Zn constitution diagrams. Prediction of casting characteristics, microstructure, response to heat treatment and mechanical properties. 6 ref. (M24b, N12, E25n, 2-64; Cu-b, *Sn, Zn, Al, Mn*)

586-M.* (Czech.) Isolation of Phases in Fe-Al-C Alloys. Hanus Tuma and Miloslav Vyklicky. *Hutnicke Listy*, v. 14, Aug. 1959, p. 706-710.

Separation of phases by dissolution in electrolytes composed of citric acid or one of its compounds, NaCl, HCl and Br. Time and temperature are controlled. 5 ref. (M20s, M27d, 3-67, 2-61; Fe-b, *Al, C*)

587-M.* The System Titanium-Calcium. I. Obinata, Y. Takeuchi and S. Saikawa. *American Society for Metals, Transactions*, v. 52, Preprint no. 157, 1959, 10 p.

Data on the system Ti-Ca up to 1300° C. No intermediate phase exists in this system. The solubility of Ti in molten Ca decreases from 0.18% at 1250° C. to 0.05% at 860° C. Ca is soluble in Ti to the extent of at least 0.13% at 1300° C. (M24b, P12e; Ti-b, Ca)

588-M.* Substructure Characteristics of Fine-Grained Metals and Alloys Disclosed by X-Ray Reflection Microscopy and Diffraction Analysis. Sigmund Weissmann. *American Society for Metals, Transactions*, v. 52, Preprint no. 171, 1959, 12 p.

Method permits a direct correlation between a quantitative X-ray analysis of the substructure of a fine-grained specimen and a metallographic analysis of the same grains. An X-ray reflection microscopy method is also presented which can be used to provide a topographical analysis of the lattice distortions within the grains and can be correlated to the quantitative analysis of the substructure characteristics. 8 ref. (M27c, M21f, 1-53)

589-M. (Book.) The Sequestration of Metals. Robert L. Smith. 256 p. 1959. Macmillan Co., 60 Fifth Ave., New York 11, N. Y. $8.50.

Definition of sequestration; influence of valency and basicity on sequestration; formation of chelate ring and strength of metal-ligand bonds; stability of chelate system; physical and chemical properties and application of sequestering agents. (M25; AD-q42)

590-M. (Translation—AIP.) Crystal Structure of the Compounds $MoBe_{12}$, WBe_{12} and $TaBe_{12}$. E. I. Gladyshenskii and P. I. Kripiakevich. *Soviet Physics, Crystallography*, v. 2, n.d., p. 730-733.

4 ref. (M26q; Mo, Be, W, Ta)

591-M.* (Translation—AIP.) Exact Determination of the Atomic Coordinates in the Metastable Phase of Ti-Cr Alloys. I. A. Bagariatskii and G. I. Nosova. *Soviet Physics Crystallography*, v. 3, Jan. 1957, p. 15-26.

By means of X-ray goniometric photographs obtained with the reciprocal lattice camera, the trigonal form of the omega phase has been confirmed. The positions of the atoms in the hexagonal unit cell have been determined more exactly. (M26; Ti-b, *Cr*)

592-M. (Translation—AIP.) Electron Diffraction Study of the Structure of Liquid Metals and Alloys. A. I. Bublik and A. G. Buntar. *Soviet Physics Crystallography*, v. 3, Feb. 1957, p. 31-40.

Methods of obtaining electron diffraction photographs of liquid metal films and calculating the distribution function of the atoms. (M22h; 14-60, Sn, Al, 14-62)

593-M. (Translation—AIP.) Determination of the Structure of SCB_2 by X-Ray Diffraction. N. N. Zhuravlev and A. A. Stepanova. *Soviet Physics Crystallography*, v. 3, Feb. 1957, p. 76-77.

Powder photographs of Sc with stationary and rotating samples. On the stationary samples two series of lines belonging to two phases with crystals of different sizes were distinguished. The

larger crystals were those of the rhombohedral boron carbide. (M22g, M26; Sc)

594-M.* The System Titanium-Bismuth. I. Obinata, Y. Takeuchi and S. Saikawa. *American Society for Metals, Transactions*, Preprint no. 156, v. 52, 1959, 12 p.

X-ray diffraction examination and differential thermal analysis of Ti-Bi alloys with less than 65% Bi in the range below 1350° C. The beta-transus of Ti is lowered by addition of Bi and a eutectoid reaction beta alpha + Ti_3Bi occurs at 29% Bi and 725 + 10° C. (M24b; Ti, Bi)

595-M.* The Uranium-Hafnium Equilibrium System. David T. Peterson and D. J. Beerntsen. *American Society for Metals, Transactions*, Preprint no. 158, v. 52, 1959, 15 p.

Hf increases the temperature of the alpha-beta uranium transformation on heating from 668 to 676° C. and lowers the beta to gamma transformation to a eutectoid at 733° C. and 4.5 at .% Hf. Uranium lowers the alpha-beta transformation in Hf to a monotectoid at about 1150° C. and 55 at .% Hf. 10 ref. (M24b; U, Hf)

596-M.* The System Zirconium-Iron-Tin. L. E. Tanner and D. W. Levinson. *American Society for Metals, Transactions*, Preprint no. 166, v. 52, 1959, 19 p.

The Zr-rich corner of the Zr-Fe-Sn system was determined up to the intermetallic compounds $ZrFe_2$ (55% Fe) and Zr_4Sn (24.5% Sn) between the temperatures 200 and 1100°C. (392 and 2012° F.) At ternary phase, theta was found between 7 and 8% Fe at about 24.5% Sn. 11 ref. (M24c; Zr, Fe, Sn)

597-M.* An Electron Microscope Study of Stainless Steel Deformed in Fatigue and Simple Tension. P. B. Hirsch, P. G. Partridge and R. L. Segall. *Philosophical Magazine*, v. 4, June 1959, p. 721-729.

Structure of deformed specimens thinned by electropolishing from one side and examined by transmission electron microscopy. Slip lines and associated dislocations; fatigue striations. 12 ref. (M26b, M21e, Q24c; SS-e)

598-M.* The Silver-Based Heusler Alloys. E. O. Hall. *Philosophical Magazine*, v. 4, June 1959, p. 730-744.

Microscopic and X-ray diffraction examination of ferromagnetic Ag-Mn-Al alloys. Approximate equilibrium diagrams at 400 and 650° C. Structures arising after quenching in water at 650° C. Identification by extraction and electron diffraction of nonequilibrium precipitates in dilute alloys around the composition Ag_5MnAl. Variation of magnetization with temperature. Origin of high coercivity. 13 ref. (M24c, M26p, P16; Ag-b, Al-b, Mn-b, SGA-n)

599-M. (Russian.) Effect of Cooling During Crystallization on the Quantity of Eutectic Formed in Binary Systems. A. A. Popov and E. E. Blyum. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 160-164.

Bi-Cd, Sn-Bi and Sn-Cd alloys were cast into metal molds, sand molds or allowed to cool slowly in a furnace. With very high cooling velocities the forming eutectic can be reduced or its formation even eliminated. With a high cooling rate, diffusionless crystallization takes place. (M24b, N12q, N6, 2-61; Bi-b, *Cd*, Sn-b)

600-M. (Russian.) The Mutual Linkage Between the Elements of Crystal Structure in the Quench Hardened or Strain Hardened State. L. I. Mirkin and Ya. S. Umanskii *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 179-181.

Dislocations formed in carbon and alloy steels by quenching from various temperatures or by plastic deformation (degree of deformation 80%). Effect of composition on the dislocations and relationship between the number of dislocations and the size of blocks formed. (M26b, N7e, 3-68, 2-60, 2-64; AY, CN)

601-M. (Russian.) Effects of Lithium, Zinc and Magnesium on the Crystal Structure of Aluminum. N. I. Varich. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 182-188.

Effect on hardness, third-order dislocations, lattice constants, binding forces within the lattice and on the tensile strength. 9 ref. (M26, Q29n, Q27a, 2-60; Al, *Li, An, Mg*)

602-M. (Russian.) Changes in the Crystal Structure of an Iron-Nickel Alloy Caused by Annealing After High-Frequency Hardening. I. N. Kidin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 196-202.

Effect of the velocity of heating, chosen for reaching the hardening temperature, on crystal structure and hardness. (M26b, Q29n, J2g; Fe-b, *Ni*)

603-M.* (English.) Magnetic and Crystallographic Analysis by Electron Diffraction. S. Yamaguchi. *Nuovo Cimento*, v. 12, May 1959, p. 1198-1201.

The Lorentz effect observable in electron diffraction is utilized for measurement of the magnetization of ferromagnetic substances. The martensitic transformed layers of austenitic stainless steel were also studied by electron diffraction. (M22h, P16; SS-e)

604-M. (Russian.) Effects of Quenching and Subsequent Annealing on the Crystal Structure of Steel. K. F. Starodubov, A. A. Sazonova and V. K. Babich. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 230-232.

Effect of various heat treatments on the number of second-order dislocations and on dimensions of mosaic blocks in the alpha-phase. (M26b, J23, J26; ST)

605-M.* Columbium-Oxygen System. Rodney P. Elliott. *American Society for Metals, Transactions*, Preprint no. 143, v. 52, 1959, 17 p.

Metallographic examination of arc-cast alloys made of electron-gun-refined Cb metal and special purity Cb pentoxide. Two intermediate oxides, CbO and CbO_2, melt without decomposition at 1945 and 1915° C. (3533 and 3479° F.), respectively. Eutectic reactions exist between Cb and CbO at 1915° C. (3479° F.) and between CbO and CbO_2 at 1810° C. (3290° F.) 13 ref. (M24b; Cb-b, *O*)

606-M.* The Yttrium-Magnesium Alloy System. E. D. Gibson and O. N. Carlson. *American Society for Metals, Transactions*, Preprint no. 146, v. 52, 1959, 13 p.

Three peritectic compounds, gamma (Y-Mg), delta (Y-Mg) and epsilon (Y-Mg) have been identified from microstructures and X-ray data. Gamma (Y-Mg) has the formula YMg (21.5 wt.% Mg) and decomposes at 935° C. (1715° F.) The delta phase (Y-Mg) occurs at approximately 41 wt.% Mg and decomposes at 780 C. (1425° F.), and epsilon (Y-Mg) occurs at approximately 60 wt.% Mg and decomposes at 605° C. (1120° F.). 6 ref. (M24b; Y, Mg)

607-M.* Investigation of the Thorium-Yttrium System. D. T. Eash and O. N. Carlson. *American Society for Metals, Transactions*, Preprint no. 142, v. 52, 1959, 17 p.

A high-temperature bcc. allotrope of yttrium was identified above 1490° C. A region of complete solid solubility occurs at elevated temperatures in this system and a eutectoid at 1375° C. and 25 wt.% yttrium. The solid solubility limits of the alpha Th and alpha yttrium regions are approximately 20 and 30 wt.% yttrium, respectively. 7 ref. (M24b; Th-b, *Y*)

608-M.* Fabrication Variables Related to Texture and Mechanical Properties of Beryllium. Jacob Greenspan. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 183-190.

The anisotropy of fracture and slip (the brittleness and ductility of the Be single crystal) is characteristic also of polycrystalline Be in which the grains are oriented in a preferred manner. Be with grain orientations resulting from hot working either unidirectionally or bi-directionally is ductile or brittle in directions given by the anisotropy and orientation of the grains. Textures developed from various hot working sequences; tensile results are correlated with textures. 7 ref. (M26c, 3-68, Q-general; Be, 14-61)

609-M.* Preferred Orientation in Uranium, Thorium, Zirconium and Beryllium. C. J. McHargue and K. Jetter. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 430-459.

Effect of preferred orientation on physical and mechanical properties. 47 ref. (M26c; U, Th, Zr, Be)

610-M. (Russian.) High-Temperature Segregation Into Two Phases of the Solid Solution in Cu-Ni-Co Alloys. S. S. Gorelik. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 176-180.

Conditions thought to favor phase segregation; great difference of diffusion coefficients; small difference of free energies and slight difference between segregation and melting temperatures. (M24b, 2-62; Cu-b, *Ni, Co*, 14-67)

611-M. (Russian.) Formation and Movement of Dislocations in Nickel and Ni-Cr Alloys. O. I. Mgebran. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 202-206.

Effects of quenching temperature, cold deformation and annealing temperature. Dislocations are investigated by exposing

the samples to a current and measuring the difference of potentials. 8 ref. (M26b, 2-64, 3-68; Ni, Ni-b, *Cr*)

612-M. (Russian.) Blocking Effect of Grain Boundaries on the Consistency of Dislocations. O. I. Mgebran. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 207-211.

Investigation on Zn, Al, Cu and Fe. Reduction of consistency depends on the ratio of deformation energy to freed heat. 5 ref. (M26b, M27f, 3-68; Zn, Al, Cu, Fe)

613-M.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Physical Metallurgy of Zinc. E. A. Anderson. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds. ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 400-422.

Metallographic techniques; effect of impurities and added elements on microstructure and mechanical properties. Mechanisms of plastic deformation in single crystal and polycrystalline specimens. 59 ref. (M20, M26n, Q24, 3-69; Zn, 14-61)

614-M.* Zinc as an Alloying Agent. C. H. Mathewson. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 573-626.

Designation, composition and chemical properties of wrought and cast Cu-base alloys containing Zn. Compositions of other materials containing Zn including Mg alloys, Ag solders, Al alloys, brazing filler metals, Ni silver, white Au and Sn alloys. Comprehensive compilation of phase diagrams of binary and ternary Zn alloy systems. 55 ref. (M24b, M24c, Q27a; Zn-b, Cu-n, Al-b, Mg-b, SGA-f)

615-M.* (German.) Deformation and Recrystallization Occurring in the Preparation of Metallographic Zinc Specimens by Grinding and Mechanical Polishing. H. Borchers and R. Schwarzwalder. *Metall*, v. 50, Aug. 1959, p. 738-739.

A mechanically prepared section is etched progressively to investigate recrystallization occurring at room temperature in the surface layers that were subjected to deformation. 4 ref. (M20p, N5; Zn)

616-M.* (German.) Brass-Type Phases With A_3-Like Structure. Walter Burkhardt and Konrad Schubert. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 442-452.

Lattice constants, ratio c-axis:a-axis and concentration of valence electrons for various Cu, Ag, Au and Mg alloys. Structure variations and superlattice phenomena are accompanied by changes in valence electron concentration. 40 ref. (M26, M25g; Cu-b, Ag-b, Au-b, Mg-b)

617-M.* (German.) Effect of Texture on the Profile of an Individual X-Ray Interference. Manfred von Heimendahl and Hermann Weyerer. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 453-459.

Cold rolled Al is X-ray tested and the effect is determined of the resulting structure on the intensity and profile of the (200)-interference. 11 ref. (M26c, M22g; Al)

618-M. (German.) Rapid Grain Size Determination and Structure Analysis. H. F. Fischmeister and M. E. Moller. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 478-480.

Measurements by photo-electric impulses. 14 ref. (M27c, 1-53)

619-M. (German.) Carbonitrides of Columbium. Georg Brauer and Richard Lesser. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 487-492.

Phases of the ternary system columbium-columbium carbide-columbium nitride. 16 ref. (M26r; Cb, 14-68)

620-M.* (English.) X-Ray Studies on the Substructures in Extended Aluminum Crystals. S. Karashima. *Osaka University, Memoirs of the Institute of Scientific and Industrial Research*, v. 16, 1959, p. 43-54.

Striations in the Laue spots of the X-ray diffraction pattern of Al single crystals. Such striations are thought to be due either to the formation of edge dislocation walls, or, more probably, to mixed dislocation walls in the subgrain boundaries. Relation of these phenomena to the mechanism of recovery. (M22g, M26b; Al, 14-61)

621-M.* (German.) High-Temperature Microscopy. F. Gabler and W. Wurz. *Metall*, v. 13, Sept. 1959, p. 819-823.

Observation of grain growth in electrolytic Cu, alpha-gamma-delta transformation in pure iron, solidification of pure iron, and alpha-beta transformation in Zr, through a hot stage microscope. 5 ref. (M21c, M27, N8, N3, 2-62; Fe-a, Zr, Cu)

622-M.* (German.) Microradiography Using X-Rays. K. Sagel. *Metall*, v. 13, Sept. 1959, p. 842-850.

Various testing methods with X-rays and gamma rays. Mass coefficients for X-ray and gamma ray absorption are listed for a number of elements. 23 ref. (M23n)

623-M.* Plutonium Constitutional Diagrams. F. W. Schonfeld, E. M. Cramer, W. N. Miner, F. H. Ellinger and A. S. Coffinberry. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 579-599.

Compilation of binary constitutional diagrams together with crystal structures. 5 ref. (M24b, M26; U)

624-M.* Uranium Alloy Systems. Arthur A. Bauer and Frank A. Rough. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 600-611.

Crystal structure data for uranium phases and compounds. 45 ref. (M24b, M26; U)

625-M.* Thorium Alloy Systems. Arthur A. Bauer and Frank A. Rough. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 612-620.

Constitution diagrams and tabulation of crystal structure data. 18 ref. (M24b, M26; Th)

626-M. (German.) Dependence of the Deflection of a Band on the Position of an Edge Dislocation. Frantisek Kroupa. *Czechoslovak Journal of Physics*, v. 9, no. 4, 1959, p. 488-494.

Deflection angle as a function of the position of edge dislocations with reference to the central plane of band. 6 ref. (M26b)

627-M.* The Crystallography of the Beta-Alpha Transformation in Zirconium and in Two Titanium-Molybdenum Alloys. P. Gaunt and J. W. Christian. *Acta Metallurgica*, v. 7, Aug. 1959, p. 534-543.

The habit planes and orientation relationships associated with the transformation studied in two specimens of crystal bar Zr. X-ray and kinetic observations both show that deformation accompanying transformation is much more severe in Zr than in Ti, possibly as a result of a large volume change, and the discrepancies may be due to the accommodation stresses. 18 ref. (M26c, N6; Zr, Ti-b, *Mo*, 5-67)

628-M.* The Fe-Cr-Co-C Quaternary System. D. Coutsouradis and L. Habraken. *Cobalt*, no. 4, Sept. 1959, p. 3-27.

Isothermal sections at 850, 1000 and 1100° C. were drawn for the 10% Co alloys. Results reveal that Co additions to Fe-Cr-C alloys with less than 30% Cr produce only a shift in the transformation lines and do not lead to new phases. Co in Cr steels shows an appreciable gamma-field-broadening effect, provided that the Cr content is sufficiently high. Thus Co can easily transform the martensite-ferrite structure of some low-carbon stainless steels into an entirely martensitic structure. 24 ref. (M24d, N8; Fe, Cr, Co, C, SS)

629-M.* Evidence of Dislocations in Crystals. A. K. Mallik. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 154-164.

Growth of metal whiskers; spiral growth of crystals; local precipitation; etching techniques; electron microscopy. 21 ref. (M26b, M20, M27, N3r)

630-M. An Electrolytic Saw. M. Metzer. University of Illinois. (Office of Naval Research.) *U. S. Office of Technical Services*, PB 151574, Mar. 1958, 8 p. $.50.

Much higher rates of strain-free cutting of metal crystals in the laboratory can be achieved by the use of the electrolytic saw instead of the usual chemical method. Chemical saws may be converted to electrolytic ones by substituting a metal wire cathode for the thread and passing a current from the specimen to the wire through an electrolyte which flows over the specimen. (M20, 1-52; 14-61)

631-M.* (French.) Elimination of Vacancies in High-Purity Aluminium. M. Wintenberger. *Acta Metallurgica*, v. 7, Aug. 1959, p. 549-555.

In high-purity Al, air-cooled from elevated temperatures, the resistivity increment due to vacancies is completely eliminated at room temperature. The rate of this recovery increases with the dislocation density. Dislocations probably remove all the vacancies by a process of elastic interaction. It is thus possible, after having determined the energy of diffusion of vacancies, to evaluate the

dislocation density produced by cold working. 22 ref. (M26b, 3-68, P15g; Al-a)

632-M.* (French.) Blocking Dislocations by Cavities and Small Precipitate Particles. P. Coulomb. *Acta Metallurgica,* v. 7, Aug. 1959, p. 556-559.

Investigation of the influence of thermal agitation and applied stresses on the liberation of blocked dislocations from the cavities. The heat of activation of the phenomenon varies linearly with the applied stress. (M26b, 3-66)

633-M.* New Macroetch Eases Study of High Alloy Steels. *Steel,* v. 145, Oct. 12, 1959, p. 118.

Composition of etchant given for superalloys. Mixture is simple, chemically stable and nonfoaming. (M20q, M28; SS)

634-M. Electron Microscopical Examination of Bonds in Zircaloy-2. Arthur P. Young and Charles M. Schwartz. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1364, July 29, 1959, 28 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Effects of various mechanical and surface treatments and impurities on the structure of Zircaloy-2 bonds. (M21e, 3-69; Zr-b, 7-58)

635-M. Zirconium Fluoride Phase Studies. Pt. 1. A Preliminary Investigation of Solid Phases. A. G. Chapman and R. A. Woodriff. Phillips Petroleum Co. *U. S. Atomic Energy Commission,* IDO-14469, Jan. 15, 1959, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Solid phases in the system zirconium-hydrofluoric acid-nitric acid. 8 ref. (M24d, P12e; Zr)

636-M.* (Russian.) Constitution Diagram of the System Li-Li N. K. A. Bol'shakov, P. I. Fedorov and L. A. Stepina. *Izvestiya VUZ—Tsvetnaya Metallurgiya,* no. 4, 1959, p. 52-53.

Melting under argon. Measurements by means of a thermocouple. Recording of crystallization graphs. (M24a, P12n, N12n; Li, NM-a36)

637-M.* The Nature of a Metal Surface. Walter Boas. *Australasian Engineer,* v. 51, July 1959, p. 48-57.

Appearance of metallic surfaces at high magnification; kinetics by which structural features are produced; effects of surface structure on physical and chemical properties. 28 ref. (M27, M26)

638-M. (Russian—Book.) Effect of Irradiation on Structure and Properties of Structural Metals. M. S. Lagovskaya. 39 p. 1958. Oborongiz, Moscow. (Available from Library of Congress, Washington, D. C.)

The strongest effect on the structural properties of metal is produced by neutrons, which, because they lack an electric charge, are capable of penetrating the crystal lattice and causing various alterations. It is concluded that the Frenkel' defect in the crystal lattice is responsible for the basic structural change in metals that determines their physical and mechanical properties. (M26, 2-67; SGB-s)

639-M. (Translation—ISA.) Production of Thin Alloy Specimens of Varying Composition. G. A. Kurov. *Pribory i Tekhnika Eksperimenta,* July 1959, p. 692-695.

Production of a variety of alloy specimens in the form of thin films by vacuum deposition. Design of evaporator and vacuum system. (M20, N15g, 1-73; 14-62)

640-M.* (Swedish.) Testing of Low Deformation Degrees by Means of X-Rays. Anders Sandin. *Metallen,* v. 15, no. 1, 1959, p. 15-16.

Measurement of small degrees of deformation, down to 0.1% on brass wire, following the Laue back-reflection method. (M22g, Q24; Cu-n, 4-61)

641-M.* (Swedish.) Testing of the Cold Deformation of Brass by Metallographic Etching. Lennart Johansson. *Metallen,* v. 15, no. 1, 1959, p. 17-21.

Electrolytic etching in a 0.25% solution of Na_2SO_4 subsequent to electrolytic polishing. The method allows the discovery of small deformation degrees. Its sensitivity is influenced by the Zn content. (M20, Q24, 2-60; Cu-n)

642-M.* Lattice Spacing Relationships in Magnesium Solid Solutions. D. Hardie and R. N. Parkins. *Philosophical Magazine,* v. 4, July 1959, p. 815-825.

In binary Mg solid solutions containing Al, Bi, Cd, In, Pb, Li, Ag, Sn and Zn, the lattice distortion accompanying the introduction of a solute depends on the difference in size of the solute and solvent atoms, their relative electronegativity and the electron:atom ratio in the solution. 15 ref. (M27b; Mg-b, Al, Bi, Cd, In, Pb, Li, Ag, Sn, Zn)

643-M.* Laves Phase Compounds of Rare Earths and of Hafnium With Noble Metals. Vera B. Compton and Bernd T. Matthias. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 651-655.

X-ray diffraction determination of lattice constant of cubic and hexagonal laves phase compounds. Superconducting and ferromagnetic transition temperatures. 16 ref. (M26q, P15g, P16, EG-g45)

644-M.* Preferred Orientation in Silicon Iron. P. N. Richards. *Australian Institute of Metals, Journal,* v. 4, Aug. 1959, p. 114-123.

Development of a preferred orientation of the (110) 001 or "Goss" type in cold reduced 3% Si iron is shown to occur during final annealing by a process akin to secondary recrystallization. For secondary recrystallization to occur normal grain growth of the primary structure must be restrained. This may be brought about by the presence of finely dispersed silicon nitride. 18 ref. (M26c, N5; AY, *Si,* SGA-n)

645-M.* Studies of the Structure of Anodic Oxide Films on Aluminum. Pt. 1. D. J. Stirland and R. W. Bicknell. *Electrochemical Society Journal,* v. 106, June 1959, p. 481-485.

Formation voltages less than 100 v. produce nonporous amophous oxide layers, while those over 100 v. also produce some crystalline gamma alumina. The low-voltage layer dissolves quickly in a phosphoric-chromic acid mixture. 16 ref. (M26r, 8-73; Al)

646-M.* Exploring Beryllium's Potential. Charles J. Giemza. *Missiles and Rockets,* Sept. 7, 1959, p. 22, 29, 31-32.

Anisotropic character of crystal structure; influence of hot pressing, hot upsetting or extruding and rolling on development of desirable crystallographic texture and mechanical properties. Factors causing embrittlement. Difficulties in assessment of properties. (M26c, Q23p, 3-68; Be)

647-M.* The Crystal Structure of UPt_2. B. A. Hatt and G. I. Williams. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 655-657.

X-ray diffraction patterns of powder and single crystal UPt_2. 4 ref. (M26q, M25m; U-b, Pt-b)

648-M.* The Crystal Structure of $ZrAl_2$. C. G. Wilson. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 660-662.

X-ray diffraction examination of powder and single crystals. 5 ref. (M26q, M25m; Al-b, Zr-b)

649-M.* Transition Element—Rare Earth Compounds With the Cu_5Ca Structure. J. H. Wernick and S. Geller. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 662-665.

Crystallographic investigation if intermetallic compounds of yttrium or rare earth and transition elements Co, Ni or Cu. Powder diffraction data; lattice constants and interatomic distances. 9 ref. (M26q; Co-b, Ni-b, Cu-b, *Y, Ce, Pr, Nd, Gd, Dy, Er,* EG-g45, *La*)

650-M.* The Effect of Segregation on the Diffraction From a Face-Centered Cubic Alloy With Deformation Faults. B. T. M. Willis. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 683-689.

Calculation of X-ray scattering from a deformation faulted f.c.c. alloy in which segregation of the alloy components has taken place at the faults. 8 ref. (M22g, M26s, 3-68)

651-M.* On the Crystal Structure of Protactinium Metal. Jerry Donohue. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 697-698.

X-ray diffraction data interpreted in terms of orthorhombic structure in contrast to previously proposed tetragonal structure. (M26n; Pa)

652-M.* On the Crystal Structure of Protactinium Metal. W. H. Zachariasen. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 698-700.

Re-examination of X-ray diffraction data and re-affirmation of tetragonal structure. (M26n; Pa)

653-M.* Crystal Structures of $ZrBe_5$ and Zr_2Be_{17}. Allan Zalkin, Ray G. Bedford and Donald E. Sands. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 700.

X-ray powder patterns for $ZrBe_5$ and Zr_2Be_{17} intermetallic compounds. 5 ref. (M26q; Zr-b, Be-b)

654-M.* A New Intermediate Phase in the Niobium-Aluminum System. C. R. McKinsey and G. M. Faulring. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 701-702.

X-ray diffraction data for intermediate sigma phase Cb_2Al. 5 ref. (M24b, M26q; Cb-b, *Al*)

655-M.* The Crystal Structures of $PuNi_3$ and $CeNi_3$. Don T. Cromer and Clayton E. Olsen. *Acta Crystallographica,* v. 12, Sept. 10, 1959, p. 689-694.

Structure of $PuNi_3$ and structure and composition of $CeNi_3$ determined by single crystal X-ray methods. 9 ref. (M26q, M25m; Ni-b, Ce-b, *Pu*)

656-M. Application of Electron Microscopy. Jaroslav Koutsky and Jaroslav Jezek. *Metal Treatment and Drop Forging*, v. 26, July-Aug. 1959, p. 264-272.

(M21e)

657-M. Reciprocal Lattice Concept. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 80-82.

In relation to X-ray diffraction. (M22g)

658-M. Cylindrical Powder Cameras. George J. Klems. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 82-86.

Principles of powder method, sample preparation, use of camera, interpretation of results and application. (M22g, 1-53)

659-M.* Technique for Determining the Orientation of Single Crystals of Bismuth. D. T. J. Hurle and S. Weintroub. *British Journal of Applied Physics*, v. 10, July 1959, p. 336-339.

Both X-rays and light figures are used to determine orientation of Bi crystal by back-reflection Laue technique. (M26c, M22g)

660-M. (Russian.) High-Temperature Constitution of Unsaturated Solid Solutions. B. I. Prosvirin. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 13-18.

Microhardness measurements performed with Cr-Ni steels of varying composition. Effect of holding at 1200 and 1300° C., previous to water quenching, on identical results obtained from microhardness measurements is explained by the formation of atom complexes. 17 ref. (M25, Q29q, 2-64, 2-62; SS)

661-M. (Russian.) Change of the Substructure After Completion of One Cycle of Loading. M. Ya. Gal'perin, E. P. Kostyukova and B. M. Rovinskii. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 56-61.

Al and Ni were subjected to one alternate bending cycle to study its effect on the substructure. Influence of the substructure present before loading; significance of the substructure on the strain hardening effect observed in the beginning of cycling and disappearing as the number of cycles increases. 14 ref. (M26n, N7e, Q5, 1-63, 3-71; Al, Ni)

662-M. (Russian.) Atomic X-Ray Scattering in Solid Solutions of Copper With Nickel. L. N. Guseva and B. I. Ovechkin. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 82-85.

Effects of composition ratio and temperature on X-ray diffraction. 6 ref. (M22g; Cu-b, *Ni*)

663-M. Cathodic Bombardment Etching of Nuclear Materials. D. Armstrong, P. E. Madsen and E. C. Sykes. *Journal of Nuclear Materials*, v. 1, July 1959, p. 127-135.

Simple apparatus for cathodic etching by ion bombardment; etching conditions for variety of metals, alloys and ceramics including U, Th, Zr and other materials. 18 ref. (M20q; U, Th, Zr)

664-M.* Effect of Irradiation on Fuel Materials. J. H. Kittel and S. H. Paine. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 500-509.

Damage which occurs at moderate irradiation temperatures is primarily due to surface roughening and anisotropic growth. Certain alloying additions greatly refine the grain size in uranium, thus eliminating surface roughening. These also alter the transformation kinetics permitting preferred orientations to be removed by heat treatment. 12 ref. (M27c, T11g, 2-60, 2-64, 2-67; U-b)

665-M.* (English.) On the Defect Structure of Rutile. Tor Hurlen. *Acta Chemica Scandinavica*, v. 13, no. 2, 1959, p. 365-376.

Theoretical analysis of the oxidation behavior of Ti and Ti alloys. Structural considerations, effect of impurities, color observations, density, conductivity, weight change measurements and oxidation phenomena. 21 ref. (M26r, M26s, R1h; Ti)

666-M.* (English.) X-Ray Investigations on Me-Si-B Systems (Me=Mn, Fe, Co). Pt. 1. Some Features of the Co-Si-B System at 1000° C. Intermediate Phases in the Co-Si-B and Fe-Si-B Systems. Bertil Aronsson and Gunvor Lundgren. *Acta Chemica Scandinavica*, v. 13, no. 3, 1959, p. 433-441.

Crystal structures and compositions of phases. 23 ref. (M26r, M24c; Co, Fe, Mn, *B, Si*)

667-M.* (English.) An X-Ray Investigation of the Nickel-Boron System. The Crystal Structures of Orthorhombic and Monoclinic Ni_4B_3. Stig Rundqvist. *Acta Chemica Scandinavica*, v. 13, no. 6, 1959, p. 1193-1208.

Existence of Ni_3B, Ni_2B and NiB confirmed. Unit cell of orthorhombic Ni_4B_3 varies slightly with phase composition. 16 ref. (M24b, M26r; Ni, NM-a37, B)

668-M. (Russian.) Light Reflection Patterns Obtained From Tungsten Crystals. V. K. Shtein. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 90-95.

After etching, a fine beam of light is directed to the crystal surface. The reflected light pattern projected on a screen is typical for individual crystal planes and their position with reference to the surface. 6 ref. (M26n, P17a; W, 14-61)

669-M. (Russian.) Reaction of Tellurium With Aluminum Antimonide. M. S. Mirgalovskaya and E. V. Skudnova. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no.2, 1959, p. 104-108.

Thermal analyses, microstructure and microhardness tests performed with Al-Sb-Te alloys of varying composition. Phases determined are AlSb, $AlTe_3$, Sb_2Te_3 and Sb. 11 ref. (M24c; Al-b, *Sb, Te*)

670-M.* Etch Pits in Zinc. Guido Bassi and J. P. Hugo. *Institute of Metals, Journal*, v. 87, July 1959, p. 376-379.

Quenching and annealing of coarse-grained Zn containing 0.002% Sn result in localized chemical attacks known as etch pits. At higher temperatures there is a progressive increase in size and decrease in number. Above a limiting temperature a decrease in size occurs. This behavior can be explained by diffusion of the Sn atoms to the dislocations. 5 ref. (M20q, 2-61, 2-64; Zn, *Sn*)

671-M.* Austenitic Grain-Size Control of Medium-Carbon and Carburizing Steels. B. L. Biggs. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 361-377.

Austenitic grain size obtained by heat treatment of medium-carbon and carburizing steels. Effects of pure Al, or Al alloyed with Si, Mn, V, Ca, Zr or Ti, in increasing grain coarsening temperatures (M27c, 2-64, 2-60; CN-p, *Al, Si, V, Mn, Ca, Zr, Ti*)

672-M. Low Melting Point Alloys of Cerium With Iron, Cobalt and Plutonium. J. K. Critchley. *United Kingdom Atomic Energy Authority*, AERE-M 488, 1959, 17 p.

Ce-rich portions of the Ce-Fe, Ce-Co, Ce-Fe-Co and Ce-Co-Pu systems investigated by thermal analysis. Low-melting alloys of potential use as fast reactor fuels occur in the Ce-Co-Pu system; solidification behavior. (M24b, M24c; Ce-b, *Fe, Co, Pu*)

673-M. (Russian.) Equilibrium of the System W-Cb. B. I. Krimer and Yu. E. Matveev. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat Moscow, 1958, p. 420-426.

By means of radiographs the presence of one phase of a bcc. lattice can be proved. Effect of composition ratio and heat treatment on hardness, resistivity lattice constant and melting point. 4 ref. (M24b, Q29n, P15g, M26, P12n, 2-61, 2-64; W-b, *Cb*)

674-M.* Magnetic Susceptibilities of Titanium-Rich Titanium-Oxygen Alloys. Y. L. Yao. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 851-854.

Solubility limit of oxygen in alpha Ti at 850° C. is determined by magnetic measurements as 12.5 ± 0.5% (29.0—30.9 at .%). Also, in the susceptibility-concentration curve, there is a distinct but not sharp maximum at 19.0 ± 0.5 wt. % (40.5—42.1 at .%), which indicates the presence of the delta phase. 7 ref. (M24b, P16, P12e; Ti-b, *O*)

675-M.* Studies of the Compound Ni_3Al by High-Temperature X-Ray Methods. R. W. Guard and J. H. Westbrook. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 871-872.

Observations of the Debye-Scherrer patterns for Ni_3Al taken at 800 and 1000° C. 5 ref. (M26q, 2-62; Ni-b, *Al*)

676-M.* (Japanese.) Electron-Microscopic Observation of A-Type Nonmetallic Inclusions in Ball-Bearing Steel. Kiyoji Deguchi, Tomitaka Nishimura and Hiroshi Suyama. *Tetsu to Hagane*, v. 45, July 1959, p. 705-712.

Indentification and classification of types of inclusions. (M21e; CN, 9-69, SGA-c)

677-M. X-Ray Investigations on Me-Si-B Systems. (Me=Mn, Fe, Co). Bertil Aronsson and Gunvor Lundgren. *Acta Chemica*

Scandinavica, v. 13, no. 3, 1959, p. 433-444. 23 ref. (M24c; Fe, Mn, Co, *Si*, B)

678-M. (Russian.) Phase Constitution of the Liquid System Nickel-Sulphur. S. E. Lyumkis, B. M. Mimukhin and L. L. Chermak. *Tsvetnye Metally*, no. 3, 1959, p. 29-32.

12 ref. (M24b; Ni, *S*)

679-M.* Temperature Dependence of Grain Migration in High-Purity Lead Containing Small Additions of Tin. K. T. Aust and J. W. Rutter. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 820-831.

Data on bicrystals of zone-refined Pb containing from 20 to less than 1 ppm. by weight of Sn. The apparent activation energy in the temperature range from 320 to 200° C. is markedly dependent upon the solute Sn concentration and the orientation relationship of the grains adjacent to the grain boundary. 28 ref. (M26b, 2-60, 2-61; Pb-a, *Sn*)

680-M.* Preferred Orientation in Extruded Aluminum Rod. C. J. McHargue, L. K. Jetter and J. C. Ogle. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 831-837.

Orientation as a function of extrusion temperature, extrusion speed and position in the rod. Duplex <111> - <001> textures were developed for slow extrusion speeds at temperatures of 75 to 850° F. and for fast extrusion speeds at temperatures of 75 to 450° F. The <001> textures component is primarily due to recrystallization occurring during fabrication. 36 ref. (M26c, F24, 2-61, 3-67, N5; Al, 4-55)

681-M.* Observations on the Decomposition of Delta Phase in a Copper-Tin Alloy. Ronald D. Nelson and D. H. Polonis. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 874-875.

Delta decomposition in Cu-Sn alloy powders containing 32.6% Sn. Alloy lump specimens exhibited entirely delta phase after fairly slow cooling (air cooling) from above 350° C. Only delta phase was detected by X-ray diffraction in powders which were heat treated 4 hr. at 450° C. and air cooled to room temperature. Lattice parameter of delta was found to be 17.92A. 6 ref. (M24b; Cu-b, *Sn*)

682-M.* (German.) Determination of Structure of Nitrided Zones With Optical and Electron Microscopy. M. Koch. *Metalloberflache*, v. 13, Aug. 1959, p. 242-245.

Structure as dependent on nitriding process and also steel composition. (M21e, M27, J28k; ST)

683-M.* (German.) Use of the Electron Microscope in the Investigation of Corrosion and Protective Films. M. Hollo and F. Guba. *Metalloberflache*, v. 13, Sept. 1959, p. 273-276.

Electron microscopy of polished pure Al surfaces, after annealing at 300-600° C., to determine the theoretical diffusion conditions along the grain boundaries. Lattice structure and pore diameter of Al oxide layers. (M21e, M27f, M26, 2-64; Al-a)

684-M. The Measurement of Grain Contiguity in Opaque Samples. J. W. Cahn and J. E. Hilliard. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 759-761.

The degree of contiguity (or contact) between adjacent grains are described by three parameters which can be rigorously determined from measurements on a random plane of polish. (M27c)

685-M. (French.) Structural Changes in Refractory Steels and Alloys Used in Furnaces for Gas Carburization. G. Pomey. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Oct. 1959, p. 471-483.

9 ref. (M26, N8r; SS)

686-M.* Electron Diffraction Studies of Structure Changes in Vacuum-Deposited Films. Rudolf Thun and George Hass. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 58-71.

Data on crystal growth, changes of crystal orientations, transitions from an amorphous to a crystalline modification or from one crystalline phase to another, reactions between solids and reactions between a gaseous and a solid phase. 16 ref. (M22h, M26, 1-73; 8-72, 14-62)

687-M.* Texture of Evaporated NiFe Thin Films. R. R. Verderber. *Journal of Applied Physics*, v. 30, Sept. 1959, p. 1359-1363.

Determination of the texture of thin NiFe films to obtain quantitative pole figures. Films of a thickness of 1000 or 2000 Å were deposited on glass slides under vacuum condition. Method of determination utilizes X-ray reflection technique and employs a reflection goniometer. (M26c; Ni-b, Fe, 14-62)

688-M.* Phase Diagram of Rubidium to 150,000 Kg/Cm² and 400° C. F. P. Bundy. *Physical Review*, v. 115, July 15, 1959, p. 274-277.

Correlation between pressure, temperature, electrical resistance and melting temperature is found by experimental measurements. A room temperature transition is found at 107,000 kg. per sq. cm. 10 ref. (M24a, P15g, 2-61, 3-74; Rb)

689-M.* (German.) Isolation of Microconstituents in Nickel Alloys. C. Ilschner Gensch. *Technische Mitteilungen Krupp*, v. 17, Sept. 1959, p. 130-136.

Ideal electrolytic isolation conditions determined by current curves. Microscopic analysis of the isolated phases; lattice structure. 8 ref. (M23s, M26; Ni-b)

690-M.* (Japanese.) Investigation on the Phase Diagram of the System Al-Zn-Mg. Hisafuji Watanabe. *Japan Institute of Metals, Journal*, v. 23, May 1959, p. 285-288.

Diagram was obtained by inverse rate thermal analysis, electric resistance measurement, X-ray analysis and microscopic observation. (M24c; Al-b, *Zn, Mg*)

691-M.* (Japanese.) Fine Bands Appearing in an Electron Micrograph of Martensite in Kovar. Zenji Nishiyama, Ken'ichi Shimizu and Ryusuke Kawanaka. *Japan Institute of Metals, Journal*, v. 23, May 1959, p. 311-314.

Observation of the fine lamellae in the martensite in Kovar using replicas. Lamellae are hardly seen in the surface relief, but are clearly revealed by light etching of that surface. (M20r; Co-b, *Ni, Fe*)

692-M.* (Japanese.) Study of the Crystal Structure of Zinc Powders by X-Ray Diffraction Method. Pt. 6. Reactivity of Zinc Powders. Yoshio Kubota. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 448-452.

Relationship between crystal structure and chemical reactivity of caustic electrolytic Zn powders. 14 ref. (M26, P13b, H10b; Zn, 6-68)

693-M.* (Japanese.) Equilibrium Diagram of the System Ti-Al. Tomo-o Sato, Yen-Chien Huang and Yutaka Kondo. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 456-460.

Emphasis is placed on Ti-rich portion of system. Phase equilibria, compositions and reactions at high temperatures; structure of various solid phases. 11 ref. (M24b, M27; Ti-b, *Al*)

694-M.* (Japanese.) An X-Ray Study on the Structure of Ordered Guinier-Preston Zone Formed in Aged Magnesium-Rich Magnesium-Silver Alloys. Shin'ichi Nagashima. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 460-464.

Two zones existing in a 12.6% Ag magnesium alloy are of platelet and oblate elipsoid form. The second zone possesses an ordered arrangement of Ag atoms. 6 ref. (M26p, N7a, M21f; Mg, *Ag*)

695-M.* (Japanese.) An X-Ray Study on the Structural Aging Characteristics of Magnesium-Rich Magnesium-Silver Alloys. Shin'ichi Nagashima. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 465-468.

Effect of aging time and temperature on the formation of Guinier-Preston zones and gamma phase precipitates in a 12% Ag alloy. 5 ref. (M26, M27d, M21f, 2-65, 2-61; Mg-b, *Ag*)

696-M. (French.) Microscopic and Electron Diffraction Testing of Thin Titanium Foils Containing 7.10 or 15% Al. A. Saulnier and M. Croutzeilles. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 379-387.

13 ref. (M21, M22h; Ti-b, *Al*, 4-56)

697-M. (French.) Creation of Fine Grain in Uranium by Small Additions and Heat Treatment. H. Aubert and J. Gerland. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 393-402.

8 ref. (M27c, 2-64, 2-60; U, AD-p35)

698-M. (Russian.) Method to Determine Phase System in Binary Alloys. I. B. Borovskii and I. D. Marchushkova. *Doklady Akademii Nauk SSSR*, v. 125, Apr. 1959, p. 835-837.

Suggested method is more simple than the combination of chemical, X-ray and dilatometric tests. 7 ref. (M24b, 1-54)

699-M. (Russian.) Characteristic Temperatures of a Copper-Aluminum Alloy From 96 to 803° K. A. S. Kagan and Ya. S. Umanskii. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 143-145.

Temperatures of X-ray diffraction maxima. (M22g, 2-61; Cu-b, *Al*)

700-M. (Russian.) The Titanium-Aluminum-Columbium System. M. V. Mal'tsev, G. P. Danilova and A. R. Avidon. *Izvestiya*

VUZ-Tsvetnaya Metallurgiya, no. 5, 1959, p. 146-150.
(M24c; Ti-b, *Al*, *Cb*)

701-M. (Russian.) Electron Microscopy of Temperature Changes in Magnetic Structure of Ferromagnetics. I. S. Svitnikov, G. V. Spivak and I. M. Saraeva. *Izvestiya Akademii Nauk, SSSR*, v. 23, June 1959, p. 734-737.
(M21e, M27g; SGA-n)

702-M. (Russian.) Clarification of the Structure of Metals and Alloys by Cathodic Bombardment. V. E. Yurasov, G. V. Spivak and F. F. Kushnir. *Izvestiya Akademii Nauk, SSSR*, v. 23, June 1959, p. 746-749.
7 ref. (M20q)

703-M. Studies of Individual Dislocations in Crystals by X-Ray Diffraction Microradiography. A. R. Lang. *Journal of Applied Physics*, v. 30, Nov. 1959, p. 1748-1755.
Observation of individual imperfections within Si by X-ray diffraction images showing a projection of a crystal slice. (M22g, M22b, 3-71; Si-a, 14-62)

704-M. (Russian.) Structure of Oxides Forming on the Surface of Titanium. D. I. Lainer and M. I. Tsypin. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1209.
(M26r, R1h; Ti)

705-M.* (German.) Energy and Electrical Resistivity of High-Angle Grain Boundaries in Metals. A. Seeger and G. Schottky. *Acta Metallurgica*, v. 7, July 1959, p. 495-503.
Calculation of energy and electrical resistivity for a simple model of high-angle grain boundaries using the electron theory of metals. Comparison with measurements of grain boundary energy made on Ag and Cu. 16 ref. (M27f, P15g; Ag, Cu)

706-M.* Dislocation Arrangements in Aluminum Deformed in Tension or by Fatigue. R. L. Segall and P. G. Partridge. *Philosophical Magazine*, v. 4, Aug. 1959, p. 912-919.
The dislocation distribution in Al deformed in tension as a function of stress. At stresses up to 3 kg. per sq. mm. the distribution is extremely irregular; at higher stresses, up to the fracture stress, polygon boundaries are formed which become increasingly well developed with increasing stress. 19 ref. (M26b, 3-68, 3-66; Al)

707-M.* X-Ray Measurement of the Atomic Scattering Factor of Iron. Boris W. Batterman. *Physical Review*, v. 115, July 1, 1959, p. 81-86.
X-ray powder diffraction reflection intensities for Fe relative to Cu and single-crystal NaCl; atomic scattering factors determined independently from extinction, preferred orientation and surface roughness effects. Comparison with theoretical scattering from free-atom wave functions. (M22g, M25n; Fe-a)

708-M.* Dislocation Dynamics at Low Temperatures. J. Lothe. *Physical Review*, v. 115, Aug. 1, 1959, p. 543-550.
Derivation of creep rate at low temperature for stress-independent activation energy based upon a model for the nucleation and growth of kinks in dislocation lines below the Peierls energy barrier. Comparison with experimental data for pure single crystals of Al under conditions of single slip. (M26b, Q3n, 2-63; Al-a, 14-61)

709-M.* Dislocations and the Plastic Deformation of Crystals. Robert V. Coleman. *Yale Scientific*, v. 34, Oct. 1959, p. 19-21.
Edge and screw dislocations determined in pure Fe crystals by etch pit technique. Polygonization of crystals produced by annealing at 600-800° C. for a number of hours. (M26b, M20q, 3-68, 2-64; Fe-a, 14-61)

710-M. (Translation—AIP.) Study of the Imperfect Structure of Metallic Single Crystals by Neutron Diffraction. B. G. Liaschenko, D. F. Lituin, I. M. Puzei, G. Abov and V. S. Golovkin. *Soviet Physics, Crystallography*, v. 3, July 15, 1959, p. 147-152.
Intensity of diffraction reflections associated with neutron scattering in Ni alloys. (M22j; Ni, 14-61)

711-M. (Translation—Brutcher no. 4413.) Effect of Columbium on the Structure of Welds in Austenitic 18-8 steels. N. F. Lashko. *Avtomaticheskaya Svarka*, v. 11, no. 6, 1958, p. 84-87.
(M26, 2-60; SS-e, 7-51, *Cb*)

712-M. (Translation—Brutcher no. 4503.) Dendritic Segregation of Silicon in Steel. Ya. N. Malinochka. *Stal'*, v. 18, Dec. 1958, p. 1130-1132.
See item 137-M 1959. (M27, S11e; ST, *Si*, 9-69)

713-M. (Translation—Brutcher no. 4738.) Effect of Aluminum, Silicon and Chromium on the Primary Structure of Low-Carbon Steel. O. D. Moldavskii and A. P. Pronov. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo*, no. 2, 1959, p. 40-42.

Effects of Al and Si on the primary grain is explained by changes in the surface tension between the liquid metal and the developing crystal. The grain size was not changed by addition of 0.5-3% Cr. 7 ref. (M27d, P13h, 2-60; CN-g, *Al, Si, Cr*)

714-M. (Translation—ConBur.) Investigation of the Structures of Liquid Bi-Sn Alloys. N. V. Alekeev and Ia. I. Gerasimov. *Proceedings of the Academy of Sciences of the USSR, Physical Chemistry Section*, v. 121, July-Aug. 1958, p. 521-525.

Radial distribution and normalized intensity curves. 5 ref. (M26; Bi-b, Sn-b, 14-60)

715-M. (Translation—ConBur.) Interaction Between Plutonium and Other Metals in Connection With Their Arrangement in Mendeleev's Periodic Table. A. A. Bochvar. *Soviet Journal of Atomic Energy*, v. 5, Sept. 1958, p. 1177-1191.

Binary alloys, solid solutions and intermetallic compounds of Pu with respect to the atomic number and atomic weight of the other constituent. Phase diagrams of the more important Pu alloys; structural data of compounds. (M24b, 2-60, 2-61; Pu, 14-67, 14-68)

SECTION N

TRANSFORMATIONS and RESULTING STRUCTURES

1-N.* Preparation of Single-Crystal Ingots of Silicon by the Pulling Technique. E. Billig and D. B. Gasson. *Journal of Scientific Instruments*, v. 35, Oct. 1958, p. 360-365.

Construction and operation of a laboratory furnace for preparing monocrystals of Si by the pulling technique. Design allows close observation of the growth front of the ingot during preparation. It has been found possible to assess the quality of high-grade Si and to obtain an indication of the concentration of dominant impurities responsible for the measured resistivity by comparison with computed distribution curves. (N3r, X24f, 14-61; Si)

2-N.* Recrystallization of Tungsten Wires. G. L. Davis. *Metallurgia*, v. 58, Oct. 1958, p. 177-184.

Tungsten wires recrystallize first by formation of a columnar structure with good retention of strength and ductility, while at higher temperatures secondary recrystallization occurs with embrittlement and lowered strength. The practically important temperature for onset of this coarsening is very sensitive to the nature of the starting material and its history. 17 ref. (N5; 4-61, W)

3-N.* (Russian.) Phase Transformation Gamma → (Gamma + Alpha) in Iron-Nickel Alloys. M. I. Zakharova, I. A. Ignatova and N. A. Khatanova. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 475-479.

The transformation in Fe alloy with 30-32% Ni is very slow at 400° C.; cold deformation at room temperature does not accelerate the gamma-to-alpha transformation; deformation of an alloy subjected previously to martensite transformation at -196° C. quickens the reverse gamma-to-alpha transition. (N6p; Fe, Ni)

4-N.* (Russian.) Transition of White Into Gray Tin. A. I. Bykhobskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 487-495.

New data regarding initial transition stage of beta-to-alpha Sn brought about by mercury surface diffusion; other methods give the final transition stages. Surface diffusion occurs in thin layers. The diffusion coefficient sharply increases in the presence of lattice tension. Effect of accelerated Hg surface diffusion is sharply noted in distorted surfaces and lowered temperatures. Transition is similar to martensite transition. 11 ref. (N6p, N1; Sn, Hg, 2-61)

5-N.* (Russian.) Microkinetics of Martensite Transformation. V. N. Arskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 496-504.

A 45% C, 19% Ni steel hardened at 1200° C. and having austenitic structure at room temperature was subjected to elongated deformation and lowered temperature. The process of martensite formation under these conditions consists of separate consecutive impulses. In one impulse (about 10^{-2} sec.) a large quantity of martensite crystals is formed. These can be expressed by a kinetic curve of phase transformation. There is no transformation between impulse intervals notwithstanding increased tension or lowered temperature. 13 ref. (N8p, 2-61, 3-68)

6-N. Use of Radioisotopes in Studies of Intermetallic Diffusion. David Lazarus. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/834, 1958, 17 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $.50.

By determining the diffusivity of various tracers at several different temperatures activation energies for the diffusion process can be determined to an accuracy of about 1%. Measurement of the diffusion of impurities in a pure metal, compared with the rate of self-diffusion, has provided quantitative rules for predicting a number of important properties of various alloys of the base metal. (N1c, 1-59)

7-N. (Japanese.) Chemical Composition and Graphite Spheroidization of Imported Pig Irons. I. Aoki and T. Tottori. *Japan Foundrymen's Society, Journal*, v. 30, Aug. 1958, p. 633-636.

(N8q, 2-60; CI-a)

8-N. (Russian.) Diffusion in Limited Solid Solutions of Nickel. A. Ia. Schiniaev. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 450-455.

Diffusion in systems: Ni-Ti; Ni-Ti-Cr and Ni-Ti-Cr-W-Al carried out at 920 - 1250° C. Iron was used as a diffusing media but was not a part of any of the alloys. 16 ref. (N1e; Ni, Ti, Cr, W, Al, 14-67)

9-N. (Russian.) Grain Sizes and Distortion Changes of the Second Order of Alpha and Gamma Phases in the Tempering of Hardened Chromium Steel. Z. K. Kosko. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 480-482.

Investigation of thin crystalline structure change in carbide transition from one formation into another. Appearance of a special carbide corresponds to large distortion of the second crystalline lattice order. In alpha and gamma phases, carbide separations are accompanied with granulations and a sudden distortion drop in the crystalline lattice of the second order. 3 ref. (N8a, M27c, 3-68, 2-64; AY, *Cr*)

10-N. (Russian.) Strain Relaxation in Nickel and Copper. M. G. Gaidukov and V. A. Pavlov. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 517-521.

Under load, the alloy undergoes an intensive diffusion process accompanied by vigorous strain relaxation. Experiments were carried out at 500 to 650° C. with an initial force of 2-4 kg. per sq. mm. At diffusion, during strain relaxation, an uneven atomic distribution occurs over the alloy mass, with complex atom formation; this is accompanied by reduced intensity of relaxing processes. 10 ref. (N1, N4, M25; Cu-b, Ni-b)

11-N. (Russian.) Determination of the Parameters of Diffusion for Iron and Chromium in Their Alloys. L. I. Ivanov and N. P. Ivanchev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, Aug. 1958, p. 15-18.

Diffusion parameters for the alpha range for alloys with 26.17-82.50% Cr, 0.09-0.90% Al, 0.09-0.12% Si, 0.19-0.56% N, 0.016-0.03% P, 0.012-0.023% C. Tests were carried out at temperatures higher than the range of sigma phase precipitation. 12 ref. (N1c; Fe, Cr)

12-N.* Discontinuous Precipitation From Solid Solutions of Cadmium in Copper. Martii Sulonen. *Academiae Scientiarum Fennicae, Annales*, 1957, 68 p.

Structural changes in discontinuous precipitation and its kinetics. Metallographic methods used; microstructural changes and quantitative kinetic data. 66 ref. (N7b, N3m, N2g; Cu, *Cd*)

13-N.* Self-Diffusion in Silver During Plastic Deformation in Extension and Compression. J. B. Darby, Jr., C. T. Tomizuka and R. W. Balluffi, *University of Chicago, Institute for the Study of Metals*, Sept. 1958, p. 340-356.

Self-diffusion of Ag^{110} in single crystals subjected to simultaneous deformation at 800 and 900° C., using the sectioning technique. Crystals were orientated for duplex slip and deformed in extension and compression at constant strain rates. Recrystallization occurred in the initially single crystal specimens during diffusion-deformation under all conditions except tension at 800° C. Effect of straining on rate of diffusion was found to be small. 21 ref. (N1d, Q24; Ag, 14-61, 3-68)

14-N.* Stability Relationships in Cast Irons and Their Representation. W. A. Oates. *Australian Institute of Metals, Journal*, v. 3, May 1958, p. 76-83.

Factors affecting the occurrence of carbide and graphite in cast irons discussed in terms of thermodynamics and kinetics of precipitation reactions. Carbon potential-temperature diagrams. 25 ref. (N8s, E25n; CI)

15-N.* Diffusion of Hydrogen in Palladium. P. A. Silberg and C. H. Bachman, *Journal of Chemical Physics*, v. 29, Oct. 1957, p. 777-781.

Rate of flow of hydrogen through Pd measured in a range of 200 to 600° C. over the pressure range 10 to 70 cm. Hg. Flow rate is found insensitive to Pd wall thickness. Data not explainable in terms of existing theory. 20 ref. (N1a, N1b; Pd, *H*)

16 N.* Recrystallization of Tungsten Wires. G. L. Davis. *Metallurgia*, v. 58, Nov. 1958, p. 228-232.

Tungsten wires recrystallize first by formation of a columnar structure with good retention of strength and ductility. At higher temperatures secondary recrystallization occurs with embrittlement and lowered strength. Kinetics of the process. 30 ref. (N5f; W, 4-61)

17-N.* Growth of Crystal Whiskers. F. R. N. Nabarro and P. J. Jackson. Paper fr from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 14-101.

Proper whiskers are differentiated from whiskers grown from vapor, from the melt, from solutions and from those formed by chemical decomposition, under mechanical stress and by electrolysis. Current theoretical and experimental evidence. 250 ref. (N3r, 14-61)

18-N.* Growth of Metal Whiskers From the Solid. W. C. Ellis, D. F. Gibbons and R. G. Treuting. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 102-120.

Growth of Sn, Zn and Cd whiskers from the solid as a process of grain growth or recrystallization and growth entailing mass transport. A nucleating crystal of critical size grows from the surface to produce the whisker. Effect of strain and X-rays on growth; growth from vapor-plates on glass; observed growth directions, kinking and growth rates. 42 ref. (N3r; 14-61, Sn, Zn Cd)

19-N.* (German.) Recrystallization in Highly Heat Resistant Materials on a Nickel-Chromium and Cobalt-Nickel-Chromium Base. Werner Jellinghaus and Wilhelm Wink. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 559-566.

Microscope, X-ray and hardness tests for recrystallization behavior. The recrystallization temperature were found to be around 760 to 1000° C., regardless of composition. 21 ref. (N5f, 2-60; Co, Cr, Ni, *Mo, V, W*)

20-N.* (Polish.) Recrystallization of Austenite in Structural Steel After Hot Plastic Deformation. Stanislaw Gorczyca. *Hutnik*, v. 25, July-Aug. 1958, p. 269-278.

Deformation in crystal structure, splintering in blocks of mosaic structure and crushing and deformation of grains in hot plastic deformation were found as process of recrystallization was investigated. Velocity of crystallization of austenite depends, to a high degree, on temperature and velocity of increase of new grains. Value of energy of activation approximates energy of activation of self-diffusion of Fe on boundaries of grains. Velocity of process of recrystallization depends on chemical composition of austenite. (N5f, N1d, 2-60, 3-68; ST)

21-N.* (Rumanian.) Cooling Curves for Nodular Graphite Cast Iron. L. Sofroni. *Studii şi Cercetări de Metalurgie*, V. 1, July-Dec. 1956, p. 241-259.

Cooling curves of nodular cast iron are different from those of gray iron in as much as the eutectic transformation takes place with supercooling (20-40%) while its duration is shorter. The difference is due to the fact that in iron with no nodular graphite the graphitization during the eutectic conversion is poorly developed in comparison with gray iron. As soon as the nodular form of the graphite changes to a foliated or interdendritic form (because of an insufficient quantity of Mg. the cooling curves of cast iron treated with Mg assume a character similar to

that of gray iron. An increase in the Mg and P content causes an increase in the degree of supercooling in the eutectic transformation; increase in C and Si reduces the degree of supercooling, while the duration of the eutectic transformation increases.) 23 ref. (N8q, M23r; CI-r, Mg, P)

22-N. Formation of Oil Pores in Nickel Electrodeposits. K. Sommer. *Metal Finishing Journal*, v. 4, Nov. 1958, p. 438-440.

5 ref. (N12d; Ni, NM-h)

23-N. Theory of Phase Transformations in Alkali Metals. M. A. E. Nutkins. *Physical Society, Proceedings*, v. 72, Nov. 1, 1958, p. 810-822.

Phase changes in Li and Na. 10 ref. (N-general; Li, Na)

24-N.* (French.) Relationships Between Allotropic Transformations and Substructures of Uranium. P. Lacombe. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 11-20.

Substructures forming at high temperatures (around 800° C.) in the transformation gamma—beta. Effect of impurities; cooling speed, internal friction. 17 ref. (N6p, 2-62; U)

25-N.* (French.) Comparison of Allotropic Transformations in Iron and Uranium. P. Lehr and J. F. Langeron. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 47-56.

The change from alpha to beta U as well as the change from alpha to gamma Fe seems to be governed by the formation nuclei from which the new grain develops. In the case of U, however, no connection appears between the orientations of the alpha and beta phases. In both metals, internal stresses developed in the structure transformation caused volume changes to the order of 1%. The recrystallization of U without previous cold working can be explained by those internal stresses. 17 ref. (N6p, 2-61; U, Fe)

26-N.* (French.) Competition Between the Recrystallization and the Polygonization of Aluminum and Solid Solution of Aluminum-Zinc. J. Montuelle. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 115-124.

Studies on pure (99.95 to 99.999%) Al and Al-Zn alloy with 6 to 15% Zn. In gradual heating of pure Al for stress-relieving a polygonization structure can be obtained. The presence of other elements (e.g., Fe) retards polygonization and recrystallization can take place. 15 ref. (N4, N5, 2-64, 2-60; Al-a, Al-b, *Zn*, 14-67)

27-N.* (German.) Oxygen and Strain Aging of High-Purity Iron. Walter Janiche and Herbert Beck. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 643-651.

With increasing temperature, the hardness of high-purity Fe was affected by O in a manner similar to that of C and N. Strain aging is influenced by O and could be caused by O. 18 ref. (N7e, Q29n, 2-61; Fe-a, *O*)

28-N. Fatigue and Aging. F. Bollenrath. *North Atlantic Treaty Organization Advisory Group for Aeronautical Research and Development*, Report no. 157, Nov. 1957, 20 p.

Supersaturated solid solutions of Al alloys and steel have a fatigue strength considerably higher than the same material in the stable or equilibrium state. Aging is influenced by oscillating plastic strain; heat is generated by vibrational plastic strain. 14 ref. (N7a, Q7; Al-b, ST)

29-N.* Growth of Crystals of Pure Materials and of the Solvents of Solutions. Bruce Chalmers. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 291-309.

Crystal growth from solutions and crystal growth from the melt. Alloys of Ge and In; effect of crystal growth on composition and temperature; dendritic growth; origin of the perfections. 15 ref. (N12; Ge-b, In-b)

30-N.* Growth of Silicon Crystals Free From Dislocations. William C. Dash. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 361-385.

Sources of dislocations in all phases of the growth of Si crystals by the Czochralski method investigated by etching and Cu

decoration techniques. Poor epitaxy and surface damage in the seed are important sources at the commencement of growth. In the bulk of the crystal only plastic generation forms dislocations which propagate by growth. Segregation of some impurity, possibly silicon carbide, in the form of dendrites was found at the tip of most crystals. 25 ref. (N12, M26b; Si)

31-N.* (German.) Recrystallization Capacity of Copper After Deformation by Tension Followed by Compression. H. Borchers and A. Schafer. *Metall*, v. 12, Nov. 1958, 980-984.

Compression after tensile deformation increases the hardening and strengthening effects, as an additional tensile deformation does. The recrystallization capacity, however, does not reach the same value as with an additional tensile deformation. 19 ref. (N5, Q28, 3-68; Cu)

32-N.* (German.) Activation Energy and Grain Growth Speed in the Recrystallization of Copper. A. Schafer. *Metall*, v. 12, Nov. 1958, p. 996-999.

Constants for speed of growth as well as the activation energy were determined for deformations of 11, 14 and 16%. 10 ref. (N5f, N3m, P13a; Cu)

33-N.* (Ukrainian.) Spheroidizing, Coalescence, Graphitization of Cementite in Deformed Pearlite. K. P. Bunin, O. O. Baranov and E. N. Pogribhoi. *Dopovidi Akademii Nauk Ukrainskoi R.S.R.*, v. 9, 1958, p. 961-965.

Microscopic investigations of annealed and deformed pearlitic Si steel established that spheroidizing, coalescence and graphitization of cementite are greatly accelerated in the traces of slip and dislocations, especially at the point of their intersection. 15 ref. (N8q, N8s; AY, *Si*)

34-N. (French.) Relationship Between Deformation and Recrystallization Structures. T. J. Tiedema. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 21-32.

Cubic recrystallization structure thought to develop when there are true twin crystals present in the deformation structure. X-ray diagrams obtained by the methods of Guinier and Tennevin and Laue. Different theories of formation of cubic structure. 28 ref. (N5f)

35-N. (French.) Relationships Between Polygonization and Recrystallization and Problems Set by the Recrystallization Theories. R. W. Cahn. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 33-40.

22 ref. (N5f)

36-N. Dimensional Instability of Uranium. Pt. 3. R. Resnick, L. S. Castleman and L. Seigle. Sylvania Electric Products. U. S. Atomic Energy Commission SEP-249, June 30, 1958, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Anisotropy in the self-diffusion coefficient of U; effects of grain and subgrain size on growth characteristics of irradiated U. Magnitude of diffusion anisotropy in alpha-U single crystals determined by measurement of self-diffusion coefficients along principal crystallographic directions. (N1, P10d; U, 2-67)

37-N.* (French.) Influence of Heat Treatments in the Gamma Phase on the Appearance of Substructures in Uranium and Low Chromium Content Uranium-Chromium Alloys. A. Robillard, D. Calais and P. Lacombe. *Revue de Metallurgie*, v. 55, Sept. 1959, p. 815-828.

Conditions of gamma phase annealing of U followed by cooling which produce recrystallization substructures different from those due to polygonization of alpha U. Substructures are caused by concentration of impurities at dislocations induced by stresses accompanying allotropic beta→gamma or gamma→beta transformation. Similar heat treatments on 1.4% at. Cr U-Cr alloys in which beta phase can be stabilized by quenching at room temperature confirm that polygonization takes place in the gamma→beta direction. Former beta and gamma grain boundaries superimposed on the alpha phase can be distinguished. 20 ref. (N6p, 2-64; U-b, *Cr*)

38-N.* (French.) Comparative Study of the Allotropic Transformation of Iron and Uranium. P. Lehr and J. P. Langeron. *Revue de Metallurgie*, v. 55, Sept. 1958, p. 829-839.

Alpha ⇌ beta transformation in U takes place, as does alpha ⇌ gamma change in Fe, through a process of nucleation and

grain growth. However, change in volume which accompanies these transformations causes appearance during formation and development of nuclei of the new phase of stresses of sufficient magnitude to entail a true plastic deformation of the metal. Characteristics of this deformation and its structural consequences. 17 ref. (N6p; Fe, U)

39-N. (Translation.) Patenting Rope Wires. A. Rose, L. Rademacher and K. Schemmer. *Wire Industry*, v. 25, Nov. 1958, p. 1037-1039. (Previously abstracted from *Stahl und Eisen*), July 10, 1958.

See item 426-N, 1958. (N8f, J25, 2-64; ST, 4-61)

40-N. (Translation-Brutcher, 4387.) Phase Composition of Austenitic Chromium-Nickel Steels With Titanium. V. I. Prosvirin. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 2-5.

Raising the hardening temperature from 900 to 1250° C. and holding it for 1 hr. does not bring about full solution of secondary phases. Number of secondary phases, after hardening, is greater in steels containing less Ti. Ni content in residual secondary phases, after heating to high temperature, is small and after hardening at 1250° C. is not present at all. Ti occurs in secondary phases, after hardening, at any temperature. In aging, Ti separations depend upon Ti content and temperatures. Ni in secondary phases is insignificant when aged at 700° C., but increases at 800° C. Fe and Cr atoms disappear from hard solutions when aging is at 800° C. Changes in dissolved alloying elements in austenite bring about changes in parameter of austenitic lattice. (N8, N7a, 2-60, 2-61, 2-64; SS, *Ti*)

41-N. (Translation-Brutcher, 4388.) Isothermal Transformation Diagram for Spheroidal Cast Iron During Heat Treatment. D. Rasheev. *Metallovedenie i Obrabotka Metallov*, Oct. 1958, p. 5-10.

Applicable to initially formed pearlite-ferrite structures. Useful to establish proper temperature range and time interval necessary for heat treating, tempering, normalizing. (N8g, 2-61, 2-64; CI-r)

42-N. (Translation-SLA, R-4466.) Determinining Depth of Liquid Phase and Crystallization Front in a Steel Ingot During Continuous Steel Casting. V. S. Rutes and A. G. Il'in. *Zavodskaya Laboratoriya*, v. 22, no. 1, 1956, p. 49-52.

(N12, D9q; ST, 5-59)

43-N. (Translation-SLA, R-4810.) Investigation of the Diffusion of Boron and Carbon in Certain Metals of Transition Groups. G. V. Samsonov and V. P. Latisheva. *Fizika Metallov i Metallovedenie*, v. 2, no. 2, 1954, p. 309-319.

See item 370-N, 1956. (N1; B, C)

44-N. (Translation-SLA, NRC-C-2579.) Isothermal Decomposition of Austenite and Martensite in Unalloyed Steels Within a Temperature Range of 100 to 400° C. by Solvent Etching Methods. H. K. Gorlich and H. Goossens. *Archiv fur das Eisenhuttenwesen*, v. 27, no. 2, 1956, p. 119-126.

See item 179-N, 1956. (N8g; ST)

45-N. (Translation-SLA, 58-1658.) Surface Reactions on Stainless Steels. T. N. Rhodin. *Journal de Chimie Physique*, v. 54, 1957, p. 72-89.

See item 237-N, 1957. (N15d, P13d, R1h; SS)

46-N.* Ageing Characteristics of Two Commercial Alloys Based on the Aluminium-Zinc-Magnesium System. I. J. Polmear and P. Scott-Young. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 65-70.

Hardness/aging-time curves for 75S and D.T.D. 687 were determined in the range 20-200° C. and compared with those for a pure ternary alloy with similar Zn and Mg contents. Effect of prior cold work on the commercial alloys was also studied. Number of stages in the aging of the ternary alloys is not changed by the presence of Cu, Cr or Mn, although the first stage appears to be modified by the presence of Cu. 23 ref. (N7a, Q29n, 2-60; Al, Zn, Mg, *Cu, Cr, Mn*)

47-N.* Kinetics and Morphology of the Allotropic Transformation of Cobalt. Herve Bibring, Francois Sebilleau and Charlotte Buckle. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 71-76.

The orientation relationship between the two phases leads to the conclusion that the cubic phase may be twinned. Observations on twinning due to the beta-to-alpha transformation and detwinning during the reverse alpha-to-beta transformation throw light on the nucleation conditions in Co. Inhomogeneous stresses are

chiefly responsible for the initiation of the transformation. 6 ref. (N6p; Co)

48-N. Theory of Diffusion-Limited Precipitation. Frank S. Ham. *Journal of Physics and Chemistry of Solids*, v. 6, Sept. 1958, p. 335-351.

Time dependence of the unprecipitated fraction of the excess-solute for small spherical, spheroidal and cylindrical particles. 32 ref. (N7b)

49-N.* (Russian.) Influence of Irreversible Changes Arising in Structure During Plastic Deformation. S. Z. Bokshtein, T. I. Gudkov and A. A. Shukhobitskii. *Doklady Akademii Nauk SSR*, v. 121, no. 6, 1958, p. 1015-1018.

Influence of preliminary plastic deformation at high temperatures on diffusion of Sn in Ni. 10 ref. (N1, 3-68; Ni, *Sn*)

50-N.* (Russian.) Values of Self Diffusion Activation Energy in Liquid Metals. K. A. Osipov. *Doklady Akademii Nauk SSR*, v 121, no. 6, 1958, p. 1019-1020.

Self-diffusion in liquid metals, in contrast to solid metals, is connected with individual rather than group activation of atoms. Individual atom activation in solid metals during self-diffusion can only take place at grain boundaries with high values at disorientation angle. 11 ref. (N1d; 14-60)

51-N.* (Russian.) Peculiarities of Magnesium Distribution During Annealing of Magnesium Treated Iron. M. A. Krishtal, I. P. Fominykh and E. P. Rikman. *Liteinoe Proizvodstvo*, Aug. 1958, p. 10-11.

Magnesium is soluble in silicon iron. It diffuses in austenite during annealing of nitrided steel with Mg. The solubility of Mg in metal is increased by increasing the Si content. In low-Si iron the Mg atoms are weakly held in the matrix and during annealing, even at low temperatures, they migrate into the graphite. Si lowers the coefficient of Mg distribution between the graphite and the matrix. 7 ref. (N12, N1e, 2-60; CI-r, *Si*)

52-N.* (French.) Orientation Relationships Between Crystals Formed by Recrystallization and Deformation Bands in Alpha Uranium. D. Calais, N. Mandin and P. Lacombe. *Comptes Rendus*, v. 247, Aug. 11, 1958, p. 646-649.

Monocrystals of alpha U of certain orientations develop deformation bands under tensile stress. When annealed, these bands produce recrystallized crystals, the orientation of which with respect to original crystal is conditioned by crystallography of mode of deformation. 4 ref. (N5, Q24c; U)

53-N.* (French.) Self-Diffusion of Uranium in the Gamma Phase. Y. Adda and A. Kirianenko. *Comptes Rendus*, v. 247, Sept. 1, 1958, p. 744-746.

Study conducted on diffusion couples composed of natural U and U^{234}-enriched U. Coefficients of self-diffusion of gamma U, energy of activation and factor of frequency. (N1d; U)

54-N.* Ductility in High-Temperature Rupture Tests. J. Glen. *Iron and Steel Institute, Journal*, v. 190, Sept. 1958, p. 30-39.

Considers strain-age-hardening occurring during high-temperature tensile tests of carbon and alloy steels, hardening effects occurring during creep tests resulting in transition in creep rate. Influence of alloying elements; tentative hypothesis to account for results. 19 ref. (N7e, Q23p, Q3, 2-60, 2-62, 3-68)

55-N.* (German.) Effect of Additions on the Equilibrium of Nitrogen With Liquid Iron. Hermann Schenck, Martin G. Frohberg and Hans Graf. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 673-676.

With additions of Mo, Mn, Si, Cr and V, increased nitrogen is found in the melt. 36 ref. (N16m, 2-60; Fe, N, O, S, Co, Ni, *Cu, Sb, As, Sn, Mo, Mn, Si, Cr, V*, AD-q)

56-N.* (German.) Austenite-Martensite Transformation in Iron-Nickel Single Crystals Influenced by Tensile Stress. Albert Kochendorfer and Gerhard Otto. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 709-714.

Single crystals grown in a vacuum induction furnace from a melt. Martensite transformation point was at -30° C. Structure transformations at temperatures from +20 to -180 C. and under a tensile stress of 75% the ultimate strength studied. Tension favors an oriented martensitic structure. 5 ref. (N8p, 2-61, 3-66; Fe, *Ni*, 14-61)

57-N.* (German.) Shape of Epsilon Carbide Precipitated From Ferrite or Martensite During Tempering. Wolfgang Pitsch and Angelica Schrader. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 715-721.

Fiber-shaped epsilon carbide particles are precipitated forming a net in the {100} planes of the ferrite. In a similar way the alpha carbide precipitation from martensite takes place. 20 ref. (N8a, 2-61; Fe, ST, *C*, *Ni*)

58-N.* (German.) Annealing Kinetics of Martensite. Otto Krisement. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 723-729.

In annealing, carbon precipitation within the martensite needles as well as diffusion of carbon from the martensite into the retained austenite are assumed. The latter thought converted into carbide. 19 ref. (N8p; ST, *C*, *Si*, *Mn*, *P*, *S*, *Cr*, *Cu*, *Mo*, *Ni*)

59-N.* Initial Stages of Growth of Oriented Copper Nuclei on Single Crystal Surfaces of Silver. E. Grunbaum, R. C. Newman and D. W. Pashley. *Philosophical Magazine*, v. 3, Dec. 1958, p. 1337-1341.

Layers of metallic Cu of less than 1 Å in average thickness were deposited in a controlled manner on to smooth (111) surfaces of Ag inside an electron diffraction camera. An electron diffraction pattern from oriented Cu nuclei appears suddenly at some critical thickness. Possibilities for the initial structure of the deposit and for the change which occurs at the critical thickness; effect of substrate temperature. 4 ref. (N3, N2; Cu, 14-61, Ag)

60-N.* Transport Properties in Pure Liquid Metals. Norman H. Nachtrieb. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 49-55.

Viscous flow and diffusive properties of several liquid metals; theory of atomic movement in liquids. Inadequacies of the transition state theory and the concepts of holes or vacancies in describing movements of atoms in liquids. 12 ref. (N1c, N14, M25, P10f, 14-60)

61-N.* Nucleation in the Solidification of Metals. G. M. Pound. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 87-105.

Formal theory of heterogeneous nucleation in solidification; kinetics of crystalline, nucleus formation in supercooled liquid metals. Effect of nucleation catalyst. Heterogeneous nucleation of crystals from vapor using thermal beam method. Results indicate formal nucleation theory adequate for description of data in terms of contact angle theta; chemical factors are more important than lattice fit in determining potency in nucleation catalyst. 29 ref. (N2, N12)

62-N.* Mechanism of Growth. Kenneth A. Jackson. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 174-186.

Prediction of rates of crystal growth on the basis of surface nucleation theory, disclocation theory; calculating and measuring growth rates from growth from liquid, growth from vapor, rate of dendritic growth, changes in free energy of surface; mode of crystal growth including dendritic, faceted, diffusion control and intermediate forms. 21 ref. (N2g, N12b, N12c, N15g; 14-60)

63-N.* Imperfections Resulting From Solidification. J. W. Rutter. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 243-275.

Origin and properties of solidification structures in materials of metallurgical interest discussed in terms of variables, parameters and constants which govern solidification. Structural features include hexagonal cell structure, dendritic freezing, introduction of new grains during freezing, development of preferred orientations, occurrence of twins, striation structure and introduction of dislocations. 58 ref. (N2g, N12, M26)

64-N.* Polyphase Solidification. William A. Tiller. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 276-318.

Expressions relating to growth conditions and thermal and physical properties of binary alloying eutectics with the morphology of the solid phases. Mechanism of lamellae formations. Transitions of lamellae to rod and rod to globule; freezing anomalous autectics. Effect of ternary element on lamellar structure. Solidification of alloys of noneutectic composition. Formation of second-phase particles at grain boundaries during solidification of equiaxed grains. 30 ref. (N12p, N12q)

65-N.* Structure of Ingots and Castings. James L. Walker. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, 319-336.

Thermal conditions, characteristics of freezing in a mold and their influence on solidification kinetics and resulting structures. Rate of grain growth and nucleation in pure liquids and liquid containing solid impurities. Mechanism of nucleation catalysis. Thermal conditions during freezing in chill zone, columnar zone and equiaxed zone. Segregation, control of

grain size. 20 ref. (N2g, N3m, E25n, E25q; 4-51)

66-N.* (French.) Large Zirconium Crystals and Orientation of Zirconium Hydride Precipitations. J. P. Langeron and P. Lehr. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 901-906.

Crystals prepared by tensile strain and subsequent heating which gave crystals of several sq. mm. Crystals more than 1 sq. cm. in diameter were obtained by repeated cooling from the beta-phase at 150° C. per hr. and subsequent heating up to 820° C. during 90 hr. Hydrides found to be oriented in planes $\{10\bar{1}0\}$. 14 ref. (N3m, 2-61, 3-68; Zr-a)

67-N.* (French.) Deformation Structures of 18-10 Stainless Steel. Bernard Jaoul. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 976-992.

Deformation below room temperature caused the development of martensite; amount varies with stress applied; above room temperature, diffusion of carbon is possible and a bainitic-type transformation takes place. 20 ref. (N8m, N8p, 3-68, 2-61; SS-e)

68-N. Radiation Enhanced Diffusion in Solids. G. J. Dienes and A. C. Damask. *Journal of Applied Physics*, v. 29, Dec. 1958, p. 1713-1721.

Measurement of enhanced diffusion as a function of temperature can indicate the mechanism by which defects are removed from the lattice. Enhancement data for alpha-brass. (N1, 2-67, M26s; Cu-s)

69-N.* (Russian.) Low-Temperature Polymorphism of Metals. I. A. Gindin, B. G. Lazareva, Ya. D. Staraoubov and V. I. Chotkhe. *Zhurnal Experimental'noi i Theoreticheskoi Fiziki*, v. 35, Sept. 1958, p. 802-804.

Li, Na, Ce, Bi and Be were deformed at low temperatures to study the phenomenon of polymorphism, then the temperature of the deformed part was raised again and its dilatometric behavior observed. The experiments, as well as X-ray diagrams, show a wide distribution of low-temperature polymorphism. 6 ref. (N6p, M23b, P10d, 2-63, 3-68; Be, Bi, Ce, Ni, Na)

70-N. (Book.) Liquid Metals and Solidification. 348 p. 1958. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $7.50.

Papers presented at a Seminar during National Metal Congress, Chicago, Nov. 1957. Papers abstracted separately. (N12, N14, P12, 14-60)

71-N. (Translation—AIP.) Sublimation of Tellurium. S. A. Semenkovich and N. N. Astashev. *Soviet Physics, Technical Physics*, v. 3, no. 4, 1958, p. 677-682.

Method for preliminary pruification before zone melting, designed to give yield of 0.3-0.7 kg. per hr. or 1.5-2.5 kg. per sublimation. 4 ref. (N15g; C22, Te)

72-N. (Translation-BISI, 627; Brutcher, 3902.) A Study of the Diffusion of Boron and Carbon in Some Transition Metals. G. V. Samsonov and V. P. Latysheva. *Fizika Metallov i Metallovedenie*, v. 2, no. 2, 1956, p. 309-312.

See item 172-N, 1957. (N1, B, C)

73-N. (Translation-BISI, 1060.) Calorimetric Investigations on the Kinetics of the Isothermal Breakdown of Austenite of 12% Manganese Steel. G. Collette. *Archiv fur das Eisenhuttenwesen*, v. 28, Apr. 1957, p. 229-235.

See item 289-N, 1957. (N8; AY, *Mn*)

74-N. (Translation-Columbia.) Investigation of Dissociation in an Ni-Be Alloy. N. N. Buinov, L. I. Podrezov and M. F. Komarova. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 9, 1957, p. 1210-1215.

Aging of Ni-Be alloy. The phase transition is accompanied by a large volumetric change, usually strong ordering, considerable changes in the magnetic properties and segregation of a nonferromagnetic beta phase. 12 ref. (N10b, N7a, P16; 2-64, Ni-b, *Be*)

75-N. (Translation—Columbia.) Kinetics of Superstructure Transformations of Fe_3Al Alloy. V. E. Rode. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 9, 1957, p. 1225-1228.

Variation of the different physical parameters of Fe_3Al in process of ordering and degree of order in the alloy as determined from the intensity of the superstructure lines in the X-ray patterns. 4 ref. (N10b, M22g; Fe-b, *Al*)

76-N.* Structure of Electrodeposited Nickel. B. C. Banerjee and A. Goswami. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 20-23.

Electron diffraction study of the crystal structure, orientation and mode of

growth of Ni deposits from sulphate-chloride-boric acid and chloride-boric acid baths. Effect of pH, temperature, concentration, current density, mechanical stirring, hydrogen peroxide, nickel nitrate and sodium chloride additions and polycrystalline substrates. 12 ref. (N12d; Ni)

77-N.* Self-Diffusion in Silver During Plastic Deformation in Extension and Compression. J. B. Darby, C. T. Tomizuka and R. W. Balluff. *Journal of Applied Physics*, v. 30, Jan. 1959, p. 104-112.

Self-diffusion of Ag^{112} in Ag single crystals subjected to simultaneous deformation at 800 and 900° C. Crystals were orientated for duplex slip. Recrystallization occurred in the initially single crystal specimens during diffusion-deformation under all conditions except tension at 800° C. The effect of straining on diffusion was small in all cases. Increases in diffusion rate due to the generation of point defects and short-circuiting paths during deformation were slight. (N1d, Q24, 3-68, N5; Ag, 14-61)

78-N.* (French.) Origin of the Cubic Texture in Rolled and Recrystallized Copper. W. G. Burgers. *Metallurgia Italiana*, v. 50, Oct. 1958, p. 447-452.

Theoretical analysis based on assumption that a pronounced recrystallization texture can be formed as result of cooperative transformation of certain domains of preceding deformation texture. In present case, such a transformation is produced by a shear parallel to planes (111) of the compact cubic lattice described by Rowland. 11 ref. (N5, M26c; Cu)

79-N.* (German.) Electrolytic Transfer of Carbon, Chromium and Nickel in an Austenitic Cr-Ni Steel. Friedrich Erdmann-Jesnitzer and Peter Hammer. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 699-707.

Armco iron wires welded to Cr-Ni steel wires and exposed to direct current. Transfer of carbon to the Armco iron proved by micrographs and hardness tests. 20 ref. (N1e, N1h, 2-61; Fe, ST, *C, Cr, Ni*)

80-N.* (Japanese.) Palmer's Effect in Malleable Cast Iron. Yoshisada Ueda. *Japan Foundrymen's Society, Journal*, v. 30, Oct. 1958, p. 799-803.

Relation between preheating and change of rate of nitrogen content in iron. Palmer's effect appears most strongly for a preheating temperature of 500 or 600° C., which may be caused by decrease of soluble nitrogen. (N15, 2-61; CI-s, *Mn, S, Si*, AD-p)

81-N.* (Russian.) Austenite Tension During Crystallization of Martensite. B. Ya. Lyubov and A. L. Roitburd. *Doklady Akademii Nauk SSSR*, v. 120, no. 5, 1958, p. 1011-1014.

Following properties can be calculated in austenite matrix—tension, deformation and resilient energy. Results can be applied in analyzing growth of martensite crystals. (N8p)

82-N.* (Russian.) Critical Transition Point of Polymorphous Cerium. E. G. Ponyatovskii. *Doklady Akademii Nauk SSSR*, v. 120, no. 5, 1958, p. 1021-1023.

On the basis of pressure-temperature diagram and thermographic analysis suggests explanation of phase transition. (N6p; Ce)

83-N.* (Russian.) Mechanics of Inter-Adjacent Transformation of Austenite. L. I. Kogan and P. I. Etin. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 12-18.

Inter-adjacent transformation consists of redistribution of carbon, forming regions with either increased or decreased carbon concentrations. (N8)

84-N.* (Ukrainian.) Electro-Diffusion of Tungsten in Iron-Tungsten Alloy. I. M. Frantsevitch, D. F. Kalinovich, I. I. Kovenskii, V. V. Pen'kovskii and M. D. Smolin. *Dopovidi Akademii Nauk Ukrainskoi RCR*, no. 7, 1958, p. 736-738.

Tracer study of W migration in solid solution with Fe in a constant electric field. (N1, 1-59; W, Fe)

85-N. (Russian.) Oscillation and Resonance in Kinetics of Martensite Formation. H. V. Grum-Grshimailo. *Doklady Akademii Nauk SSSR*, v. 131, no. 5, 1958, p. 850.

Effect of chemical reaction on process of isothermal decomposition of austenite by calculating speed of reaction. Effect of ferromagnetic transformation is strongly evident in kinetics of austenite decomposition. (N8g, N8p)

86-N. (Russian.) Energy During Formation of Vacancies. K. A. Osipov. *Doklady Akademii Nauk SSSR*, v. 131, no. 5, 1958, p. 855-857.

Role of vacancies in process of self diffusion. 19 ref. (N1d, M26s)

87-N.* The Kinetics of Bainite Formation in a Plain Carbon Steel. P. Vasudevan, L. W. Graham and H. J. Axon. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 386-391.

Rate of isothermal decomposition of austenite in the 400-350° C. range for a 0.97% C plain carbon steel. Transformation was followed by a conventional dilatometer method and chemical analysis of combined C in partly or completely reacted specimens. A marked change in the kinetics of decomposition was observed at 350° C. Above 350° C. dilatometric and color-carbon measurements both give the same transformation/time characteristics. 21 ref. (N8m, M23b; CN)

88-N.* (Ukrainian.) Controlling Graphite Growth in Cast Iron. K. P. Bunin and A. V. Chernovoc. *Dopovidi Akademii Nauk Ukrain'skoi RSR*, no. 8, 1958, p. 831-834.

Effect of preliminary deformation on carbon diffusion rate compared with that of graphite growth. Deformation leads to acceleration of graphite growth with subsequent graphitization. (N8s, 3-68; CI)

89-N.* (Russian.) Structural Variations in Molten Aluminum With Changes in Temperature. V. M. Glazov and Yu. D. Chistyakov. *Izvestiya Akademii Nauk, SSSR*, July 1958, p. 141-143.

Data show absence of polymorphous transition in liquid Al, and substantial structural changes in a precrystallizing period. Solid and liquid Al crystals differ little from each other. (M12n, 2-61; Al-a)

90-N.* (Russian.) Effect of Surface-Active Agents on Diffusion Rate of Electrolytic Hydrogen Through Iron. A. N. Oshe. *Zhurnal Physicheskoi Khimii Akademii Nauk SSSR*, v. 32, July 1958, p. 1623-1631.

Effect of halide anions of organic additive agents of high molecular weight on the H_2 through Fe membranes during cathodic polarization in one normal sulphuric acid. (N1, P15, 2-66; Fe, H)

91-N.* (Ukrainian.) Effect of Plastic Deformation on Diffusion Rate in Nickel-Molybdenum Alloys. I. Ya. Dekhtyar and V. S. Mikhalenkov. *Ukrainskii Phizichnii Zhurnal Akademii Nauk, Ukrainskoi RSR*, v. 3, no. 3, 1958, p. 385-389.

Cobalt diffusion in Ni-Mo system in a range of 950-1150° C. in a single phase during plastic deformation. (N1, 3-68; Ni-b, Mo, Co)

92-N.* (Ukrainian.) Aging Mechanism of Lead Alloys. L. N. Larikov. *Ukrainskii Phizichnii Zhurnal Akademii Nauk, Ukrainskoi RSR*, v. 3, no. 3, 1958, p. 397-405.

Causes of stable state of Pb alloys aged at room temperature. (N7a; Pb-b, *Co*, Sn)

93-N.* Reduction of Passive Films by Hydrogen Diffusion Through Steel. R. T. Davis, Jr., and T. J. Butler. *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 563-568.

Diffusion of H through a steel specimen is followed by electrode-potential measurements. One surface is exposed to acid and the other to a sodium dichromate solution. Potential changes result from the reduction of the dichromate-produced passive film by diffused H. Effect of variations in steel composition and thickness, acid composition and concentration, and sodium dichromate concentration. 15 ref. (N1a; ST, *H*)

94-N.* Diffusion Into Silicon From Glassy Layers. J. E. Cline and R. G. Seed. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 700-701.

Diffusion of B into Si from glassy layers containing the system K_2O-SiO_2-B_2O_3. Glassy layers were prepared by dehydration of aqueous solutions of silicates or borates of K. The penetration of diffusant was determined after each diffusion run by carefully lapping down the Si slices and taking electrical measurements. Position of p-n junctions determined by hot-probe measurements. (N1; Si, *Bi*, 14-62)

95-N.* Preparation and Some Characteristics of Single Crystal Indium Phosphide. T. C. Harman, J. I. Genco, W. P. Allred and H. L. Goering. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 732-739.

Technique for purifying P, reacting elemental In and P, purifying the compound, InP, by directional recrystallization, and growing large crystals all in one glass tube. Electron mobility as a function of temperature is given for two single-crystal specimens. (N3r; In, P, 14-61)

96-N.* Preparation of Crystals of Pure Hexagonal SiC. D. R. Hamilton. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 735-739.

Growth of SiC crystals in laboratory furnaces in environment dominated by radiative change of energy. Orientation and habit of crystals are greatly influenced by nature of the radiative losses in the environment. Under normal experimental conditions crystal growth is unlikely to proceed by a two-dimensional nucleation mechanism. (N3r; Si, C, NM-a35, 14-61)

97-N. Transformation Kinetics of Plutonium. Pt. 2. A Study of the Gamma-to-Beta-to-Alpha and Alpha-to-Beta-to-Gamma Transformations. R. D. Nelson. Hanford Atomic Products Operation. *U.S. Atomic Energy Commission,* HW-56843, July 18, 1958, 21 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.25.

Rates of formation of the alpha and beta phases from the gamma phase determined after gamma heat treating and allowing a sample to transform isothermally in the alpha and beta ranges. The T-T-T curve of the gamma→beta→alpha transformation was plotted together with the effect of the gamma heat treating time and temperature on the rate of transformation. (N7c, 2-64; Pu)

98-N. The Solid Solubilities of Iron and Nickel in Beryllium. S. H. Gelles, R. E. Ogilvie and A. R. Kaufmann. Nuclear Metals Inc. *U.S. Atomic Energy Commission* NMI-1207, July 29, 1958, 36 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.

Solid solubility limits between 850 and 1200° C. obtained by analysis of differential-type multi-phase diffusion couples, using an X-ray absorption technique. A previously unreported high-temperature phase which decomposes eutectoidally at 1065° C. is found to exist in the Be-Ni system at a composition of approximately 8 at. % Ni. 16 ref. (N12p, N9; Be-b, *Fe, Ni*)

99-N.* (English.) Mechanism of Carbon Diffusion Peak in F.C.C. Iron-Nickel Alloys. Wu Tzu-liang and Wang Chi-min. *Scientia Sinica,* v. 7, Nov. 1958, p. 1029-1053.

At a vibrational frequency of 1.4 cycles per sec., the peak occurs at about 500° K. This peak arises under the influence of an oscillating load from the preferential rotation of the axes of carbon pairs existing in the specimen. These carbon pairs were formed by the interaction between the substitutional carbon atoms and their neighboring interstitial carbon atoms. 23 ref. (N1e; Fe, Ni, *C*)

100-N.* High-Pressure, High-Temperature Growth of Cadmium Sulfide Crystals. W. E. Metcalf and R. H. Fahrig. *Electrochemical Society, Journal,* v. 1505, Dec. 1958, p. 719-723.

Process for growing CdS crystals of uniform size, shape and homogeneity from the melt in an argon atmosphere at 1500 psi. Controlled cooling to cause a solid-liquid interface to move from the bottom to the top of the vertical cylinder of CdS at a slow and controlled rate results in the formation of single crystals weighing in excess of 100 g. 10 ref. (N12, N3r, 2-62; Cd, S, Nm-a37)

101-N.* (French.) Study of Nucleation of Graphite and Kinetics of Graphitization in Prehardened White Cast Irons. Pt. 3. Discussion of Results. P. Laurent and M. Ferry. *Fonderie,* Aug. 1958, p. 351-361.

Review of published experimental data and critical evaluation of theories advanced by others. (To be continued.) (N2g, N8s; CI-p)

102-N.* (German.) Precipitation in an Alloy With 15% Cr, 16% Mo and 55% Ni. Martin Protzl. *Archiv fur das Eisenhuttenwesen,* v. 29, Dec. 1958, p. 745-756.

Alloy was melted, cast into ingots, forged, heated to 1230° C., water quenched and machined into samples. Precipitation at temperatures ranging from 500 to 1300° C. studied. Diagram showing precipitation mechanism of carbides prepared. 47 ref. (N7b, 2-61, 3-67; Ni-b, *Cr,* Fe, *Mo, C*)

103-N.* (German.) Austenite-Martensite Transformation in Iron-Nickel Single Crystals Under Tensile Deformation. Albert Kochendorfer and Gerhard Otto. *Archiv fur das Eisenhuttenwesen,* v. 29, Dec. 1958, p. 775-784.

X-ray diagrams were obtained from Fe-Ni single crystals with 30% Ni, exposed to a tensile load during the austenite-martensite transformation. It was found that the martensitic orientation is influenced by tensile deformation. (N8p, 8-66; Fe, *Ni,* 14-61)

104-N.* Recrystallization of Molybdenum. G. L. Davis and P. J. Burdon. *Metal Treatment and Drop Forging,* v. 25, Dec. 1958, p. 495-502.

Recrystallization behavior of Mo wires fabricated from ingots of cast metal and

ingots made by sintering pressed powder compacts. Strength and ductility of the two materials at room and elevated temperatures after similar heat treatments differ significantly. Fine Mo wires drawn from stock made by powder metallurgy techniques have, in general, superior properties. Resistance to softening by recrystallization is greater and annealing treatments leave the powder-metallurgy wires more ductile and capable of withstanding deformation. 25 ref. (N5; Mo, 4-61, 5, 6)

105-N. Recrystallization and Grain Growth of Nickel. D. A. Douglas and J. R. Weir. Oak Ridge National Laboratory. Nov. 20, 1958. *U. S. Atomic Energy Commission,* ORNL-2406, 29 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Effects of cold work, annealing time and initial grain size on the recrystallization temperature. Deformations of less than 20% do not appreciably refine the grain structure. When the material has a coarse grain size prior to deformation, a somewhat higher temperature for recrystallization is required. (N5, N3; Ni)

106-N.* (German.) Micrographs of Unalloyed Cast Steel. Hans Reininger. *Giesserei-Praxis,* Nov. 25, 1958, p. 437-445.

After solidification ferrite prevails with some pearlite present; after normalizing at 910° C. and slow cooling a fine-grained structure of ferrite and pearlite appears; after hardening at 880° C. and oil quenching the micrograph shows martensite. (N8, 2-64; ST, 5-60)

107-N.* (Russian.) Termomagnetic Treatment in Order-Disorder. Pt. 2. A. A. Glazer and Ya. S. Shur. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 52-59.

Process of ordering is slower in ferromagnetics annealed in magnetic field than in disordered alloys, indicating that the structures of specimens in disorder and those annealed in magnetic field are different. Structural condition produced by thermomagnetic treatment is that of ordered superlattice. (N10b, 2-64; SGA-n)

108-N.* (Russian.) X-Ray Investigation of Recrystallization of Electrolytic Chromium by Means of Fine Primary Beams. V. I. Arkharov and F. L. Shangareev. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 82-88.

Experiment was evaluated by photomicrographs of Debye's X-ray lines recorded during the electrolytic deposition of Cr. Increase in current density results in lowering temperature of recrystallization. This dependence is correlated with the quality of deposition. 13 ref. (N5, L17, 2-61; Cr)

109-N.* (Russian.) Investigation of Self-Diffusion in Silver by the Terminal Deposit Method. S. D. Gertsriken and D. D. Tsitsiliano. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 89-94.

Basic advantage of this method is provision for measuring small coefficient of diffusion by means of a relatively brief annealing period. 5 ref. (N1d; Ag)

110-N.* (Russian.) Effect of Preliminary Plastic Deformation on Martensitic Transformation in Fe-Cr-Ni Alloys. G. V. Kurdyumov, O. P. Maksimova, A. I. Nikonorova, Z. D. Pavlenko and A. M. Yampolskii. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 95-105.

Effect of degree of preliminary deformation, influence of heating on stability of deformed austenite and isothermal transformation. Different changes in the fine crystal structure of austenite produced either facilitate development of nascent martensite by subsequent cooling or impede its formation. 11 ref. (N8, 3-71; Fe-b, *Cr,* Ni)

111-N.* (Russian.) Effect of Rate of Heating on the Manifestation of Consequent Structure of Austenite in Prehardened Chromium Steel. V. G. Gorbach and V. D. Sadovskii. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 106-109.

Effect of Cr content on slowly heated, hardened and annealed, and on rapidly heated unannealed steels. Structure of austenite developing while heating previously hardened steel depends on rate of heating. Rate of heating required for development of grain is slower for higher Cr content. 9 ref. (N8f, 2-64; AY, *Cr*)

112-N.* (Russian.) Problem of Wave-Like Distribution of Admixtures Along Length of Growing Mono-Crystals. A. I. Landau. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 148-156.

Processes of crystal orientation in solutions. The curve of distribution of admixtures along the length of monocrystals is not smooth but wave-like. Nature of this phenomenon. 14 ref. (N12, 2-60)

113-N.* (Russian.) Selective Evaporation of Some Metals From Surface of Steels While Heated in Vacuum. S. F. Yurev and Z. I. Kusnitzina. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 157-166.

Experimental results of heating Cr-Mn and Cr-Ni-Mo steels at various temperatures. Method found to determine composition of emission by means of change in the composition of the steel's surface. 19 ref. (N16n, 1-73; SS, *Cr, Ni, Mo*)

114-N.* Sinking Under Bosses on Thin Plates. J. W. Dews and A. G. Fuller. *British Cast Iron Research Assoc., Journal*, v. 7, Dec. 1958, p. 392-400.

Variation during the course of the day in the number of eutectic cells in iron of approximately constant composition obtained from a continuously tapped hot blast cupola. Relationship between degree of eutectic nucleation and shrinkage defects. (N2, N12q, P10c; CI-n)

115-N.* Diffusion of Oxygen in Zirconium and Its Relation to Oxidation and Corrosion. J. Paul Pemsler. *Electrochemical Society, Journal*, v.105, June 1958, p. 315-322.

Diffusion in temperature range 400 to 500° studied by observing rates of dissolution of anodically deposited interference oxide films. Diffusion coefficient of O in Zr depends on the grain orientation and varies by the factor of two among different orientations. Oxidation and corrosion rates have a similar orientation dependence. 14 ref. (N1, R1h; Zr, *O*)

116-N.* Grain Growth and Flecking in Electroplated Copper Caused by Cyclic Stress. H. Okubo and N. Nozaki. *Electrochemical Society, Journal*, v. 105, July, 1958, p. 384-388.

Flecks are produced only when the grains constituting the plated metal develop in sufficient size to reach its surface and can never be produced when grain growth does not occur. Predominating stress producing the flecks is shearing stress, so that the physical change in the constitution of the plated metal can be attributed to the reversals of shearing strain. 4 ref. (N3; 8-62, Cu, 9-71, 3-66)

117-N.* Some Observations on the Effect of the Interaction of Tantalum With Oxygen, Nitrogen and Hydrogen. R. Bakish. *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 574-577.

The habit plane of the precipitation of oxide, nitride and hydride in Ta is {100} and these appear to be Ta_2O_5. TaN and beta-TaH respectively. {100} and {110} result from these gas-metal interactions. 11 ref. (N15; Ta, *O, N*, H)

118-N.* Effect of Rolling Unstable Austenitic 0.76% Carbon Steel at 220-300° C. P. R. V. Evans and Hugh O'Neill. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 34-44.

Red hot steel strip quenched in salt bath and immediately rolled at reductions up to 50%, then either air cooled or held isothermally and cooled. Effect of these treatments and variations in rolling speed on final microstructure, impact resistance and hardness. Theoretical mechanism in accelerated breakdown of austenite. 24 ref. (N8, M27, Q29n, F23, 2-64, 3-68; CN-g)

119-N.* Kinetics of Formation of Bainite in High-Purity Iron-Carbon Alloys. S. V. Radcliffe and E. C. Rollason. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 56-65.

Isothermal transformation of austenite to bainite at temperatures in the range of 200 to 450° C., studied by measurements of changes in electrical resistivity in fine wire specimens containing 0.65 to 1.2% carbon. Examination of structures of fully reacted specimens by light microscopy and X-ray diffraction at room temperature. 29 ref. (N8g, N8m, 2-61; Fe-b, *C*)

120-N.* Freezing of Aluminium and Its Alloys. R. M. Sergeant. *Metal Industry*, v. 94, Jan. 16, 1959, p. 43-45, 50.

In conditions of normal freezing in which growth of crystals takes place in the direction of increasing temperature, pure Al freezes with a smooth solidification front; a 2% Si alloy freezes dendritically. The only condition under which a pure metal can freeze dendritically is the unusual one when the crystals are growing into supercooled metal. (N12, 2-60; Al-a, Al-b, *Si*)

121-N. Recrystallization of Titanium. L. S. Castlemen, F. D. Rossi and L. L. Seigle. Sylvania Electric Products, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121188, Sept. 1955, 44 p. $1.25.

Rates of nucleation and grain growth during the recrystallization of critically deformed sponge and iodide titanium.

Energy of activation for grain growth in sponge Ti was about 52,000 cal. per mol, and in iodide Ti 39,000 cal. per mol. (N5, N3, N2, P13b; Ti-b, 6-74)

122-N.* (Russian.) Structural Changes in Cast Iron Saturated With Magnesium in Zone of Eutectoid Temperature. P. I. Stepin. *Liteinoe Proizvodstvo*, Nov. 1958, p. 24-27.

Mechanism of graphite formation in cast iron when saturated with differing amounts of Mg at varying temperatures. Heating cast iron in contact with liquid Mg under pressure greatly increases solubility and diffusion of Mg. Heating the center of a metallic Mg object 1 hr. at 1100° results in spreading of Mg in concentric manner throughout entire object to depth of 12 mm. Within the center in radius of 3-5 mm. the Mg concentration reaches 0.3%. By raising temperature from 1000 to 1100° speed of diffusion increased 2.5 times. (N8q, E25q, 2-60, 2-61; CI-r, Mg)

123-N. Investigation of Germanium-Silicon Alloys. C. C. Wang. Sylvania Electric Products, Inc. *U. S. Office of Technical Services*, PB 131422, Feb. 1955, 48 p. $1.25

Isothermal solidification technique for preparing homogeneous Ge-Si alloys in polycrystalline form for all the compositions and in single-crystal form for the low-silicon alloys. Semiconductor devices made of Ge-Si alloys shown to operate at temperatures higher than those of Ge. (N12, N3r; Ge-b, Si, EG-j)

124-N. (Russian.) Problem of Possible Cause of Irregular Distribution of Alloying Elements in Crystallized Ingots. B. N. Aleksandrov, B. I. Berkin, I. M. Lifshitz and G. I. Stepnova. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 167-168.

(N12; AD-n)

125-N. (Russian.) Investigation of Recrystallization of Pure Copper by Fine Primary Cluster of X-Rays. V. I. Arkharov and F. L. Shangareev. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 172-173. 9 ref. (N5, Cu-a)

126-N. (Russian.) Effect of High Pressure on Wustite. V. I. Arkharov and D. K. Bulychev. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 186-188.

Influence of air pressure and temperature on formation and decay of wustite. 7 ref. (N3m, 2-60, 3-74; Fe, O, NM-a34)

127-N. (Russian.) Susceptibility to Evaporation of Fe-Ni Alloys Within the 77-290° K. Range. N. Z. Miryasov. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 188-190. 4 ref. (N16n, 2-63; Fe-b, *Ni*)

128-N. (Czech.) Solidification Theory for Alloys. Marie Rysava. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1087-1092.

Theory of solidification, supersaturation and precipitation of a solid solution based on the equation of Clausius-Clapeyron. 23 ref. (N12p, 10-51)

129-N.* (Czech.) Precipitation of Carbides and Nitrides in the Tempering of Low-Carbon Chromium Steel. Jaroslav Koutsky and Jaroslav Jezek. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1098-1105.

Steel heat treated at 1000° C. for 2 hr. and oil quenched. Martensitic structure with more or less delta ferrite resulted Then samples were heat treated at 750° C. for 2 hr. or alternated at 450 and 550° C. for up to 1000 hr. 22 ref. (N7b, 2-64; SS, *Cr*)

130-N.* (German.) Review of Present-Day Position of Recrystallization Research. H. Borchers, H. Jordan and R. Schwarzwalder. *Metall*, v. 13, Jan. 1959, p. 12-19.

Reference to conventional recrystallization theories. More recent perspective, particularly regarding recrystallization in situ, the high energy block hypothesis and secondary recrystallization. Convenient recrystallization diagrams and practical applications. 104 ref. (N5f)

131-N.* (German.) Particular Properties of Metal Whiskers. F. Blaha. *Metall*, v. 13, Jan. 1959, p. 20-25.

Historical review dating back 200 years. More recent research results regarding spontaneous and influenced growth of Fe, Cu and Zn whiskers, also nonmetallic ones. Tensile strength for iron whiskers found to be 1340 kg. per sq. mm. max., for graphite 350. Production methods, applications, outlook. 50 ref. (N3r, Q27a, A2; Fe, NM-k36, 14-61)

132-N.* (Russian.) Diffusion Shift Peculiarities in Phase Boundary of Complex Alloys. A. A. Popov. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 643-649.

Process of interphase divided surface shifting depends on definite boundary components which are determined by the character of isothermal section of ternary phase diagram through two-phase region

of adjacent phases, and by correlation of the intensity of diffusion process of various elements in adjacent elements. 5 ref. (N1e)

133-N.* (Russian.) Investigation of Phase Transformation in Some Iron Alloys. S. A. Eliseev and B. G. Livshits. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 657-661.

Measurement of specific electroresistance, hardness, magnetic saturation and microstructure at 350-650° C. Dilatometric curves of thermal expansion taken during continuous heating and cooling. 11 ref. (N-general, J-general, P15g; Fe-b, *V, Mo*)

134-N.* (Russian.) Effects of Preliminary Heat Treatment on the Kinetics of Pearlite-Troostite Dissociation in Supercooled Austenite. V. G. Gorbach and V. D. Sadovskii. *Fizika Metallov i Metallovdenie*, v. 6, no. 4, 1958, p. 665-672.

Austenitic structure depends on heat treatment which determines degree of carry-over of austenite structure. Difference is in grain sizes. 12 ref. (N8h, 2-64; SS-e)

135-N.* (Russian.) Aging of Spring Alloys. M. M. Borodkina. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 700-705.

Boundary lines of phase regions on Fe-Ni-Ti diagram. Al and Cr additions and deformation before tempering. Epsilon phase separated during aging of Fe-Ni alloys and steels. 4 ref. (N7a, 2-60, 3-68; SGA-b, ST, Fe-b, *Ni, Ti, Al, Cr*)

136-N.* Inhomogeneities of Deformation as They Affect Recrystallization in Zinc. G. Brinson and M. E. Hargreaves. *Institute of Metals, Journal*, v. 87, Dec. 1958, p. 112-119.

Microscopic observations using polarized light and with the specimen on a hot stage allow direct study of recrystallization in deformed, polycrystalline Zn (99.998%). Strain markings produced by 7.5 compression are related to the behavior during recrystallization. New grains appear and grow rapidly only near grain boundaries and in heavily twinned regions. 19 ref. (N5, N3, 3-68; Zn)

137-N. (Book.) Preparation of Single Crystals. W. D. Lawson and S. Nielson. 255 p. 1958. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. $8.80.

Growing crystals, purifying and preparing materials; mechanism of crystal growth. (N3; 14-61)

138-N. (Translation—AIP.) Influence of Cr, Mo and W on the Self-Diffusion of Iron in Dilute Alpha Solid Solutions. I. B. Borovskii, K. P. Gurov, and Iu. G. Miller. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 147-150.

Determined by method of alternate mechanical removal of layers and anodic solution of thin layer of active surface. 8 ref. (N1d; Fe, *Cr, Mo, W*, 3-69, 14-67)

139-N. (Translation—AIP.) Question of the Diffusionless Crystallization of Metal Alloys. V. M. Glazov and V. N. Vigdorovich. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 177-180.

Combined influence of cooling rate and alloy composition on degree of branching of dendritic forms of crystal growth. 21 ref. (N12; Al-b, *Fe, Cu, Si*, 2-60)

140-N. (Translation—AIP.) Structure of Thin Films of Sb_2S_3 Obtained by Sublimation in a Nitrogen Atmosphere at Pressures Below 4 Mm. Hg. A. M. Resketnikov. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 382-385.

Molecular behavior in N atmosphere is cause of film during evaporation. 5 ref. (N15g, M25, 3-74; Sb, *S*, 14-62, NM-a)

141-N. (Translation—AIP.) Connection Between the Process of Carbide Formation in the Tempering of Steel and the Phenomenon of Reversible Temper Brittleness. L. M. Utevskii. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 386-389.

Influence of elements and grain boundaries in austenitic and ferritic steels. 25 ref. (N8a, N8r, Q26s, 2-64, 2-60; SS-d, SS-e)

142-N. (Translation—AIP.) Study of Diffusion of the Components in Tl_2Se by the Method of Labeled Atoms. G. A. Akhundov G. B. Abdullaev. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 390.

Temperature-dependence of diffusion coefficient. (N1a, N1b, 2-61; Tl-b, *Se*, 14-68)

143-N. (Translation—AIP.) Influence of Alloying on the Temperature of Polymorphic Transformations in Metals. O. S. Ivanov. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 396-397.

Influence determined by arrangement of regions of stability of different types of crystal lattice in periodic system and the position in latter of polymorphic and alloying elements. (N-general, 2-60)

144-N. (Translation—AIP.) Study of Diffusion in Nickel-Base Alloys Containing From 2 to 8 Components. A. Ia. Shiniaev. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 415-417.

Relationship between temperature and diffusion coefficient. Long-term strength and diffusion determined by same factors. 9 ref. (N1; Ni-b, *Fe, Ti, Cr, W, Al, Mo, C, Cb*)

145-N. (Translation—AIP.) Polygonization of Cast Metals and Alloys. B. A. Movchan. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 646-648.

Breakdown of primary crystallites in ingots of Ni alloys and steel during slow and fast cooling rates. 5 ref. (N4, N5; ST, Ni-b, *W, Fe, Co, Nb*, 5-59)

146-N. (Translation—AIP.) Stressed Condition of Austenite in the Vicinity of a Martensite Crystal in Course of Formation. B. Ia. Liubov and A. L. Roitburd. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 659-662.

Calculated stress, strains and elastic energy in austenite matrix during formation of martensite within it, assuming crystal is elliptical cylinder. 9 ref. (N8p, 3-66, 3-73)

147-N. (Translation—AIP.) Investigation of the Processes of Repeated Decomposition of an Al-Cu Solid Solution. L. S. Palatnik and B. T. Boiko. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 663-666.

Alpha and theta phases after heating to 400-500° C., then cooling to room temperature, studied by electron diffraction and electron microscope. 6 ref. (N12p; Al-b, *Cu*)

148-N. (Translation—AIP.) Diffusion of Antimony in Germanium Alloyed With Antimony. B. I. Boltaks, V. M. Prokhorova and L. I. Novozhilova. *Soviet Physics, Technical Physics*, v. 3, May 1959, p. 921-926.

With increased Sb in single crystal ingots, the activation energy of diffusion and pre-exponential factor increase. 13 ref. (N1, 2-60; Ge, Sb, 5-59, 14-61)

149-N. (Translation—AIP.) Anamalous Rate of Diffusion of Some Elements in Germanium. G. Q. Boltaks. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 927-929.

Values of diffusion coefficients of some elements of groups III, V, I, and VIII in Ge at 800° C. 7 ref. (N1, 1-66; Ge, *B, Ga, In, As, Sb, Li, Cu, Ag, Au, Fe, Ni*)

150-N. (Translation—AIP.) Self Diffusion and Diffusion of Impurities in Lead Telluride and Selenide. B. I. Boltaks and Iu. N, Mokhov. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 974-977.

5 ref. (N1d, N1e, Pb-b, *Te, Se, Sb, Sn*, 14-61, 14-68)

151-N. (Translation—BISI, no. 1054.) Investigations on Banded Structure in Plain Carbon and Alloy Structural Steels. Erwin Plockinger and Alfred Randak. *Stahl und Eisen*, v. 78, July 24, 1958, p. 1041-1058.

See item 488-N, 1958. (N12b, 2-60; CN, AY)

152-N. (Translation—BISI, no. 1197.) Transformation Characteristics of Steels With 12-14% Chromium. Walter Peter and Werner Matz. *Archiv fur das Eisenhuttenwesen*, v. 28, Dec. 1957, p. 807-823.

See item 264-N, 1958. (N8; SS)

153-N.* (French.) Study of the Influence of Aging Temperature on Carbon Precipitation in Pure Iron by Measurement of Electrical Resistivity at Very Low Temperatures. Bernard Migaud. *Comptes Rendus*, v. 247, Oct. 6, 1958, p. 1003-1005.

Two stages were observed in precipitation of C from a supersaturated solid solution of alpha Fe. First stage occurs during aging at 67° C., is rapid and characterized by fine precipitation; second stage is much slower, is most clearly detected at about 150° C., and is attributed to a phenomenon of coalescence. (N7a, N7b, P15g; Fe)

154-N. (Japanese.) Effect of Nitrogen on Cupola Iron. Kaoru Sato, Hideo Arai and Harutosi Yamamoto. *Japan Foundrymen's Society, Journal*, v. 30, Dec. 1958, p. 935-947.

Nitrogen is passed into iron melt through a graphite tube, and chemical structure, physical properties, chill test, pressure and flux of gas metallic structure examined. Almost no difference between the graphitization due to gas passage and inoculation observed. (N8s, E25q, 2-66, 2-61; CI-n)

155-N.* (Polish) Metal Sulphide Diffusion in a Cu-Au Alloy Containing 5% Gold. Lucjan Czerski, Stanislaw Mrowiec and Teodor Werber. *Archiwum Hutnictwa*, v. 3, no. 4, 1958, p. 305-313.

X-ray analysis and chemical testing of outer sulphide layers, formed as result of outward diffusion of metals and the internal layer of sulphide scale formed by

inward diffusion of S. 10 ref. (N1c; Cu-b, *Au, S*

156-N.* (Russian.) Cementitae Austenite Equilibrium Lines of Iron-Carbon Alloys. V. I. Psarev. *Zhurnal Neorgenicheskoi Khimii Akademii Nauk, SSSR*, v. 3, no. 9, 1958, p. 2217-2218.

Mathematical relationship between particle size of iron carbide, temperature and concentrations in Fe_3C system. Relation between solubility of FeC at various temperatures utilized for calculating various C concentrations at different temperatures in FeC systems. (N8, P12e, 2-60, 2-61; Fe, *C*, NM-a35)

157-N.* (Ukrainian.) Effect of Casting Temperature on the Graphitization of White Cast Iron. K. R. Bunin. *Dopovidi Akademii Nauk Ukrainskoi RSR*, no. 11, 1958, p. 1199-1203.

Graphite inclusions and rate of graphitization decrease with an increase of casting temperature, despite interphase surface growth, due to decrease in micropores formed during crystallization. (N8s, 2-62; CI-p)

158-N. Vacancy Diffusion in Ordered Alloys. B.W. Elcock. *Physical Society, Proceedings*, v. 73, Pt. 2, Feb. 1, 1959, p. 250-264.

Examined for stoichiometric cubic binary alloy. Self-diffusion coefficients calculated. (N1d, N1e)

159-N. Theory of Diffusion of Copper in Germanium. M.D. Sturge. *Physical Society, Proceedings*, v. 73, Pt. 2, Feb. 1, 1959, p. 297-306.

14 ref. (N1; Ge, *Cu*)

160-N.* The Mechanism of Diffusion in the Solid State. C.E. Birchenall. *Metallurgical Reviews*, v. 3, no. 11, 1958, p. 235-277.

Diffusion coefficients; rotation, interstitial and vacancy mechanisms for diffusion in metals. Kirkendall effect, temperature dependency, activation energy, frequency factors, diffusion mechanisms in ionic crystals. Cation diffusion in oxides with NaCl structures. Diffusion of cation in spinel oxides. Mechanisms in covalent crystals; boundary and surface diffusion. 192 ref. (N1c)

161-N.* (Russian.) Effect of Hydrogen on Structural Transformation in Titanium Alloys. N.I. Block, A.I. Glazova, N.F. Lashko and A.M. Yakimova. *Izvestiya Akademii Nauk, Otdelenie Tekhnicheskikh Nauk*, no. 11, 1958, p. 96-99.

Complex phase analysis of two alloys. 6 ref. (N7c; M24c; Ti-a, *Mo, Cr*, H)

162-N.* Stress Induced Martensitic Transformation of Beta Titanium. R.H. Hiltz, Jr. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 138-143.

Behavior analogous to that of stress transformation in stainless steels. Deforming materials show low strength, high ductility and high strain hardening exponent. 16 ref. (N6q, Q24m, 3-66; Ti-b)

163-N.* (German.) Phase Transformations in Hardened Steel Causing Dimensional Changes. Z. Csepiga. *Acta Technica*, v. 22, no. 3-4, 1958, p. 285-310.

Contraction caused by martensite transformation and expansion produced by austenite transformation were studied by comparing the dimensions on annealed standard specimen with those of similar specimens quenched from different temperatures. 23 ref. (N8, P10d; AY)

164-N.* (Russian.) Importance of Surfaces on Graphitization of Iron Melts. Ya. Grecnnyi and I.G. Kheifetc. *Liteinoe Proizvodstvo*, Dec. 1958, p. 14-17.

Surface is source of vacancies necessary for graphitization. (N8s; Fe, *C*, 14-60)

165-N.* (Russian.) Effect of the Temperature of Liquid Cast Iron on the Cementite Zone in Wedge-Shaped Test Pieces. I.E. Brainin and S.I. Shapovalov. *Liteinoe Proizvodstvo*, Dec. 1958, p. 19-20.

Test pieces were cast from molten iron at different temperatures. The white zone was influenced more by the graphitization constant than by the temperature. (N8s, N8k, E10a, 2-61; CI)

166-N.* Investigation of Electric Transport in Solid Solutions of Metals Using Radioactive Isotopes. I. N. Frantsevich, D. F. Kalinovich, I. I. Kovensky and B. B. Penkovsky. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 194-209.

Investigation of electric transfer in ion of radioisotopes of carbon (C^{14}), iron (Fe^{59}), chromium (Cr^{51}), molybdenum (Mo^{99}) and tungsten (W^{185}). 8 ref. (N1, 1-59; Cr, Fe, Mo, W, 14-63, 14-67)

167-N.* Tracer Diffusion of A-Cadmium-115 in Pure Cadmium. K. A. Mahmoud and

R. Kamel. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 271-278.

Self-diffusion investigated by the radio-tracer method for pure Cd in polycrystalline and monocrystalline states. The Cd disks used were electroplated with a very thin layer of Cd^{115}. Diffusion rates at different temperatures were measured by the surface activity decrease method. 4 ref. (N1d, 1-59, 2-61, 2-64; Cd)

168-N.* Shape, Size and Growth of Some Intermetallic Compounds in Liquid Bismith. P. J. Barton and G. W. Greenwood. *British Nuclear Energy Conference, Journal* v. 4, Jan. 1959, p. 21-26.

Shapes and sizes of particles of binary intermetallic compounds of U, Th, Ce, Zr, Mg, Ca, Sr, Ba, Te, and Se with Bi studied metallographically with respect to their mode of preparation, after isothermal treatment in liquid Bi, under changes in temperature, and on precipitation from solution. 16 ref. (N12, M27c; Bi-b, U, Th, Ce, Zr, Mg, Ca, Sr, Ba, Ti, Se, 14-68)

169-N.* Thermal Cycling of Uranium. Wayne Hayden. *Tech Engineering News*, v. 40, Jan. 1959, p. 10-17, 39, 57.

Mechanism of growth of alpha uranium crystals when cycled between two temperatures. 10 ref. (N3m, P10d, 2-61, 3-68; U)

170-N.* (French.) Control Methods for Electrolytic Deposits. P. Godeaux. *Metaux Corrosion-Industries*, v. 33, Dec. 1958, p. 519-528.

Examination of porosity and hardness of deposited layer by various techniques. 5 ref. (N12d, P10m, Q29n; 8-62)

171-N.* (Russian.) Effect of Low-Frequency Vibration on Weld Metal Crystallization and Properties. V. L. Russo and P. N. Efimov. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 10-12.

Dendrites are destroyed during formation by increasing frequency of vibration. In the vibration range of 25-50 cycles, the frequency increase results in reducing the size of the original grain and increasing the impact ductility. (N12, K9n)

172-N. Self Diffusion in Polycrystalline Platinum. G. V. Kidson and R. Ross. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 185-193.

(N1d; Pt)

173-N. Structural Effects of the Diffusionless Phase Transformations in Au-Cd Alloys. Howard K. Birnbaum. *University of Chicago, Institute for the Study of Metals, Quarterly Report*, no. 51, Dec. 1958, p. 357-358.

Line broadening and order charges; suggested mechanism. 5 ref. (N6b; Au-b, *Cd*)

174-N. Self-Diffusion in Liquids and Crystalline Solids. Norman H. Nachtrieb. *University of Chicago, Institute for the Study of Metals, Quarterly Report*, no. 51, Dec. 1958, p. 490-496.

Radioactive tracer study of effects of temperature and pressure. 7 ref. (N1d, 1-59, 2-61, 3-74)

175-N.* (Russian.) Intercrystalline Segregation of Silicon in Gray Cast Iron. Ya. N. Malinochka. *Liteinoe Proizvodstvo*, Jan. 1959, p. 32-36.

The austenite formed at the beginning of eutectic crystallization is richer in Si than the austenite formed at the end of solidification. In hypo-eutectoid, FeSi segregation can occur in the branches of primary austenite, more along the axes than along the periphery. 10 ref. (N12q, N8; CI-n, Si, 9-69)

176-N.* Study of Grain Boundary Diffusion in Metals. V. T. Borisov, V. M. Golikov, B. Y. Ljubov and G. V. Shtsherbedinsky. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 212-231.

Measurements of the integral activity of the specimen are taken continuously during the diffusion process, the specimen being previously covered with a thin radioactive layer. Determination of both diffusion coefficients from the data of a single experiment. Comparatively short diffusion annealing is sufficient and the method is nondestructive. 12 ref. (N1, 1-59)

177-N.* Effect of Metal Composition and Structure on Grain Boundary Diffusion. S. Z. Bokstein, S. T. Kishkin and L. M. Moroz. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 232-248.

Boundary diffusion prevails not only at low, but also at rather high temperatures: up to 1200°C. (self-diffusion of Fe, diffusion of Sn in Ni), and at least up to 1350°C. (self-diffusion of Cr). Consequently, a significant difference in the

structure of grain boundary and grain body persists up to high temperatures. Preferential grain boundary diffusion is observed in various metals irrespective of the type of crystal lattice. 11 ref. (N1a, M27f, 2-60, 2-61, 1-59; Fe, Sn, Ni, Cr)

178-N.* Investigation Into Carbon Atoms Mobility and Atomic Interaction. P. L. Gruzin, Y. F. Babikova, Y. A. Polikarpov and G. B. Fedorov. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 249-269.

Radiometric method reveals effect of C transport in Fe and Ni under the influence of the electric field. C atoms in Fe and Ni shown to be in cation state. 19 ref. (N1, R2a, 1-59; Fe-b, *C, Ni, Mo, S*)

179-N.* Application of Radioactive Isotopes in Solving Diffusion Problems in Metal Theory. A. A. Zhukhoyitsky, M. E. Janitskaya and A. D. Sotskov. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 279-301.

Studies of thermodynamic characteristics and self-diffusion coefficients of solvent Ag with positive and negative deviations from Raoult's law (Ag-Cu and Ag-Sn). 16 ref. (N1, 1-59, 2-60, 2-63; Ag-b, *Cu, Sn*)

180-N.* (Russian.) Eutectoid Transformation of Austenite in Malleable Iron. K. P. Bunin, S. L. Voitselenok and C. A. Fedorova. *Liteinoe Proizvodstvo*, Jan. 1959, p. 43-44.

Microscopic studies at 755-760° establish time necessary for commencement of cementite and ferrite separation; time required for completion of austenite structure and time to complete graphitization of eutectic cementite. 5 ref. (N8; CI-s)

181-N.* (French.) Physico-Chemical Reactions Occurring in 18% Chromium Steels Containing 2, 4 or 6% Nickel. P. Bastien and A. Sulmont. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 40-48.

Tempering, martensite formation and decomposition; composition of alpha and gamma phases; diffusion of Cr and Ni and role of this diffusion in alpha-gamma transformation. 7 ref. (N-general; N1, N8p; SS)

182-N.* Diffusion of Oxygen in Alpha and Beta Zircaloy-2 and Zircaloy-3 at High Temperatures. M. W. Mallett, W. M. Albrecht and P. R. Wilson. *Electrochemical Society, Journal*, v. 106, Mar. 1959, p. 181-184.

Diffusion coefficient determined at 1000-1500° C. 9 ref. (N1; Zr-b, *O*)

183-N.* Crystal Growth of Electrodeposited Zinc. Ryoitiro Sato. *Electrochemical Society, Journal*, v. 106, Mar. 1959, p. 206-211.

In initial stage of deposition, the Zn layer always consists of fine-grained cyrstallites oriented at random. For relatively thick Zn layers deposited under influence of hydrogen and/or organic colloids, the orientation and texture are interpreted from standpoint of crystal growth. 24 ref. (N12d, M26c; Zn)

184-N. Diffusion in Multicomponent Metallic Systems. Pt. 4. A General Theorem for Construction of Multicomponent Solutions From Solutions of the Binary Diffusion Equation. J. S. Kirkaldy. *Canadian Journal of Physics*, v. 37, Jan. 1959, p. 30-34.

8 ref. (N1c)

185-N. (Russian.) Determination of the A_1 Critical Range in Malleable Iron. G. F. Tikhonov. *Liteinoe Proizvodstvo*, Jan. 1959, p. 42-43.

Critical interval of A_1 is in the region of 730-780° C. ± 10° C. A series of dilatometric curves shows austenitizing in the temperature range 730-800°. (N8g; CI-s)

186-N.* Titanium Alloys Today. Paul D. Frost. *Metal Progress*, v. 75, Mar. 1959, p. 95-96, 96-B, 97-98.

Ti is definitely being established as a useful structural material. It is light, strong and temperature resistant. Through alloy additions, either alpha or beta phase can be stabilized. Heat treatments, much like those used for steels, enhance the mechanical properties, particularly those of the alpha-beta and beta alloys. (N-general, Q-general, J-general; Ti-b)

187-N.* Treatment of Nimonic Alloys. W. Betteridge. *Metal Treatment and Drop Forging*, v. 26, Feb. 1959, p. 45-52.

Increased elongation before creep fracture can be obtained by the inclusion of an overaging treatment in the region of 850-900° C., depending on the particular alloy. For service at 500° C.appreciably improved strength can be obtained by an

appropriate combination of lattice distortion and precipitation hardening. The lattice distortion can be introduced either by hot working or by cold working of the previously solution-treated material. 4 ref. (N7, Q3; Ni-b)

188-N. (Book—Translation.) Dendritic Crystallization. D. D. Saratovkin. 126 p. 1959. Consultants Bureau, Inc., 227 W. 17th New York 11, N. Y. $6.

Russian work on eutectics in metals and crystallization of steel castings. 127 ref. (N12b, N12q; CI, ST, Cd-b, Pb-b, Bi-b, Cu-b, Sn-b, 5, 14-67)

189-N. (Translation—AIP.) Study of Phase Transformations at Very High Pressures. V. P. Butuzov. *Soviet Physics, Crystallography*, v. 2, no. 4, 1958, p. 533-543.

Determination of melting points of a number of metals as a function of pressure. The polymorphic transitions of phosphorus were studied. A phase diagram was constructed for Bi for pressures of up to 30,000 kg. per sq. cm. 32 ref. (N-general, P12n, M24a, 3-74; Bi, P)

190-N. (Translation—BISI no. 1043.) Contribution to the System Ferrous Oxide, Ferrous Sulphide, Manganous Oxide, Manganous Sulphide. Klus Giessler and Ernst Justus Kohlmeyer. *Archiv fur das Eisenhuttenwesen*, v. 29, Jan. 1958, p. 57-63.

See item 266-N, 1958. (N12, P12; Fe, 14-68)

191-N. (Translation—BISI no. 1067.) Eutectoid Formation in Transformation Structure of Low and Medium Alloy Heat-Resisting Steels. Richard Pusch and Hans Jurgen. *Archiv fur das Eisenhuttenwesen*, v. 29, Jan. 1958, p. 65-72.

See item 268-N, 1958, (N8; AY, SGA-h)

192-N. (Translation—Brutcher no. 4462.) Formation of a New Phase in 18-8 Steel Welds Containing Columbium. G. G. Mukhin and N. Yu. Pal'chuck. *Avtomaticheskaya Svarka*, v. 11, no. 6, 1958, p. 88-91.

(N6p; SS, Cb, 7-51)

193-N. (Translation—Brutcher no. 4474.) Abnormal Changes in Properties of Steel and Alloys During Phase Transformation. M. E. Blanter and A. K. Mashkov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 6-10.

Increase in electrical conductivity and lowered resistance to plastic deformation during phase transition. These changes are characterized by a weakening of the interatomic bond and acceleration of the process of plastic deformation, together with migration of electrons. 4 ref. (N8g, P15g, Q24, M25h; ST, *C, Cr, Mn, Si*)

194-N. (Translation—Brutcher no. 4476.) Deformation of Technical Iron Under Cyclic Temperature Fluctuations. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 15-19.

Technical iron, within certain conditions of heating-cooling, manifests a sharp lowering of resistance to deformation, caused by action of stresses. The resulting reconstruction of the cyrstal lattice upsets the coherent atomic bonds and helps to promote a sharply reduced resistance to deformation only in carbon-enriched grain regions. 6 ref. (N8g, M26, 2-61, 3-66; Fe)

195-N. (Translation—Brutcher no. 4477.) Ferrite Grain Boundary Structure. V. N. Gridnev. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 19-25.

Defects and distortions in the crystal lattice form grounds for redistribution of diffused elements and formation of non-uniform structure. Laminae in technical iron (0.1% C) around ferritic grain are formed at temperatures where diffusion rate of surface-active additions is sufficiently high. 7 ref. (N1h, M27f; Fe, AY, *Cr, Cb, Mn, Mo, P, Si*)

196-N. (Translation—Brutcher no. 4479.) Effect of Elastic Vibrations of Sonic and Ultrasonic Frequency Upon Transformations in Metals and Alloys. E. A. Al'ftan. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 31-39.

Elastic vibrations aid magnetization and demagnetization of metals, considerably accelerate allotropic transformation of Sn, raise the cooling capacity of quenching media and increase the hardness in nitriding. 28 ref. (N6p, J28k, 1-74; Sn, ST, *Cr, Ni, Mo*)

197-N. A Study of the Rates of Crystallization of Iron From Liquid Bismuth Solutions. D. H. Kerridge. *United Kingdom Atomic Energy Authority*, AERE M/R 2579 (a), Oct. 1958, 4 p.

Shape of the crystallized Fe particles and variation of initial growth rates with crystallization temperature and supersaturation indicate that the dislocation mechanism of crystal growth is operative and that diffusion of Fe through the liquid

Bi is the rate controlling step in the process. 6 ref. (N12, N3; Fe, *Bi*)

198-N. Recovery of Lattice Expansion of Irradiated Molybdenum. D. L. Gray. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission, HW-57903,* Nov. 1, 1958, 16 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Upon annealing the lattice expansion, three thermal recovery processes occur up to 800° C.—one at 100-200° C., one near 400° C., and one from 500-800° C. The first process is grossly characterized by first-order kinetics and the total decrease in radiation-induced lattice expansion is independent of temperature. The 100-200° C. process possibly represents the trapping of interstitials at small impurity atoms. (N4, 2-67, 2-64; Mo)

199-N.* (English.) Contraction During the Solidification of Cast Iron as Influenced by Magnesium. L. Sofroni, R. P. Todorov and G. I. Koshovnik. *Revue de Metallurgie (Bucharest),* v. 3, no. 3, 1958, p. 61-72.

Experiments with Fe-C, Fe-C-Si and with Ni-C, Ni-C-Si and Co-C alloys reveal that during solidification the initial expansion is caused by graphitization in the cementite decomposition, while shrinkage is determined by graphitization in the eutectic transformation. 4 ref. (N8k, N8s, P10c, N12q, 2-60; CI, Mg, Ni, C, Si, Co, Fe)

200-N.* (German.) Precipitation and Intercrystalline Corrosion in Heat Resistant Cb-Stabilized Steel (16% Cr, 13% Ni, Mo and V) as Influenced by the Degree of Stabilization. Karl Bungardt and Gustav Lennartz. *Archiv fur das Eisenhuttenwesen,* v. 30, Jan. 1959, p. 23-29.

Precipitation behavior of nitrogen-containing alloy steel investigated by chemical and X-ray testing of isolated residues. A compound carbonitride (Cb, V) (C, N) exists in the quenched state. V content in the nitrides increases with growing Cb content and quenching temperature. Cold working prior to annealing increases precipitation speed. 10 ref. (N7, R2h; SS, *Cr, Ni, Mo, V*)

201-N.* (German.) Influence of Direct and Alternating Current on Quench and Strain Aging of Soft Iron. Friedrich Erdmann-Jesnitzer, Ditmar Mrowka and Klaus Ouvrier. *Archiv fur das Eisenhuttenwesen,* v. 30, Jan. 1959, p. 31-33.

Direct-current flow increases speed of aging process, low-frequency (50 cycles) alternating current having no effect in this respect. 12 ref. (N7e; Fe)

202-N.* (German.) Investigation of Stable and Metastable Equilibriums of Fe-C-Alloys. Theo Heumann and Joseph Grosse-Wordmann. *Archiv fur das Eisenhuttenwesen,* v. 30, Jan. 1959, p. 35-39.

Solubility limits between gamma compound crystals and secondary cementite or graphite for the two equilibriums in the Fe-C systems; tendency of cementite to decomposition. 19 ref. (N8k; Fe-b, *C*)

203-N.* (German.) Self-Diffusion of Pure Chromium. Harold W. Paxton and Ewald G. Gondolf. *Archiv fur das Eisenhuttenwesen,* v. 30, Jan. 1959, p. 55-60.

Specimens of radioactive Cr applied on pure Cr heated for various periods in the 950 to 1250° C. range. Surface radioactivity is reduced as a result of partial diffusion of the radioactive Cr into the base material. 14 ref. (N1d, 1-59; Cr)

204-N. Stability of Microstructures and Related Physical Properties at Elevated Temperatures. Wolfgang H. Steurer. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D. C., p. 70-89.

Relationship between stability and degree of strengthening in strain hardened, precipitation hardened and heat treated structures. Effects of grain growth, recrystallization and recovery on hardness and microstructure. 18 ref. (N7, N3, N5, M27, 2-62)

205-N.* (Italian.) Formation and Stability of the Epsilon Phase in Nitrided Iron. A. Burdese. *Metallurgia Italiana,* v. 50, Dec. 1958, p. 529-537.

Morphology, mechanical properties and speed of formation of nitrided layers as function of temperature, duration and other treatment conditions. Distribution of nitrogen in surface layers; effect of hardening and tempering on stability of nitrides, particularly in epsilon phase. 15 ref. (N9, J28k; Fe, *N*)

206-N.* (Rumanian.) Effects of Nitrogen Content in Steels. S. Bercu, A. Kathrein and R. Fischgold. *Studii si Cercetari de Metalurgie,* v. 3, no. 3, 1958, p. 385-396.

Iron with varying alloy additions heated to 600-750° C. in a current of NH_3 to study the influence of nitrogen on structure and

properties. As an alloying element, nitrogen retards martensitic transformation and intercrystalline corrosion in Cr-Ni and Cr-Mn steels and causes grain reduction in high Cr steels. 16 ref. (N8p, R2h, 2-60; CN, SS, *Cr, Ni, N*)

207-N. (German.) Growth Phenomena of Germanium Crystals. G. Zielasek. *Zeitschrift fur Naturforschung,* v. 13a, Dec. 1958, p. 1097-1098.

Semiconductor crystals grown by the Czochralski method have grooves due to the rotation. Fine grooves and cavities are related to lattice imperfections and impurities. (N3r, M26s; Ge)

208-N.* (German.) Formation of Austenite in Unalloyed and Low-Alloy Steels. Eugen Schmidtmann and Helmut Brandis. *Archiv fur das Eisenhuttenwesen,* v. 30, Feb. 1959, p. 83-89.

Structure of CK15, CK35, CK60, 24CrMo5, 36CrNiMo4 steels and of steel containing 0.8% Cr and 3.5% Ni subsequent to annealing. (N8f; AY, *Cr, Ni, Mo*)

209-N.* (German.) Phase Changes in Iron-Vanadium Alloys. Karl Bungardt and Wolfgang Spyra. *Archiv fur das Eisenhuttenwesen,* v. 30, Feb. 1959, p. 95-102.

Phases present in the temperature range of 350-1100° C. In alloys with 27 and 45% V a sigma phase developed, the formation of which depends on the temperature and time of heat treatment. Below 700° C. embrittlement was observed, explained by ordering processes. (N6p; Fe-b, V)

210-N.* Orientation of Recrystallized Grains in Strained Aluminum Single Crystals. H. Yoshida, B. Liebmann and K. Lucke. *Acta Metallurgica,* v. 7, Jan. 1959, p. 51-56.

Recrystallization started at cut end with fine grains. After further heating most of grains disappeared and a few large crystals were left. Preferred orientation of final crystals originates in growth selection. 10 ref. (N5, M26c; Al, 14-61)

211-N.* (Czech.) Diffusion of Zinc in Nickel. Stevo Trajkov. *Hutnicke Listy,* v. 14, Feb. 1959, p. 139-141.

At temperatures from 300 to 700° C., a gamma phase ($NiZn_3$) develops on the contact surfaces of the two metals by chemical reaction. Later an epsilon phase ($Zn_{15}Ni_2$) and a beta phase (ZnNi) are formed where the gamma phase touches the Zn and the Ni. (N1h, M24b; Ni, *Zn*)

212-N.* (Hungarian.) Dimensional Changes in Bearing Races During Aging and Age Hardening. Pt. 2. Pal Prokay. *Kohaszati Lapok,* v. 91, Oct-Nov. 1958, p. 501-503.

Influence of quenching agent on relative amount of retained austenite. Hardness of the steel depends on tempering temperature. Satisfactory dimensional stability obtained by combined oil and water quenching. 9. ref. (N7a, P10d, T7d; ST, SGA-c)

213-N.* (Slovakian.) Structure of Pearlite Formed in the Continuous Decomposition of Austenite. Ivan Hrivnak. *Hutnicke Listy,* v. 14, Feb. 1959, p. 133-139.

Nonlaminar tertiary cementite and nonhomogeneous pearlitic cementite with growth defects can form in addition to the pearlitic cementite. Nature of cementite and pearlitic structure is influenced by the carbon, Cr or Mo content. 18 ref. (N8h, 2-60; CN-b, AY, *Cr, Mo*)

214-N. Strain Hardening Behavior of High Purity Copper. E. Voce. *Wire Production,* v. 7, Jan-Feb. 1959, p. 3-7.

(N7e; Cu-a)

215-N. (German.) Calorimetric Proof of Long-Range Order in Nickel Brass. A. Kussmann and H. Wollenberger. *Naturwissenshaften,* v. 45, Nov. 1958, p. 541.

Specific heat as function of temperature for various Ni contents. Short-range order characteristics for solid solutions containing less than 20% Ni and long-range order characteristics for higher Ni contents. 4 ref. (N10; Cu-b, *Zn, Ni,* 14-67)

216-N.* Self and Interdiffusion in Aluminum Zinc Alloys. J. E. Hilliard, B. L. Averbach and Morris Cohen. *Acta Metallurgica,* v. 7, Feb. 1959, p. 86-92.

Self-diffusion rate of Zn increases as the Zn content is raised while the thermodynamic driving force decreases with increasing Zn content until a minimum is reached at 38% Zn. Interdiffusion rate changes little with content. 17 ref. (N1d, N1h, 2-60; Al-b, *Zn*)

217-N.* Stress-Ordering Effect on Thermal Expansion of CuAu Single Crystals. Makoto Hirabayashi. *Physical Society of Japan, Journal,* v. 14, Feb. 1959, p. 149-152.

On cooling from above the transition temperature under compressive stress in the longitudinal direction, the c-axes of the ordered phase is aligned in one of the cubic axes nearest the stress direction. 4 ref. (N10; Cu-b, Au, 14-61)

218-N.* (French.) Pseudo-Martensitic Transformation in Zirconium Hydride. D. Whitwham, Melle A. Huber and J. Herengual. *Acta Metallurgica*, v. 7, Feb. 1959, p. 65-68.

Existence in ZrH_2 alloys of two different hydride phases. 5 ref. (N6q, Zr-b, *H*)

219-N.* (French.) Precipitation in Several Nickel-Base Alloys. J. Manenc. *Acta Metallurgica*, v. 7, Feb. 1959, p. 124-130.

Ni-Al, Ni-Al-Ti, Ni-Cu-Al, Ni-Si, Ni-Cu-Si, Ni-Mo-Si alloys precipitate an ordered fcc. phase. Preprecipitation and aging sequence given. 28 ref. (N7; Ni-b, *Al, Ti, Cu, Si, Mo*)

220-N.* (French.) Effects on Resistivity of the Diffusion of Protons in Steel After Charging in Acid Medium and Plastic Deformation. E. Herzog and M. Hugo. *Comptes Rendus*, v. 248, Jan. 19, 1958, p. 408-410.

Hydrogen was introduced into specimens of killed, mild and openhearth steel by cathodic charging or by immersion in saturated solution of H_2S, with and without simultaneous or subsequent application of tensile stresses. Considerable increase of resistivity in specimens partially charged with hydrogen occurs if rate of charging is sufficiently high. When saturation is reached, phenomena vary according to mode of introduction of hydrogen. Partial or total saturation of steel by hydrogen modifies its aptitude for plastic deformation. (N15e, 3-68, P15g; ST, *H*)

221-N.* (French.) Influence of Conditions of Heat Treatment on the Exaggerated Growth of Soft Iron. P. Coulomb. *Comptes Rendus*, v. 248, Feb. 2, 1959, p. 682-685.

Exaggerated grain growth is due to elimination of impurities by hydrogen. Its appearance depends on chemical composition and rolling conditions, but also on natural aging before annealing and conditions of gas-metal exchange (thickness of sheet and temperature). (N3, 2-64, 3-69; Fe)

222-N.* (French.) Presence of Free Crystals in Alloys During Solidification and Formation of the Cone of Inverse Segregation in Commercial Ingots. A. Kohn and M. Olette. *Comptes Rendus*, v. 248, Feb, 9, 1959, p. 797-800.

Autoradiographic examination of iron alloys containing S, P or As revealed presence of free dendritic crystals, poor in element studied, which tend to collect near base of ingot. Confirms theory that cone of inverse segregation is result of drop of free crystals formed during cooling. 6 ref. (N12b, M23q; Fe-b, *S, P, As*, 5-59, 9-69)

223-N.* (French.) Secondary and Tertiary Recrystallization of Work-Hardened, Hydrogen-Annealed Soft Iron. P. Coulomb and P. Lacombe. *Comptes Rendus*, v. 248, Feb. 16, 1959, p. 964-966.

Secondary texture is characterized by absence of crystals (100) parallel to plane of sheet. This texture is composed of grains (110), (111) and (112) and is replaced by a tertiary texture composed of large grains (110) (001). 10 ref. (N5; M26c, Fe)

224-N.* (French.) Polygonization of Aluminum of Different Degrees of Purity. Jean Montuelle. *Comptes Rendus*, v. 248, Feb. 23, 1959, p. 1174-1177.

Diversity of shapes, orientations and sizes assumed by substructures of polygonization depends on modes of deformation and annealing used to provoke appearance of this phenomenon. 7 ref. (N5, 3-68, 2-64; Al)

225-N. General Theory, Mechanism and Kinetics. J. B. Newkirk. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, 1959, p. 6-149.

Concepts of precipitation process; clustering; nucleation; changes in mechanical, physical and chemical properties; Al, Ni, Cu and Fe alloys. 379 ref. (N7, P-general, Q-general, 2-65, 3-68; Al-b, Ni-b, Cu-b, Fe-b, SS, 14-67)

226-N. Precipitation Reactions in Irons and Low-Alloy Steels. H. W. Paxton. Paper from "Precipitation From Solid Solution". American Society for Metals, Cleveland, 1959, p. 208-243.

Strain aging and quench aging in relation to the reactions of the interstitial elements carbon and nitrogen in Fe and its dilute alloys. 71 ref. (N7e, N7a, Fe, ST)

227-N.* (Japanese.) Kinetics of the Thermal Decomposition of Cementite. Hiroya Kaieda. *Kyushu University, Faculty of Engineering, Memoirs*, v. 17, May 1958, p. 164-221.

Transformation, graphitization and heat treatment of steel and cast iron. 60 ref. (N-general, J-general; ST, CI)

228-N.* (Russian.) Grain Refining by Vibration of a Crystallizing Melt. I. I. Novikov, G. A. Korol'kov, V. V. Solov'eva and A. Freilikh. *Litinoe Proizvodstvo*, Feb. 1959, p. 42.

Vibrating the melt near the crystallizing front breaks up the microstructure to a great extent. If the vibration is discontinued when the crystallizing front is at some distance from the melt surface the upper part of the casting exhibits a zone of coarse grain. The boundary between the coarse and finegrained zones is quite sharp. 5 ref. (N12, M27c; AD-p35)

229-N.* (German.) Recrystallization in 6% Tin Bronze. Heinz Borchers and Hans Jordan. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 75-80.

Recrystallization behavior after cold deformation by upsetting and subsequent heating. (N5; Cu-s, *Sn*)

230-N.* (Russian.) Austenite Decomposition as Affected by Thermal Cycling During Welding. N. N. Prochorov, E. L. Makarov and V. I. Gospodarevskii. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 164-166.

Austenite decomposition during two temperature cycles is determined for 15 types of steel. Resistance to cracking remarkably decreases when the austenite decomposition is completed at a temperature below 300° C. (N8, K1a; AY)

231-N. Calorimetric Determination of Ordering in the U-Mo System. R. F. Boyle and E. K. Halteman. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 101-111. U. S. Office of Technical Services, Washington 25, D. C.

Callorimetric and X-ray spectrometer measurements used to verify the presence of an order-disorder reaction. Results are in good agreement with order-disorder theory. A slight readjustment of previously accepted phase boundaries is indicated. 11 ref. (N10, M24b; U-b, *Mo*)

232-N.* (German.) Physical Structure and Metallography of Aluminum. D. Altenpohl and Z. Z. Jackson. *Metall*, v. 13, Mar. 1959, p. 179-183.

Increase in Cu content from 0.0002 to 0.002% considerably affects the recrystallization of pure Al while further increase of Cu has no effect. Heat treatment at 50-130° C. shows little, or no change in strength value. 21 ref. (N5, M-general, 2-60; Al-a, *Cu*)

233-N.* (German.) Effect of Warm Forming Upon Discontinuous Grain Growth in Aluminum Sheets. H. Hug and H. Bichsel. *Metall*, v. 13, Mar. 1959, p. 188-192.

Discontinuous growth in crystals may be influenced by proper choice of warm forming so that coarse grain appears either quickly or only after long heating. 11 ref. (N3; Al, 4-53)

234-N.* (German.) Precipitation and Dissolving Processes in Copper-Iron Alloys. Volker Schumacher. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 81-86.

Wires with a higher Cu than Fe content are heated and then quenched from different temperatures. Changes in conductivity and thermo-electric force are measured to determine precipitation and dissolution data. 21 ref. (N7b, N1e; Cu-b, *Fe*)

235-N.* (German.) Discontinuous Precipitation in Copper-Indium Alloys. Horst Bohm. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 87-93.

Laminar discontinuous precipitation studied in samples containing 4-15% In in the range 200-480° C. Activation energy of the diffusion occurring on the boundaries and transition temperature from discontinuous to continuous precipitation depends on the In concentration. 15 ref. (N7b, N1e, 2-60; Cu-b, *In*)

236-N.* (Russian.) Structural Stability and Properties of Chromium Steels. A. V. Merlina and A. M. Bozoyka. *Stal'*, Feb. 1959, p. 160-165.

Investigation of properties of heat resisting steels (3%, 5-6% and 12% Cr content) alloyed with Mo, W, V and Cb revealed that heat resistance for conditions of long-time service is related to the thermal stability of the carbide phase and the strength of the solid solution. 5 ref. (N8r, Q27a, 2-61; AY, *Cr, Mo, V, W, Cb*)

237-N. Kinetic Study of Irradiation Induced Phase Changes in Uranium-9 w/o Molybdenum Alloy. M. L. Bleiberg. *Nuclear Science and Engineering*, v. 5, Feb. 1959, p. 78-87.

U-Mo alloys shown to transform from stable to metastable phase due to neutron bombardment. This is explained on the basis of the smoothing out of concentration gradients due to the action of "displacement spikes" or "thermal pulses" generated within the sample. 9 ref. (N6p, 1-59; U-b, *Mo*)

238-N. (Russian.) Instrument for Tests on the Martensite Formation Under Plastic Deformation. P. V. Novichkov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 166-170. (N8p, 1-53)

239-N.* (German.) Calorimetric Investigations of Ordering Processes in Alpha-Brass and in German Silver. Albrecht Kussmann and Heinrich Wollenberger. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 94-100.

Thermal analyses performed with samples of various composition in the homogenized and annealed state prove the short-range ordering hypothesis for alpha-brass. In the alpha range of german silver long-range ordering of the type Cu_2NiZn is assumed. 26 ref. (N10b; Cu-n, Cu-b, *Zn, Ni*)

240-N.* (Japanese.) Recrystallization of Al-Zr-Cd Alloy. Motoyuki Nakamura, Shigeru Matsuo and Masaaki Yanagisawa. *Nagoya Government Industrial Research Institute, Reports*, v. 7, Mar. 1958, p. 185-189.

Recrystallization during rolling and heating. (N5; Al-b, *Zr, Cd*)

241-N.* (Japanese.) Process of Precipitation in Al-Bronze Containing Ni and Co. Shizuo Suzuki. *Nagoya Government Industrial Research Institute, Reports*, v. 8, Mar. 1959, p. 191-195.

Hardening and softening begins sooner at the grain boundary than at the center of the grain; there are two types of precipitates at the grain boundary; parallel side-plates and preferentially grown precipitates along the grain boundaries. 10 ref. (N7, N3; Cu-s, *Al, Co, Ni*)

242-N. (Book.) Precipitation From Solid Solution. R. F. Mehl, J. B. Newkirk and W. A. Anderson. 517 p. 1959. American Society for Metals, 7301 Euclid Ave., Cleveland 3. $10.

Series presented at National Metal Congress and Exposition, Chicago, Nov. 1957. General concepts, mechanism and kinetics, property changes, precipitation-hardening base alloys. Lectures abstracted separately. 854 ref. (N7, J27)

243-N. (Translation—BWRA.) Problem of Primary Weld Crystallization in Fusion Welding. M. I. Razikov. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 57-59.

In the welding of steel the fused grains of austenite along the fusion line are the bases for the growing columnar dendrites of weld metal. Weld metal grain size therefore largely depends on the grain size of the parent metal at the fusion line. Effective methods of reducing the dimensions of the weld metal dendrites in fusion welding are those which minimize grain growth in the parent metal at the fusion line. 4 ref. (N12, K9n, 2-59; 7-51, SS)

244-N.* Factors Which Influence the Structure of Electrodeposits. A. M. Max. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 73-80.

Plating of a metal by an electric current involves the transfer of the metal ion from a solution to a position in a crystal lattice. Whether deposits will tend toward a finer or a coarser grain depends on the ratio of the number of ions striking the surface to the number remaining, and the ease with which an ion can move laterally. 15 ref. (N12d)

245-N.* (English.) Grain Boundary Hardening Due to Piled-Up Dislocations. Jin-ichi Takamura and Sei Miura. *Physical Society of Japan, Journal*, v. 13, Dec. 1958, p. 1421-1423.

Hardening in alpha brass. 6 ref. (N7e, M26b; Cu-n)

246-N.* (German.) Austenite Transformation Occurring in the Cases and Cores of Carburized Steel. Hermann Schenck, Eugen Schmidtmann and Peter Schmithals. *Archiv fur das Eisenhuttenwesen*, v. 30, Mar. 1959, p. 153-160.

The carburized zone shows a transformation behavior different from that of a steel of the same composition as the zone but homogeneously distributed over the whole section. The discrepancy is explained by expansion differences between case and core and resulting stresses. 16 ref. (N9g, 3-66, J28g; CN-r, CN-g)

247-N.* (German.) Strength Properties of Carbon Steel With Widmannstatten Structure. F. Erdmann-Jesnitzer and B. Schellhorn. *Industrieblatt*, v. 59, Mar. 1959, p. HT19-HT23.

Micrographic, electron-optical and fractographic study of the impact brittleness which is characteristic of the Widmannstatten structure. Several unalloyed cast steels were investigated with and without heat treatment. Influence of grain structure and stresses on the cracking. (To be continued.) (N8, Q26s, 3-66; CN, 5)

248-N.* (Russian.) Effect of Small Additions of Silver and Zinc on the Aging of Aluminum-Copper Alloys. Pt. 5. V. I. Arkharov and L. M. Magat. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 804-808.

Addition of 0.05-0.5% Ag and 0.2% Zn to Al-Cu alloy has a retarding effect on

the disintegration of over-saturated solid solution of Cu in Al at the start of aging at 245° C. Introduction of Ag and Zn causes an increase of Cu diffusion. 7 ref. (N7a, 2-60; Al-b, *Cu, Ag, Zn,* AD-p)

249-N.* (Russian.) Effect of Cadmium, Silver or Zinc on the Aging of Aluminum-Copper Alloys. Pt. 6. V. I. Arkharov and L. M. Magat. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 809-811.

Addition of 0.05% Cd has an accelerating effect on aging at 245° C. The further addition of Ag reduces the effect of Cd. 8 ref. (N7a, 2-60; Al-b, *Cu, Cd, Ag, Zn*)

250-N.* (Russian.) Effect of Grain Size on the Diffusion of Carbon in Iron. I. E. Kontorovich and Yu. M. Mermel'shtein. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 812-818.

Diffusion of carbon in Fe is greater as grain size increases. The diffusion depth may be increased by 200-250% by varying the grain size. Carbon concentration is greater than in coarse-grained Fe. 11 ref. (N1, 2-59; Fe, *C*)

251-N.* (Russian.) Phase Changes in 1KH18N9T Steel During Plastic Deformation. V. A. Tolomasov. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 838-842.

In addition to an alpha-phase with a Curie point of 600° C., two other ferromagnetic phases form with a Curie point of 160 and 270° C. The number of ferromagnetic phases is dependent on the degree of deformation. 8 ref. (N11h, N8, 3-68; SS)

252-N.* (Russian.) Volumetric Phase Diagram for Steel SJKH15. A. P. Gulyaev and B. M. Zel'bert. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 843-848.

Diagrams indicate relationship of specific volumes of austenite and martensite at various temperatures to various carbon contents in solid solution. 8 ref. (N8, M24; ST, *C*)

253-N.* (Russian.) Effect of Heat Treatment Upon Structure and Cold Shortness of Phosphorus Steel. V. N. Svechnikov and Yu. E. Yakovchuk. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 849-857.

Effect of heating for 1 hr. at 760° C. on normalized steels with 0.04-1.1% carbon and 0.05-0.30% phosphorus. The average impact strength, measured at 0 to -50° C., on steel not heat treated ranged from 5.5 down to 0.7 and that of heat treated steels, from 6.3 down to 1.1 kg. per sq.cm. Anomaly of structure is caused by phosphorus. (N8h, Q6n, 2-64, 2-60; ST, *C, P*)

254-N.* (Russian.) Kinetics of Martensite Deformation. V. N. Arskii and A. P. Glyaev. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 866-873.

Rate and magnitude of loading affect martensite deformation. This is analogous to the effect of cooling rate and to the temperature of isothermal exposure during formation of martensite on cooling. Maximum amount of martensite deformation occurs when the deformation temperature coincides with martensite temperature. 5 ref. (N8p; AY, *Ni*)

255-N.* (Russian.) Carbide Formation During Tempering of Chromium Steels. B. A. Anaev. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 858-865.

Phase transformation determined sometimes by the ratio of Cr to C and the temperature. Increase of Cr content has no effect upon carbide stability. Preparatory stage formation of special Cr carbides is dissolving of Cr in cementite. The higher the Cr content in steel, the lower the initial dissolving temperature of Cr in cementite. 13 ref. (N8r; AY, *Cr*)

256-N.* (Ukrainian.) Diffusion of Silicon in Titanium, Tantalum, Molybdenum and Iron. G. V. Samsonov, M. S. Koval'chenko and T. S. Verkhoglyadova. *Dopovidi Akademii Nauk Ukrainskii RSR,* Jan. 1959, p. 32-35.

Relative change in weight, diameter and specimen height depends on the absolute temperature and saturation time. 12 ref. (N1, Ti, Ta, Mo, Fe, *Si*)

257-N.* (Ukrainian.) Linear Rate of Growth of Recrystallization Centers in Deformed Nickel and Iron. E. E. Zasimchuk and L. N. Larikov. *Dopovidi Adademii Nauk Ukrainskii RSR,* Jan. 1959, p. 42-44.

Slight impurities lead to a perceptible change in the pre-exponential factor and a substantial increase in the activation energy. 5 ref. (N3, N5, 3-68, 3-69)

258-N.* Martensitic Transformations in Steels. Rajendra Kumar. *Indian Institute of Metals, Transactions,* v. 11, Dec. 1958, p. 21-35.

Reviews theories on kinetics of martensite formation and free energy change. Effects of stress and alloying elements.

Stabilization of austenite; isothermal formation of martensite. 54 ref. (N8p, N8n, 2-60, 3-66; ST)

259-N.* Recrystallization Texture of Drawn Aluminum Wire. P. Dayal and S. Dey. *Indian Institute of Metals, Transactions*, v. 11, Dec. 1958, p. 59-66.

X-ray diffraction examination of 99.5% purity Al wire drawn to 97% reduction in diameter and annealed for 2 hr. at 300 to 630° C. indicated that the [111] texture is retained up to 600° C. 20 ref. (N5f, M26c, 2-64; Al)

260-N. Enhanced Diffusion. G. J. Dienes. *Journal of Metals*, v. 11, Apr. 1959, p. 281.

Report on Conference on Enhanced Diffusion, University of Pennsylvania, Oct. 1, 1958. (N1, 2-67, 3-68)

261-N. Electrical Resistivity and Superstructure of $CuAu_3$. Makoto Hirabayashi. *Physical Society of Japan, Journal*, v. 14, Mar. 1959, p. 262-273.

Study of superlattice formation with electrical resistivity measurements. 29 ref. (N10a, P15g; Au-b, *Cu*)

262-N. (Ukrainian.) Effect of Normalizing on the Graphitization of Steel. A. A. Baranov. *Dopovidi Akademii Nauk Ukrainskoi RSR*, Jan. 1959, p. 37-41.

Acceleration of the graphitization of cast steel is a result of rapid cooling above Ar_1. Normalizing temperature is 800-1200° C. 8 ref. (N8s, J24; ST)

263-N. Diffusion of Beryllium in Beryllium Oxide. Stanley B. Austerman. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-3170, Dec. 15, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Self-diffusion of Be in polycrystalline BeO determined with radioactive Be^7 at temperatures between 1570 and 1934° C. Following diffusion annealing the samples were sectioned by grinding, and the one-dimensional diffusion-penetration of Be^7 determined by counting procedures. No evidence was found for grain-boundary diffusion. 9 ref. (N1d, 1-59; Be)

264-N.* (French.) Diffusion and Solubility of Hydrogen in Iron and Extra-Mild Steel. Jacques Plusquellec, Pierre Azou and Paul Bastien. *Comptes Rendus*, v. 248, Mar. 23, 1959, p. 1816-1819.

Effects of deformation degree and temperature on hydrogen diffusion and solubility. 7 ref. (N1, N15e, 2-61, 3-68; CN, Fe, *H*)

265-N.* (French.) Quantitative Investigation of Dendritic Segregation in Some Iron Alloys. J. Philibert and C. De Beaulieu. *Revue de Metallurgie*, v. 56, Feb. 1959, p. 171-178.

Investigation by autoradiography and Castaing's microprobe indicates a decreasing segregation order—As, Mo, Cr, Mn and Ni. There is only a slight and scarcely detectable segregation in the absence of carbon. The degree of segregation in Fe-As alloy is 30 times smaller than in Fe-C-As ternary alloy. 10 ref. (N12b; Fe-b, *As, C*)

266-N.* (German.) Graphitization of Iron-Carbon Casting Alloys. Adalbert Wittmoser. *Giesserei*, v. 46, Apr. 9, 1959, p. 177-187.

Laminar graphite present in cast iron, malleable cast iron and cast steel thought to develop immediately from the melt, or indirectly from decomposing ledeburite. Formation of temper carbon (nodular to spherical graphite) is also explained by ledeburite decomposition. Formation of spherical graphite from supersaturated mixed crystals. (N8s, CI-b, CI-s, ST 5-60)

267-N.* Diffusion of Interstitial Solutes in the Group V Transition Metals. R. W. Powers and Margaret V. Doyle. *Journal of Applied Physics*, v. 30, Apr. 1959, p. 514-524.

Mechanical relaxation measurements used to obtain information on the diffusion rate of interstitial solute atoms in bcc. metals. 40 ref. (N1e; Cb, Ta, V, C, O, N)

268-N. Diffusion of the Neutron Diffusion Parameters in Room-Temperature Beryllium. G. deSaussure and E. G. Silver. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission*, ORNL-2641, Feb. 27, 1959, 38 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

The pulsed neutron method was used to determine the diffusion parameters of thermal neutrons in Be at room temperature. Values are given for the inverse lifetime, diffusion constant and diffusion cooling constant. 21 ref. (N1; Be)

269-N.* (French.) Decomposition of an Austenitic Matrix in Annealing Z180C13 Steel. Andre Faure. *Metaux Corrosion-Industries*, v. 34, Feb. 1959, p. 72-80.

Determination of heat treatment which provides an austenitic matrix at room temperature. (To be continued.) (N8, J23; SS)

270-N.* Room Temperature Decomposition of Austenite in Fifty Percent Nickel-Fifty Percent Iron Magnetic Alloy Tapes. N. I. Ananthanarayanan and R. J. Peavler. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 202S-203S.

Partial transformation on storage to orthorhombic or tetragonal phase. (N-general; Fe-b, *Ni*)

271-N.* (French.) Strain Hardening of Iron Crystals. Bernard Jaoul and Daniele Gonzalez. *Comptes Rendus*, v. 248, Apr. 1, 1959, p. 1932-1934.

Strain hardening curves for decarburized Armco iron crystals are linear for the range from 3% deformation (beginning of crystal slip) to the first appearance of cross-section reduction. These curve slopes are small and resemble those of fcc. crystals in the range of easy glide. (N7e, Q24a; Fe, 14-61)

272-N. (French.) Pre-Precipitation in Hardenable Alloys. Jack Manenc. *Comptes Rendus*, v. 248, Mar. 23, 1959, p. 1814-1816.

Irregular diffusion of X-rays explained by the beginning of precipitation. 4 ref. (N7b, M22g)

273-N.* (Russian.) Effect of Dissolved Carbon on Recrystallization and Long-Time Endurance of Iron-Nickel-Manganese Solid Solution. E. Z. Kaminskii and V. M. Rosenberg. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1036-1039.

Introduction of carbon into Fe-Ni-Mn solid solution reduces the temperature of initial recrystallization of carbon dissolved solution; promotes resistance to rupture during high deformation rates and reduces resistance to rupture at comparatively low deformation rates. 11 ref. (N5, 2-60, Q-general; AY, *Ni, Mn, C*, 14-67)

274-N.* (Russian.) Effect of Manganese and Molybdenum on Carbon Solubility in Alpha-Iron. S. N. Polyakov and K. F. Starodubov. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1110-1121.

Both 0.75% and 0.4% Mo at temperatures from 720-550° C. reduce carbon solubility. Alloying with Mn leads to formation of an incubation period whereas alloying with Mo produces no incubation period. 28 ref. (N1c, P12e, 14-67, 2-60; Fe, *Mn, Mo, C*)

275-N.* (Russian.) Structural Changes in 20KHML Steel During Prolonged Exposure to Heating. S. S. D'Yachenko, L. S. Palathik and R. S. Kaplan. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1122-1129.

X-ray studies showed that after normalizing and tempering at 650-680° C. for 3 hr., the carbide precipitate contained a mixture of three carbides, $Cr_{23}C_6$, Mo_2C and Fe_2MO_2C. At prolonged exposure at 500-550° C. coalescence of carbides results in the formation of zones of ferrite at the boundary of pearlitic grains which do not contain carbides. (N8p, N3; SS-d)

276-N. Diffusion in Metals. Paul Shewmon. *Industrial & Engineering Chemistry*, v. 51, Mar. 1959, p. 402-405.

Review. 106 ref. (N1)

277-N. Observations on Diffusion in the Iron-Chromium System. H. W. Paxton, E. J. Pasierb and T. Kunitake. Carnegie Institute of Technology. *Office of Naval Research*, Mar. 1, 1959, 23 p.

Determination of self-diffusion of Cr in Fe-Cr system with from 30 to 100% Cr at 1275° C. using isotope Cr^{51} and autoradiographic techniques. Marker movement and chemical diffusion coefficients in welded couples between pure Cr and a 30 Cr, 70 Fe alloy at 1150 to 1425° C. 32 ref. (N1d, 1-59; Fe-b, *Cr*)

278-N. Partitioning of Alloying Elements in Malleable Irons. George Sandoz. *Naval Research Laboratory*, NRL Report 5268, Feb. 15, 1959, 26 p.

Partitioning of Si, P, Mn, S, V, Cr, Mo, Cu, Ni, Co and Al between cementite and austenite phases of Fe during first stage graphitization at 1650° F. Analysis of chemically extracted cementite residues. Electron-probe microanalyzer determination. 33 ref. (N8k, N8n, N8s, J23b; CI-s)

279-N.* Graphitization Failures in Piping. J. B. Nuchols and J. R. McGuffey. *Mechanical Engineering*, v. 81, May 1959, p. 43-45.

Carbon steel with 0.5% Mo in Oak Ridge power plant is being replaced by 1¼% Cr, ½% Mo steel because of repeated failures. (N8s, Q26, W11g; AY, *Mo, Cr*, 4-60)

280-N.* (German.) Micro-Tensile Tests on the "Presseffekt" in Naturally or Artificially Aged Aluminum-Copper-Magnesium Alloys. Werner Dickenscheid and Hugo Josef Seemann. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 527-532.

Investigation of extruded products. The strain hardening effect can be determined

by finding the ratio between the longitudinal microtensile strength and that measured in transversal direction. If the material is in the strain hardened state (of "presseffekt") the ratio is 1.2 to 1.3 and remains constant up to the strength maximum. In the state of artificial overaging it becomes 1 (i.e., the effect disappears). 19 ref. (N7e, Q27; 4-58, Al-b, *Cu, Mg*)

281-N.* (Hungarian.) Crystallization in Rimming Steel Ingots Influenced by High-Frequency Vibrations. Sandor Enekes. *Kohaszati Lapok*, v. 91, Dec. 1958, p. 536-542.

Application of high-energy vibrations results in a balance of gravitation and inertia forces and liberation of entrapped gases. 4 ref. (N12; ST-d, 5-59)

282-N. (German.) Recovery After the Plastic Deformation in Single Crystals. Friedrich Blaha and Bertwin Langenecker. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 357-360.

Effects of additional deformation, temperature and ultrasonic treatment on the recovery of Zn and Al crystals. 9 ref. (N4, 3-68, 2-61; Zn, Al, 14-61)

283-N. (German.) Superlattice Formation in the Hexagonal Phases of the Systems Ag-In and Cu-Ga. Walter Lang. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1958, p. 424-425.

An ordered Ag_3In phase below 195° C. in the Ag-In system, and an ordered beta-prime-phase below 340° C. in the Cu-Ga system were determined. (N10, M24b; Ag, In, Cu, Ga)

284-N. (German.) Anisotropy in the Deformation of Supersaturated Mixed Crystals. Hans Joachim Bunge. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 517-523.

Precipitation and ordering effects. 10 ref. (N7b, N10b)

285-N. (Russian.) Diffusion Along the Grain Boundary and Into the Volume of the Grain. B. S. Bokshtein, I. A. Magidson and I. L. Svetlov. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1040-1052.

Diffusion pattern in a polycrystal body. The pattern of diffusion is close to that accepted in the theory of heat transmission and mass transmission. 14 ref. (N1h)

286-N.* (German.) Superstructure and "K-State" in the Nickel-Chromium System. Hans Gunter Baer. *Zeitschrift fur Metallkunde*, v. 49, Dec. 1958, p. 614-622.

An ordered phase Ni_2Cr is found in alloys with 25-36 at.% Cr. Its critical temperature is at 580° C. for an alloy with 33.7 at.% Cr. By an increased temperature of preliminary heating (for example, from 800-1200° C.), on previous cold deformation the ordering process is accelerated. The ordered state is destroyed by cold deformation. Low Cr-alloys can pass into the K-state, which is characterized by an increase of electric resistance, after by heat treatment and by a decrease of resistance as a result of deformation. 22 ref. (N10a, 2-64, 3-68; Ni-b, *Cr*)

287-N.* (Hungarian.) Determination of the Sizes of Crystal Nuclei. Sandor Gardonyi. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 23-28.

Calculation of the dimensions and expected growth pattern of crystal nuclei based on laws of thermodynamics. Solid impurities in the metal melt stimulate formation of crystal nuclei. Speed of crystal growth in a direction normal to the face is related to surface adhesion on the crystal faces. 5 ref. (N2, N3, 3-69)

288-N.* Normal Grain Growth in Zone-Refined High-Purity Metals. E. L. Holmes and W. C. Winegard. *Canadian Journal of Physics*, v. 37, Apr. 1959, p. 496-498.

A model is proposed for the mechanism of grain-boundary migration based on the assumption of a single-atom process. 12 ref. (N3m, Pb-a, Sn-a)

289-N.* Recrystallization of Lead During Creep. R. C. Gifkins. *Institute of Metals, Journal*, v. 87, Apr. 1959, p. 255-261.

Acceleration of creep associated with recrystallization is shown to result from primary creep of the new grains and not from the actual process of recrystallization. Although recrystallization appeared to consist of nucleation and growth, its characteristics were predominantly those of marked grain growth. 33 ref. (N3m, N5f, Q3; Pb)

290-N.* Removal of Hydrogen by Diffusion From Large Masses of Steel. J. D. Hobson. *Iron and Steel Institute, Journal*, v. 191, Apr. 1959, p. 342-352.

Theoretical calculation of the loss of hydrogen during forging, annealing and heat treatment of large masses of alloy steel. Comparison of calculated and observed values. (N1; AY, *H*)

291-N.* Effect of Austenitizing Treatment on Formation of Lower Bainite in a Plain Carbon Steel. L. W. Graham and H. J. Axon. *Iron*

and Steel Institute, Journal, v. 191, Apr. 1959, p. 361-365.

Metallographic and dilatometric study of influence of solution treatment, temperature and time on kinetics of austenite-bainite reaction in 0.97% carbon steel. 13 ref. (N8g, N8m, 2-64; CN-p)

292-N.* Electrical Resistivity and Superstructure of $CuAu_3$. Makoto Hirabayashi. *Physical Society of Japan, Journal,* v. 14, Mar. 1959, p. 262-273.

Study of superlattice formation with electrical resistiveity measurements. 29 ref. (N10a, P15g; Ag-b, *Cu*)

293-N.* (German.) Strength Properties of Carbon Steel With Widmannstatten Structure. F. Erdmann-Jesnitzer and B. Schellhorn. *Harterei-Technik und Warmebehandlung (Supplement to Industrieblatt),* v. 5, Apr. 1959, p. 25-31.

Effect of various annealing temperatures on the impact strength of cast steel with 0.46% carbon. Brittle behavior under impact is thought to be caused by the position of ferrite needles and by carbon layers in the ferrite. 39 ref. (N8j, Q26; CN, 5-60, 3-71)

294-N.* (German.) Formation of the Omega-Structure in Titanium-Vanadium and Titanium-Molybdenum Alloys. Karl Lohberg and Herbert Westphal. *Zeitschrift fur Metallkunde,* v. 49, Sept. 1958, p. 449-455.

Effects of heat treatment and artificial aging on formation of omega-structure after plastic deformation. (N7c, Q24, 2-64, 2-65; Ti-b, *V, Mo*)

295-N. The Free-Energy Changes Attending the Martensitic Transformation in the Iron-Chromium and Iron-Chromium-Nickel Systems. Larry Kaufman. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 218-223.

An equation is derived which relates the difference in free energy between austenite and martensite to temperature and composition in the Fe-Cr and Fe-Cr-Ni systems. The equation is used to calculate the difference at M_S for low-carbon stainless steels. A method for utilizing the energetic equations to calculate M_S in stainless steels is suggested. 33 ref. (N8p, M24c, P12; SS, *Fe, Cr, Ni*)

296-N. Heat Treatment, Transformation Reactions and Mechanical Properties of Some High-Strength Zirconium-Base Alloys. H. A. Robinson, J. R. Doig, M. W. Mote and P. D. Frost. *Metallurgical Society of AIME,* v. 215, Apr. 1959, p. 237-245.

The Zr alpha-beta alloys respond to heat treatment much as Ti alpha-beta alloys, showing both the epsilon and the alpha-prime aging reactions, depending on composition and heat treatment history. Data are presented for Zr-Mo-Sn and Zr-Nb-Sn alloys, which produce strengths as high as 190,000 psi. with reasonable ductility. 14 ref. (N-general, Q-general, 2-64, 2-60; Zr-b, *Mo, Sn, Cb,* SGB-a)

297-N. Freezing of Liquid Metal in a Mold. G. Harvay and J. G. Henzel. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 258-273.

Nomograms and charts permit rapid determination of the mold-casting interface temperature and the speed of solidification when a semi-infinite ingot is cast into a semi-infinite mold. The physical properties of the mold, the frozen metal and the liquid metal are not assumed to be equal, but they are assumed to be temperature independent. 15 ref. (N12)

298-N. Diffusion of Zinc From the Vapor Phase Into Copper-Zinc and Silver-Zinc Alloys. A. G. Guy. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 279-282.

Zinc vapor from a reservoir of liquid Zn maintained at lower temperatures was diffused into sets of Cu-Zn alloys at 759 and 870° C. and into sets of Ag-Zn alloys at 650 and 700° C. Natural markers at the initial surfaces of the specimens were "trapped" under a thin electroplate and their depth of burying was measured after diffusion. 20 ref. (N1; Cu, Ag, *Zn*)

299-N. Retrogression in Age Hardening. L. F. Mondolfo. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 289-294.

An Al-Cu alloy 4% Cu aged at room temperature for times increasing up to 78,000 hr. was annealed at 170° C. and the hardness and electrolytic potential determined during retrogression and subsequent aging. A change of behavior with increasing time of aging at room temperature indicates that, given sufficient time, retrogression disappears and the room-temperature aging tends to progress directly into the high-temperature aging. 78 ref. (N7a; Al-b, *Cu*)

300-N. A Proposed Mechanism for the Strengthening of SAP-Type Alloys. G. S. Ansell. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 294-295.

SAP-type alloys are not truly dispersion-hardened alloys in the normal sense, since the dispersed second phase acts only to prevent the production of dislocations, whereas in the dispersion-hardened alloy the dispersion acts to hinder dislocation movement. SAP-type alloy should be treated as a distinctive type of dispersion-hardened metal. (N7; Al-b, 6-68)

301-N.* Microstructure of Age-Hardenable Alloys. J. R. Mihalisin and K. G. Carroll. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 68-72.

Microstructure of a Ni-Ce-Fe-Al-Ti-Cb alloy after solution and double aging treatments and of a Ni-Cr-Fe-Mo-Ti-Al alloy following creep rupture tests at 1350° F. 5 ref. (N7a, N7e; M27, Ni-b, *Cr, Fe, Al, Ti, Cb*)

302-N.* An Electron Metallographic Study of the Precipitation-Hardening Process in Commercial Nickel-Base Alloys. W. C. Bigelow, J. A. Amy, C. L. Corey and J. W. Freeman. Paper from "Symposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 73-87.

Development of gamma-prime phase in Inconel X, Waspaloy, M-252 and Udimet-500 during aging at 1400 and 1600° F. for periods up to 100 or 1000 hr. 11 ref. (N7a, N7b, M21e; Ni-b, *Cr, Co, Mo, Fe, Al, Ti, Cb, Mn*)

303-N.* Application of Electron Diffraction and Electron Microscopy in Studies of Minor Phases of Heat-Resistant Alloys. W. C. Bigelow, L. O. Brockway and J. W. Freeman. Paper from "Sumposium on Advances in Electron Metallography". American Society for Testing Materials, STP no. 245, 1958, p. 88-99.

Etched surfaces of 16-25-6 Cr-Ni-Mo steel, Inconel X, S816 Co-base alloy and N-155 alloy after solution treatment and aging for various times at 1200 to 1600° F. Identity and distribution of precipitated phases. Surface preparation techniques. 19 ref. (N7a, M20, M22h, M21e; SS, Co-b, Ni-b, SGA-h)

304-N.* (English.) The Casting of Special Steel Ingots. *Aciers Fins & Speciaux*, no. 31, Mar. 1959, p. 22-28.

Liquid metal-solid metal contraction; segregation; mold walls; solidification; columnar and equiaxed crystallization; properties of rimming, interupted rimming or capped, semikilled and killed steel. 5 ref. (N12, P10d; 9-69, ST, 5-59)

305-N. A Study of the Peritectoid Transformation. R. D. Reiswig and D. J. Mack. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 301-307.

Six peritectoids selected were those reported at 7.02% Al-Ag, 26.0% Sb-Cu, 30.5% Sb-Cu, 32.3% Sn-Cu, 8.35% Si-Cu, and 21.2% Al-Cu. Peritectoid transformation takes place ideally by the formation of a peritectoid wall of the low-temperature phase at the interface separating the high-temperature phases and the lateral growth of this wall at the expense of the high-temperature phases. 11 ref. (N11g; Cu-b, *Sb, Sn, Si, Al*, Ag-b)

306-N. Observations on the Recrystallization of a Silicon-Iron Crvstal in a Polygonized Matrix. Hsun Hu. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 320-326.

Recrystallization tendency of the deformed crystal is much weakened by the polygonization of the matrix. Complete recrystallization in such specimens is achieved by the growth of recrystallized grains of sufficient size and of the right orientations in relation to the matrix. 15 ref. (N5, 3-68; Fe-b, *Si*, 14-61)

307-N. An Investigation of the Effects of Variables on the Stored Energy of Cold Work. A. L. Titchener and M. B. Bever. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 326-335.

Stored energy of cold work in drawn Au-Ag wires investigated by tin-solution calorimetry as a function of strain, strain rate, initial grain size and temperature of deformation. The energy expended in the deformation process was measured. 29 ref. (N7e, P12, 3-68, 2-61, 2-59; Au-b, *Ag*, 4-61)

308-N. Diffusion of Bismuth in Copper Grain Boundaries. S. Yukawa and M. J. Sinott. *Metallurgical Society of AIME, Transactions*, Apr. 1959, p. 338-340.

Use of high-resolution autoradiography to detect the presence of Bi in Cu polycrystalline and bi-crystal specimens. 5 ref. (N1, M23q; Cu, *Bi*)

309-N. Nonmetallic Dispersions in Cobalt. E. F. Adkins, C. T. Sims and R. I. Jaffee. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 344-352.

Effect of oxide dispersions on mechanical properties of Co and Co-base powder

metallurgy alloys. Oxide dispersions added to pure Co greatly improve the high-temperature creep resistance of the metal. Dispersions in powder metallurgy Co alloys are much less effective. 4 ref. (N7, Q-general, 2-60, 2-62; Co-b, NM-a34, 6)

310-N.* (English.) The Influence of Annealing on the Pearlitic Structure of a Eutectoid Carbon Steel. H. Modin. *Jernkontorets Annaler*, v. 143, no. 2, 1959, p. 76-116.

Pearlite formed at 700 and 650° C. is lamellar and the cementite in the pearlite has the form of deep jagged plates perforated by numerous holes. The perforated and jagged shape of the cementite particles is formed at the time of formation of the cementite and not in consequence of the continued annealing. 5 ref. (N8h, J23; CN)

311-N. (German.) Physical Properties of Superstructures With Shifting Atomic Structure. Werner Koster and Walter Lang. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 443-449.

In Cu_3Au-Zn_3Au, Pd_3Cu and CuAu-Zn systems, the electrical resistivity and Young's modulus are higher and the Hall constant is more negative in superstructures with shifting atom blocks than in nondisturbed superstructures. 17 ref. (N10a, M25, P15, Q21a; Cu-b, *Au, Zn, Pd*)

312-N. (German.) Crystal Structures of AuZn (r), Au_3Zn_5 and Some Related Variants. Manfred Wilkens and Konrad Schubert. *Zeitschrift fur Metallkunde*, v. 49, Dec. 1958, p. 633-646.

The structures are understood as superstructures of the LI_2-type showing the phenomenon of atomic shifting. 18 ref. (N10a, M26; Au, Zn)

313-N. (Ukrainian.) Eutectic Structure of Cast Iron. K. P. Bunin and L. T. Kalinina. *Dopovidi Academii Nauk Ukrain'skoi SSR*, no. 2, 1959, p. 156-159.

Crystallization of eutectic case iron with both low and high Si content during continuous cooling at a varying rate. (N12q, CI)

314-N.* (French.) Influence of Some Addition Elements on the Stability of Stellite. K. Lobl, J. Jezek and H. Tuma. *Revue de Metallurgie*, v. 56, Apr. 1959, p. 324-330.

Structural changes caused by long-term annealing of Co-Cr-W type alloys; comparison with Co alloys containing small additions of Ti, Mo, Cb, Zr, B and Fe. (N7c, J23q; SGA-h, Co-b, *Cr, W, Cb, Ti, Mo, B, Fe, B, Zr*)

315-N.* (French.) Nature of Microconstituents Formed in Zinc-Rich Brasses Containing Iron and Aluminum. A. R. Weill. *Revue de Metallurgie*, v. 56, Apr. 1959, p. 371-379.

Two commercial beta brasses studied by optical microscopy, electron diffraction and Castaing's electron probe microanalyzer. Specimens containing Fe, Al and Mn have homogeneous precipitates formed by a solid solution of Fe-Mn-Al. When brass also contains Ni, dendritic precipitates are two-phased, consisting of an Fe-Mn-Al matrix and Ni-Fe-Al branches. Latter solidx solution is ordered. 16 ref. (N12b, M27, Cu-n, *Fe, Al, Mn, Ni*, 14-67)

316-N.* (French.) Study of Segregation of Arsenic and Copper by Autoradiagraphy and Quantitative Examination by Means of the Castaing Microprobe. *Revue de Metallurgie*, v. 56, Apr. 1959, p. 395-406.

Effect of carbon content, mode of crystallization, forging and rolling on dendritic segregation of As in pure alloys and commercial steels. A particularly high concentration of As occurs in interdendritic spaces in as-cast metal while this heterogeneity is partly reduced by forging. 11 ref. (N12b, M23q, 3-70; 9-69, CN, AY, *As, Cu*)

317-N.* (German.) Development of Ears in Aluminum Single Crystals. G. Siebel. *Aluminium*, v. 35, Apr. 1959, p. 186-188.

It was possible to grow single crystals in Al sheet by recrystallization after critical deformation. Disks of 55 mm. diameter and 1 mm. thick were stamped for cupping tests. With (100) (001), (110) (001), and (110) (110) textures, ears at 0 and 90° to the rolling direction appeared, while (100) (110), (110) (111), (110) (112) and (112) (111) textures gave 45° ears. (N3r, N5, M26c; Al)

318-N.* (Polish.) Effect of Phosphorus on the Aging of Steel. Fr. Erdmann-Jesnitzer and W. Dehnke. *Hutnik*, v. 26, Jan. 1959, p. 1-8.

Increase in plasticity and hardness observed after deformation and age hardening. Age hardenability decreases with the phosphorus increase from 0.006 to 0.073%. 15 ref. (N7a, 2-60; CN-g, *P*)

319-N.* (Russian.) Colloidal State of Solid Solutions in Metallic Systems of Binary Phase

Alloys. V. M. Glozov and V. N. Vigdorovich. *Kolloidnyi Zhuranl,* v. 21, no. 1, 1959, p. 18-23.

Microhardness studies of crystals of binary phase solid solution of a number of binary systems. The kinetics of the transition of heterogeneous crystals of a solid solution from a metastable to a stable state was examined. The transition occurred in two stages. 4 ref. (N11h; 14-67)

320-N.* (Russian.) Carbon Distribution in Weld Zone and Weld Metal. K. V. Lyubavskii and M. A. Studnits. *Svarochnoe Proizvodstvo,* Apr. 1959, p. 7-12.

Stabilization of E1257 stainless steel welded joints at 800° C. for 20 hr. results in a noticeable carbon redistribution caused by its migration from the base metal into the weld metal. Aging of heat-treated steel samples (austenitizing or stabilizing) at 580-600° C. for 1000 hr. under stressed and stress-free conditions does not change the carbon distribution in the melting zone. (N1, J22, J23q; 7-51, C, SS)

321-N.* (Russian.) Effect of Chemical Composition of Austenite Weld Metal on Gamma-Sigma Transformation. B. I. Medovar and Yu. B. Malevskii. *Svarochnoe Proizvodstvo,* Apr. 1959, p. 12-16.

Austenitic welded seams of Type 25-20, welded with Sv-KH25N20 rods, are susceptible to intensive brittleness because of gamma-sigma transformations during prolonged heating at 650-870° C. The response of the metal to sigma phase transformation depends upon its chemical composition. 11 ref. (N6p, Q23r, 2-60; SS, 7-51)

322-N.* (Russian.) Phase Diagrams in the Chromium-Tantalum System. T. Grigor'ev, V. V. Kuprina and N. A. Nedumov. *Zhurnal Neorganicheskoi Khimii,* v. 4, no. 3, 1959, p. 650-654.

A chemical compound, Cr_2Ta, formed at 2020° C. during melting, without decomposition, has a transition point at 1800° C. In a solid solution of Cr in Ta, the Cr_2Ta forms a eutectic mixture, the eutectic point being at 75% Ta and eutectic temperature at 1980° C. (N11h, M24b; Cr-b, *Ta*)

323-N.* Carbon Flotation in Ductile Iron. A. H. Rauch, J. B. Peck and G. F. Thomas. *Modern Castings,* v. 35, May 1959, p. 61-64.

In hypereutectic ductile iron castings, carbon in excess of that necessary to maintain a carbon equivalent of 4.55% was found to be precipitated during the solidification period. (N12, 2-60; CI-r, 9-71)

324-N.* Diffractometric Study on Formation of Ferrite in Cold Worked 18-8 Stainless Steel. Gunji Shinoda and Tadashi Kawasaki. *Osaka University, Technology Reports,* v. 8, Oct. 1958, p. 363-371.

Effect of cold working and annealing on the transformation of stainless steel. (N8j, M22g, 2-64; SS)

325-N. The Compatability of a Number of Metals With Graphite. Arnold F. Gerds and Manley W. Mallett. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1261, Apr. 14, 1958, 28 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Materials were tested at 1650° C. and 1850° F. in 1000-hr. tests. Cu is the material most resistant to attack by carbon, Ni is only slightly more reactive than Cu in the 250-hr. test. Of the alloys studied Inconel X appears least affected by reaction with carbon when heated in contact with graphite. Alnico is less resistant than Inconel X but better than Nichrome V, Inconel, and types 316 and 318 stainless steel. (N1; Cu, Ni-b, SS, *C*)

326-N. Corrosion and Decarburization of the Ferritic Chromium-Molybdenum Steels in Sodium Coolant Systems. W. C. Hayes and O. C. Shephard. Atomics International. *U. S. Atomic Energy Commission,* NAA-SR-2973, Dec. 1, 1958, 33 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

The rate-controlling step in the decarburization reaction appears to be the diffusion of carbon in the ferritic steels where the austenitic-to-ferritic ratio is high. Steel containing 5% Cr with Ti, and the 7 and 9% Cr steels are approximately neutral in carbon activity, with respect to 304 stainless steel in a loop containing Na which is not contaminated with C. 8 ref. (N1, R-general; SS-d, *Cr, Mo, C, Ti*)

327-N.* (German.) Austenite Formation. Adolf Rose. *Harterei-Technische Mitteilungen,* v. 13, no. 1, 1958, p. 46-76.

Austenite formation and connected phase changes in unalloyed and low-alloy structural steels, and in toolsteels. Dimensional changes in isothermal transformations. Martensite point and hardness as influenced by the holding time in austenitizing. 8 ref. (N8f; CN, AY, TS)

328-N. (Russian.) Effect of Ordering in Solid Solutions. A. M. Evseev. *Zhurnal Fizicheskoi Khimii,* v. 33, Jan. 1959, p. 112-118.

A procedure is proposed to account for the "effect of ordering" in liquid metallic systems. 12 ref. (N10, 14-67)

329-N. (Russian.) Iron-Nickel Alloys Obtained by Electrolytic Precipitation. V. V. Sysoeva. *Zhurnal Prikladnoi Khimii,* v. 32, Jan. 1959, p. 128-132.

Electrolyte composition, temperature control and current density. 18 ref. (N12e; Fe-b, Ni)

330-N. Electron Metallographic Studies of Nickel-Base Heat-Resistant Alloys. W. C. Bigelow and J. A. Amy. University of Michigan. *Wright Air Development Center,* Technical Report no. 58-406, Aug. 1958, 49 p.

Changes in microstructure of the commercial alloys Inconel-X, Waspaloy, M-252 and Udimet-500 during aging at 1400 and 1600° F. Favorable high-temperature properties result largely from the precipitation of the intermetallic gamma' phase during exposure to high temperature. Electron diffraction studies show that the gamma' phase has an ordered structure and precipitates with a preferred orientation in the matrix. 33 ref. (N7, J27d, M27, M26c; Ni-b)

331-N.* (French.) Effects of Copper, Zinc and Silver on Recrystallization of Aluminum. J. C. Blade. *Revue de Metallurgie,* v. 56, Mar. 1959, p. 229-236.

An explanation is proposed for the effect of additions of Cu, Ag and Zn on the recrystallization rate of super-purity Al. 7 ref. (N5, 2-60; Al-a, *Cu, Zn, Ag*)

332-N.* (French.) Recrystallization of Zone Melted Aluminum. O. Dimitrov and Ph. Albert. *Revue de Metallurgie,* v. 56, Mar. 1959, p. 267-271.

Low-temperature recrystallization of high-purity Al as revealed by X-ray diffraction and electric conductivity measurements. Special methods of electrolytic polishing and anodic oxidation were developed to permit micrographical studies at subzero temperatures. 4 ref. (N5, L13p, M22g; Al-a)

333-N.* (French.) Cinemicrographic Investigation of Allotropic Transformation of Cobalt and Cobalt-Nickel Alloys. Herve Bibring, Gabriel Lenoir and Francois Sebilleau. *Revue de Metallurgie,* v. 56, Mar. 1959, p. 279-287.

The allotropic transformation of Co studied by hot stage microscope equipped with a camera. Appearance of martensitic platelets and the effect of stress on grain boundaries are analyzed by using slow motion (6000 exposures per sec.) Binary Co-Ni alloys show only one spontaneous transformation during heating when the Ni content is in excess of 30%. (N6p, 2-60, 3-66; Co-b, *Ni*)

334-N.* (Russian.) Relationship Between Surface Structure of Electrodeposits of Alloys and Their Phase State. Yu. M. Polykapov and V. V. Bondar'. *Doklady Akademii Nauk,* v. 123, no. 4, 1958, p. 719-721.

Formation of supersaturated solid solution shows a considerable effect on the structure of electrodeposited layers, helping the formation of fine crystalline deposits. Since no relation exists between orientation and the lattice of the deposited metal, formation of phase nucleus in the more negative metals is difficult. 11 ref. (N12d; Cu-b, *Bi,* 14-67)

335-N.* (Russian.) Formation of Solid Solutions in Metallic Systems. A. N. Kcrstovnikov and V. N. Vigdorovich. *Zhurnal Fizičheskoi Khimii,* v. 33, Jan. 1959, p. 79-82.

Materials analyzed from the standpoint of the nature of electronic structure of the atoms. (N12p, M25)

336-N.* (Russian.) Phase Diagram for the Chromium-Cerium System. E. M. Savitskii, V. F. Terekhova and A. V. Kholopov. *Zhurnal Neorganicheskoi Khimii,* v. 6, Feb. 1959, p. 435-438.

Data for constructing Cr-Ce diagram with Cr as a base (Ce up to 30% by wt.) A large region of Ce scattering, in a liquid state, stretches from 10 to 90% Ce at a monotectic temperature of 1780° C. Solubility of Ce in Cr in solid solution at 1700° C. is about 6%, and at reduced temperature (20° C.) falls off to 1.5-2.0%. Addition of Ce to Cr breaks up its structure. 7 ref. (N12s, M24b; Cr-b, *Ce*)

337-N.* Carbon as an Indicator of Gas Content in Metallic Tube Components. D. R. Kerstetter. Paper from "Symposium on Cleaning of Electronic Device Components and Materials". American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 94-100.

Relationship between carbon content and gas removed from steel, Ni-plated steel and Ni strips. (N15; ST, Ni)

338-N.* Hydrogen Absorption by Tube Parts Due to Various Processing Procedures. David Lichtman. Paper from "Symposium on Cleaning of Electronic Device Components

and Materials". American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 120-128.

Effect of wet and dry hydrogen firing; hydrogen brazing and baking conditions on gas content of Ni and cold rolled steel. (N15; ST, Ni, H)

339-N.* (French.) Study of an Austenitic Matrix at Room Temperature and Its Decomposition During Tempering of Z 180 C 13. Andre Faure. *Metaux, Corrosion, Industries*, v. 34, Mar. 1959, p. 121-136.

Conditions of maximum hardening during tempering. Nature and kinetics of transformations when matrix is subjected to slow, rapid and quasi-instantaneous reheating and other time-temperature variations. (N8; AY)

340-N.* (Italian.) Grain Growth in Slightly Deformed Rimming Steel Sheet and Its Effect on Magnetic Properties. V. Berruti and B. Sommacal. *Metallurgia Italiana*, v. 51, Apr. 1959, p. 129-138.

Cold working followed by annealing and resulting structures. 14 ref. (N3, P16, 2-64, 3-68; ST-d, 4-53)

341-N.* (Japanese.) Diffusion of Electrodeposited Chromium in Carbon Steel. Shigetomo Ueda and Tohru Kurauchi. *Metal Finishing Society of Japan, Journal*, v. 10, Feb. 1959, p. 66-67.

Diffusion coefficient and activation energy of 0.59% carbon steel plated and heated at 1000-1300° C. in vacuum. (N1; CN, *Cr*)

342-N.* (Russian.) Effect of Ultrasonic Waves on Nickel-Chromium-Titanium Alloy. E. A. Al'ftan and V. S. Ermakov. *Akusticheskii Zhurnal*, v. 4, no. 4, 1958, p. 307-314.

Ultrasonic waves of 20-26 Kilohertz accelerates aging of Ni-Cr-Ti alloy. Doubling the ultrasonic energy considerably increases its effect on aging, reducing the aging duration 40-50 times as compared with standard conditions. (N7a, 1-74; Ni-b, *Cr, Ti*)

343-N.* (Russian.) Effect of Surface Active Agents on Crystal Shape and Texture of Zinc Deposits. K. M. Gorbunova and K. P. Lebedeva. *Zhurnal Fizicheskoi Khimii*, v. 33, no. 3, 1959, p. 669-676.

Growth of base and prism faces of Zn single crystal from $ZnSO_4$ solution without addition of surface-active substances and with addition of tetra-butyl-ammonia and n-octyl alcohol. Addition of surface active agents to the $ZnSO_4$ solution changes the initial rates of the growth rates of faces and hence the shape of crystal. (N3r, M26c; Zn)

344-N.* (Russian.) Phase Diagram of the Rhenium-Molybdenum System. E. M. Savitskii, M. A. Tylkina and K. B. Povarova. *Zhurnal Neorganicheskoi Khimii*, v. 4, Feb. 1959, p. 424-434.

A peritectic type of diagram is shown with two peritectics at 2570° beta $\rightleftharpoons$ sigma, 2500° sigma $\rightleftharpoons$ alpha and peritectic transformation at 1850° sigma beta $\rightleftharpoons \chi$ (sigma + beta $\rightleftharpoons$ chi). There is formed in the system a large region of solid solutions of Re in Mo. 11 ref. (N12r, M24b, Rh-b, *Mo*)

345-N.* (Ukrainian.) Phase Changes in Steel During Annealing. V. N. Gridnev and V. I. Trefilov. *Ukrainskii Fizicheskii Zhurnal*, v. 3, no. 6, 1958, p. 796-800.

High heating rates during the annealing of carbon steel cause considerable changes in the mechanism of the annealing process. The mechanism is related to the separation of carbon from the martensite. Disintegration of residual austenite during heating was not detected from 300-670° C. 12 ref. (N8p, N8n, J23n; CN)

346-N.* Retained Austenite in Precipitation Hardening Stainless Steels. G. Krauss, Jr., and B. L. Averbach. *American Society for Metals, Transactions*, v. 52, Preprint no. 134, 1959, 25 p.

Retained austenite contents measured by X-ray diffraction technique in 17Cr-7Ni-1Al and 17Cr-4Ni-3Mo stainless steels after various hardening and aging treatments. Hardening mechanisms. 9 ref. (N7a, N8n, N8p, 2-64; SS-e, *Cr, Ni, Al, Mo*)

347-N.* (German.) Binary and Complex Copper-Silicon and Copper-Nickel-Silicon Alloys Used for Screws and Nuts. *Draht*, v. 10, Apr. 1959, p. 153-159.

Structural changes in recrystallization and during artificial aging; corrosion behavior in the presence of organic and inorganic substances; determination of tensile strength, elongation, reduction in area and bending angles. 14 ref. (N5, J27d, R-general, Q-general; Cu-b, *Si, Ni*)

348-N.* The Growth of Temper Carbon Nodules. J. Burke. *Acta Metallurgica*, v. 7, Apr. 1959, p. 268-274.

Equations relating the radius of a temper carbon nodule to the time of annealing during first-stage graphitization are presented for each of the possible controlling mechanisms, and compared with experimental growth curves. The rate of solution of cementite determines the rate of growth of graphite, except during the very early stages of the reaction. 17 ref. (N8s, 2-64; Fe-b)

349-N.* Aging in Au-Ni Alloys. J. Silvertsen and C. Wert. *Acta Metallurgica*, v. 7, Apr. 1959, p. 275-282.

Changes in some physical properties of quenched alloys of 70% Au-30% Ni when annealed at low temperatures. Changes in the electrical resistance, volume and Young's modulus indicate that there is at least one metastable precipitate formed on low-temperature annealing. The low-temperature phase seems to be either clusters of Au-rich or Ni-rich atoms or regions of high geometrical order. Quenched-in vacancies are presumed to control the rate of the reaction but the precipitate is not thought to be simply clusters of vacancies. 6 ref. (N7a, J23, 2-63, M26s, Au-b, *Ni*)

350-N. The Release of Fission Product Rare Gas From a Uranium/Zirconium Alloy During Irradiation in the BEPO Reactor. F. J. Stubbs and C. B. Webster. *United Kingdom Atomic Energy Authority*, AERE C/M 372, Feb. 1959, 12 p.

Release rate is small and can be attributed to fission recoil from the surface, of the gas atoms or their precursors. Above 600° C. the release rate increases sharply and becomes highly temperature dependent. At high temperatures the emission is attributed to a diffusion process in addition to recoil and over the range 700-900° C. diffusion coefficients are calculated. (N1, 2-67; U-b, *Zr*)

351-N.* Mechanical Properties of Iron and Some Iron Alloys While Undergoing Allotropic Transformation. M. De Jong and G. W. Rathenaw. *Acta Metallurgica*, v. 7, Apr. 1959, p. 246-253.

Plasticity during the allotropic transformation of pure Fe, Fe + 0.08% N and Fe + 0.2% C. Elongation is a linear function of the applied stress when the crystals of the new phase grow in arbitrary directions. The external stress works upon a material with vanishing yield point. Results are discussed by assuming a tendency for the mean macroscopic dilatation to be zero along the phase boundary, as in the case of diffusionless transformations. 16 ref. (N6p, Q-general, 3-66; Fe-b, *N, C*)

352-N.* Surface Growths and Whiskers on an Aluminum-Magnesium Alloy. P. J. E. Forsyth, P. G. Partridge and D. A. Ryder. *Philosophical Magazine*, v. 4, Apr. 1959, p. 447-450.

Development of whiskers and surface growths along grain boundaries on surface of 7% Mg-Al alloy during vacuum heat treatment at 450 to 520° C. Growth mechanism. (N3s, N3r, 2-64, 1-73; Al-b, *Mg*)

353-N.* A Possible Determination of the Activation Energy for Self-Diffusion in Aluminum. T. Federighi. *Philosophical Magazine*, v. 4, Apr. 1959, p. 502-510.

Calculation of activation energy from decrease of quenched-in resistivity of of 99.995% Al with annealing time in the range of 130 to 170° C. Agreement between value determined and expected activation energy for self-diffusion in Al. 8 ref. (N1d, N4, P15g; Al)

354-N. Development of High Strengths and High Recrystallization Temperatures in Molybdenum-Base Alloys. M. Semchyshen, Gordon D. McArdle and Robert Q. Barr. Climax Molybdenum Co. of Michigan. *Wright Air Development Center*, Technical Report no. 58-551, Feb. 1959, 116 p.

Alloy castings were converted to bar stock and evaluated from standpoint of recrystallization temperature, grain growth and embrittlement tendencies, tensile and creep-rupture strength and brittle-to-ductile transition. The most outstanding Mo-base alloy contained 0.46% Ti, 0.08% Zr and 0.08% carbon and required 1 hr. at 2950° F. for complete recrystallization. (N5, N3, Q3, Q23r; Mo-b, *Ti, Zr, C*)

355-N. Transformations in Uranium Alloys With High Solute Solubility in the B. C. C. Gamma Phase. Pt. 1. Preliminary Observations on the "Banded Structures" Produced by Non Equilibrium Transformations in Uranium Alloys. A. G. Harding and M. B. Waldron. *United Kingdom Atomic Energy Authority*, AERE M/R 2673, Sept. 1958, 15 p.

High-temperature body centered cubic gamma phase in uranium alloys with approximately 10% Ti, Cb, Zr or Mo can be rendered metastable under critical cooling conditions, and can be transformed

by a shear mechanism to form a characteristic banded structure or by a nucleation and growth process to equiaxed grains. Formation of these metastable structures seems dependent on composition, cooling rate and the effect of the solute element on the incubation period and decomposition rate of the metastable gamma phase. (N2, N3; U-b, *Ti, Cr, Zr, Mo*)

356-N.* (French.) Characteristics of a Martensitic Phase Obtained in Uranium-Molybdenum Alloys. Jeanne Lehmann. *Comptes Rendus*, v. 248, Apr. 6, 1959, p. 2098-2100.

Uranium alloys with 2-3% and 4% content. The conditions of martensitic phase, developed from the solid solution of gamma-uranium are determined. The structure of this phase designated alpha-prime$_b$ is monoclinic. 6 ref. (N6q; U-b, *Mo*)

357-N.* (Polish.) Growth of Large Metal Single Crystals. Antoni Modrzejewski, Bronislaw Buras and Roman Czarnecki. *Archiwum Hutnictwa*, v. 4, no. 1, 1959, p. 81-89.

Large single crystals of Zn, Pb, Al and Cu were obtained by slow cooling of the melt. Single crystals were oriented by X-rays cut mechanically and chemically etched. 6 ref. (N3r; M26c, Zn, Pb, Al, Cu)

358-N.* (Japanese.) Studies of Ultra-High-Strength Steel. Pt. 1. Kohji Tasaka and Takayasu Okada. *Sumitomo Metals*, v. 10, Oct. 1958, p. 224-230.

Transformation behavior and tempering characteristics of 0.4% C-2.5% Si-Mn-Cr-Mo-Steel. The isothermal and continuous cooling transformation diagrams consist of two separated regions—an upper region (pearlite) and a lower region (bainite). Considerable amounts of retained austenite may be developed during slow continuous cooling and lower temperature isothermal transformation due to the lowering of the Ms point which is apparently due to Si content. (N8n, J29; AY, C, Si, Mo, Mn, Cr)

359-N.* (Japanese.) High-Strength Copper-Titanium Alloys. Keichi Mizuno. *Sumitomo Metals*, v. 10, Oct. 1958, p. 246-257.

Age-hardening of binary alloys and effects of small Al and Cr additions. The age hardenability is increased by adding 0.2 to 0.3% Cr. Grain growth is suppressed by adding 0.8% Cr or 2% Al at high temperature. (N7a, 2-60; Cu-b, Ti, Cr, Al, SGB-a)

360-N. Growth of Metal Single Crystals. *National Bureau of Standards*, STR-2630, May 1959, 3 p.

Equipment has been developed to grow preferentially oriented metal monocrystals in practically any cross-sectional shape. These crystals, having an ordered atomic arrangement, are particularly useful in studying the influence of crystal structure on corrosion. A pre-selected crystallographic orientation is obtained with a technique known as "seeding," and the desired cross-sectional shape is produced by growing the crystals in a vertical furnace. (N3r, M26c)

361-N.* (German.) Effect of Time on Pearlite Transformation. Erich Greulich. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 219-225.

Mechanism of pearlite formation is isothermal transformation of two steels containing 0.7% C and 0.65% Ni, after austenizing at 840-1050° C., holding at 540° C. and quenching. Average distance among the centers of pearlite grains was measured statistically and by electron microscopy. 13 ref. (N8h, 3-67; CN)

362-N.* (German.) Mathematical Description of the Relationship Between Martensite and Austenite Orientation in Iron-Nickel Single Crystals. Albert Kochendorfer and Gerhard Otto. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 227-232.

Relationship observed differs from the transformation matrices given by Kurdjumow-Sachs and Nashiyama. The axes of of rotation D_{Mo} as well as in the azimuths differ by amounts of 1 to 2° from those estimated by Nashiyama. The planes and orientations of the austenite and martensite lattices are not quite parallel. 17 ref. (N8f, N8p, M26c; Fe-b, *Ni*, 14-61)

363-N.* (German.) Critical Strain and Coarse Grain Formation in Zinc With Alloy Trace Additions. Friedrich Erdmann-Jesnitzer and Guenther Wieghardt. *Neue Hutte*, v. 4, Mar. 1959, p. 152-158.

Zn alloyed with small quantities of Cu, Al, Cd, Hg, Li and Mg. Specimens were homogenized, cold rolled and heat treated. Recrystallization, recovery, substructures, formation of solid solutions and coarse grain structures. 24 ref. (N5, 2-60; Zn, *Cu, Al, Cd, Hg, Li, Mg*)

364-N.* (German.) Dependence of Intermediary Structure Change on Preliminary Treatment in the Recrystallization of Bronze. Heinz Borchers and Alfred Schaefer. *Zeitschrift fur Metallkunde,* v. 50, Jan. 1959, p. 24-37.

Structure refining during the recrystallization of alpha bronze (Cu, 6.36 -6.50% Sn, 0.04% P). 4 ref. (N5f, Cu-s)

365-N.* (German.) Nucleation in Medium Concentration of a Binary System With Miscibility Gap. Hans Stadelmaier and Leo J. Huetter. *Zeitschrift fur Metallkunde,* v. 50, Jan. 1959, p. 41-44.

Conditions under which nucleation takes place. 11 ref. (N2)

366-N.* (German.) Germanium Single Crystal Growth by the Floating Crucible Technique. Jan Goorissen and Frithjof Karstensen. *Zeitschrift fur Metallkunde,* v. 50, Jan. 1959, p. 46-50.

Single Ge crystals with homogeneous inpurity concentration can be prepared if the correct quantity of impurities is supplied. A small crucible from which the crystal is pulled floats in molten Ge in a larger outer crucible. Access between the two crucibles is made possible by a capillary permitting a continuous replacement of Ge lost by crystallization. 13 ref. (N3r; Ge)

367-N.* Grain Refinement of Solidifying Metals by Vibration. R. G. Garlick and J. F. Wallace. *Modern Castings,* v. 35, June 1959, p. 86-94.

Explains refinement by alternate high and low-pressure waves which increase nucleation rate of the solidifying phase. Mechanism of refinement during solidification of pure metals, solid solutions and anomalous eutectics. 16 ref. (N12)

368-N. (English.) Superstructure of the Ordered Alloy Cu_3Pd. Pt. 3. High Temperature Electron Diffraction Study. Denjiro Watanabe. *Physical Society of Japan, Journal,* v. 14, Apr. 1959, p. 436-443.

Using a high-temperature electron diffraction camera, Cu_3Pd alloys were investigated in thin oriented, evaporated films at temperatures below and above the critical point of order-disorder. 14 ref. (N10; Cu-b, *Pd*)

369-N.* The Kinetics of the Allotropic Transformation in Iron and Binary Iron Alloys. J. W. Spretnak. Ohio State University Research Foundation. *Wright Air Development Center,* Technical Report no. 58-563, Sept. 30, 1958, 24 p.

Transformation characteristics in zone-refined Fe, 0.71% Mo-Fe alloy and 0.21% Cr-Fe alloy. The transformation front travels in discreet jumps, confirming the conclusion that the gamma-alpha transformation occurs by a cooperative shearing mechanism (martensitic type). Increasing the purity of Fe decreases the mean shear path and the mean rest period. (N6p; Fe-a, Fe-b, *Cr, Mo*)

370-N.* (German.) Diffusion of Some Metals in Liquid Solution. E. Pelzel. *Galvanotechnik,* v. 50, Apr. 15, 1959, p. 211.

Surface of a Pb melt is exposed to air at 400-500° C. An oxide layer with increasing thickness appears, accompanied by a change in color. Structure and color of the oxide layer are considerably affected by the slightest traces of alloying components and permit study of diffusion of Zn, Cd, Sn, Sb, Na, Li and As in Pb. (N1a; Pb, Zn, Cd, Sb, Na, Sn, Li, As, 14-60)

371-N. (Ukrainian.) Effect of Over-All Pressure on the Parameter of Iron Diffusion in Iron Alloys With Minute Quantities of Aluminum. S. D. Gertsiken and M. P. Pryanishnikov. *Ukrainskii Fizicheskii Zhurnal,* v. 3, no. 5, 1958, p. 651-657.

The diffusion coefficient is high with increasing pressure. The effect of overall pressure is explained by the presence of local plastic deformation which brings about defects and accelerates the diffusion. With elevated temperature, the rate of heat flow that "remedies" these defects progressively increases, and at a given temperature, completely compensates for the pressure effect. 6 ref. (N1d, P13a, 3-74; Fe-b, *Al*)

372-N. (Ukrainian.) Determination of Recrystallization Temperature of Metals. L. N. Larikov. *Ukrainskii Fizicheskii Zhurnal,* v. 3, no. 5, 1958, p. 664-668.

Time at which various microscopic and X-ray centers of recrystallization appear at a given temperature and deformation is equal to the time necessary for the formation of the most distorted regions of initial nucleus within the undistorted lattice plus the time necessary for the growth of the nucleus to a certain diameter. 7 ref. (N3, N5, 2-61, 3-67)

373-N. (Ukrainian.) Atom Mobility in Metals in the Recrystallization Temperature Region. L. N. Larikov. *Ukrainskii Fizicheskii Zhurnal,* v. 3, no. 5, 1958, p. 668-671.

Relationship of linear growth of recrystallization centers and effective coefficient of self-diffusion of atoms in strongly distorted regions of metal. Comparison of the self-diffusion coefficient of atoms with the self-diffusion coefficient for both volume and boundary self-diffusion of the same metals at identical temperature reveals that the order of magnitude of atomic mobility is the same as that at the boundary diffusion. 20 ref. (N1d, N3, N5f)

374-N. (Ukrainian.) Nature of Short-Range Order of Iron-Chromium Alloys. P. D. Suprunenko. *Ukrainskii Fizicheskii Zhurnal*, v. 3, no. 5, 1958, p. 673-676.

With preliminary annealing at high temperature the Curie temperature of Fe-Cr alloys (45, 47 and 49% Cr) is increased, together with the relative electrical resistance in the entire temperature region. Results discussed on basis of formation of a negative short-range order. 9 ref. (N10a, N8j, 2-64; SS)

375-N. (Japanese.) Growth of Silicon Single Crystals by the Pulling Technique. Y. Matsukura and M. Adachi. *Laboratory of Electric Engineering, Journal*, v. 22, Dec. 1958, p. 940-947.

Equipment and practice. (N3r)

376-N.* (French.) New Determination of Self-Diffusion Constants of Cubic Centered Iron. C. Leymonie, Y. Adda, A. Kirianenko and P. Lacombe. *Comptes Rendus*, v. 248, Mar. 9, 1959, p. 1512-1515.

Method consists of progressive machining of polycrystalline Fe cylinder covered with radioactive Fe and submitted to diffusion heat treatment from 580 to 616° C. 7 ref. (N1d, 1-59; Fe)

377-N.* (Japanese.) Age-Hardening of Copper-Titanium Alloys. M. Tanaka and E. Sakuma. *Laboratory of Electric Engineering, Journal*, v. 22, Dec. 1958, p. 881-886.

Strength increases in proportion to higher Ti content and increased cold forming. Annealed at 450-500° C., the alloys show minimum electric resistivity and maximum mechanical strength. (N7a, P15, Q27a, 2-60; Cu-b, *Ti*)

378-N. (Japanese.) The Effect of Magnesium on the Recovery of Aluminum-Magnesium Alloys. J. Wada, M. Sasagawa and S. Kobayashi. *Light Metals*, v. 9, Jan. 1959, p. 20-27.

Work hardening of Al-Mg alloys at low temperature is not so dependent on temperature as in pure Al. Recovery of Al-Mg alloys is less then pure Al because of the interaction between Mg atoms and vacancies or interstitial atoms, while the thermal equilibrium state is retained during plastic deformation. (N4, 2-63; Al-b, *Mg*)

379-N.* (Japanese.) The Effects of Calcium on the Decomposition Rate of Carbide in Iron-Carbon-Silicon Alloys. Masuteru Maruyama and Mitsuru Itoh. *Japan Foundrymen's Society, Journal*, v. 31, Mar. 1959, p. 172-178.

Decomposition rate of carbides in alloys treated with Ca-Si is considerably higher than that of carbides in alloys treated with Si. Decomposition rate has its maximum value with carbon content a little higher than that of carbon-saturated austenite. (N8r; Fe-b, *C, Si*, AD-p)

380-N.* (Translation—AIP.) State of Carbon in Annealed Silicon Steel. E. L. Gal'perin and Iu. S. Terminasov. *Soviet Physics, Crystallography*, v. 2, no. 5, 1958, p. 684-485.

Investigation of interstitial carbide phase formed during tempering. 7 ref. (N8r, J29, 2-64; AY, *Si*)

381-N. (Translation—AIP.) Effect on Diffusion Mobility of Irreversible Structural Changes Arising From Plastic Deformation. S. Z. Bokshtein, T. I. Gudkova, A. A. Zhukhovitskii and S. T. Kishkin. *Soviet Physics Doklady*, v. 3, July-Aug. 1958, 865-868.

See item 49-N, 1959. (N1, 3-68; Ni, Sn)

382-N. (Translation—AIP.) Values of the Activation Energy of Self-Diffusion in Liquid Metals. K. A. Osipov. *Soviet Physics Doklady*, v. 3, July-Aug. 1958, p. 869-871.

See item 50-N, 1959. (N1d; 14-60)

383-N. (Translation—BISI no. 1157.) Former Precipitation of the Epsilon-Carbide in Ferrite and Martensite During Tempering. Wolfgang Pitsch and Angelica Schrader. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 715-721.

See item 57-N, 1959. (N8a, 2-61; Fe, ST, C, Ni)

384-N. (Translation—BISI no. 1158.) Kinetics of Tempering of Martensite. Otto Krisement. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 723-729.

See item 58-N, 1959. (N8p; ST, *C, Si, Mn, P, S, Cr, Cu, Mo, Ni*)

385-N. (Translation—ConBur.) Recrystallization of Uranium by the Action of Cyclic Heat Treatment. A. A. Bochvar, G. I. Tomson

and N. T. Chebatarev. *Soviet Journal of Atomic Energy*, v. 4, June 1958, p. 729-733.

Variation in microstructure of uranium, quenched from the gamma-phase, uranium annealed in the gamma-phase region and cast in the process of cyclic heat treatment in the temperature range 100-550° C. with 50-sec. cycles. 6 ref. (N5, M27, 2-64; U)

386-N. (Russian.) Effect of Silicon, Aluminum, Nickel, Copper and Phosphorus on the Form of Temper Carbon. K. P. Bunin and A. K. Repin. *Liteinoe Proizvodstvo*, Apr. 1959, p. 24-30.

In a pure Fe-C-Si system various amounts of Si affect in various ways the rate of graphitization growth and the amount of graphite inclusions. Usually both are increased with increasing Si content; Al affects the system in a similar manner while Ni affects graphitization to a lesser degree. Cu acts similarly to Ni and P. 20 ref. (N8s, 2-60; Fe-b, *C, Si, Al, Ni, P*, Cu)

387-N. (Russian.) Nonuniform Distribution of Elements in White Cast Iron. I. E. Lev. *Liteinoe Proizvodstvo*, May 1959, p. 36.

Alloying elements in white cast iron are nonuniformly distributed between separate phases and between micro-areas of the matrix. Rate of structure formation in many cases is determined by diffusion of the alloying elements and not by diffusion of carbon. (N1; CI-p)

388-N.* Kinetics of Bainite Formation in a Plain Carbon Steel. P. Vasudevan, L. W. Graham and H. J. Axon. *Iron & Steel*, v. 32, May 22, 1959, p. 229-232.

At about 350° C. a change occurs in kinetics of austenite-bainite transformation in a 0.97% plain carbon steel. Above 350° C. the product may be identified as upper bainite, which forms with activation energy of 34,000 cal. per mole and the controlling factor is probably rate of diffusion of carbon in austenite. Below 350° C. product may be identified as lower bainite forming with activation energy of 14,000 cal. per mole, while the controlling factor in this case is the rate of diffusion of carbon in supersaturated ferrite. (N8m; CN-r)

389-N.* Kinetics of Bainite Formation in High-Purity Iron-Carbon Alloys. S. V. Radcliffe and E. C. Rollason. *Iron & Steel*, v. 32, May 22, 1959, p. 232-237.

Effects of temperature and carbon content on kinetics of isothermal formation of bainite. Progress of transformation at temperatures in range 200-450° C. was followed by high-speed measurements of change of electrical resistivity of fine wire specimens containing 0.65-1.2% C. Fully reacted specimens were examined by light microscopy and X-ray diffraction at room temperature. (N8m; CN-r, Fe-b, *C*)

390-N.* Effect of Austenitizing Treatment on Formation of Lower Bainite in a Plain Carbon Steel. L. W. Graham and H. J. Axon. *Iron & Steel*, v. 32, May 22, 1959, p. 237-239, 294.

Influence of austenitizing temperature on lower bainitic transformation of a plain carbon steel for conditions in which all the carbon is in solid solution in macroscopically homogeneous austenite of standardized grain size. (N8m, 2-64; CN-r)

391-N.* Diffusion of Hydrogen in Steel at Temperatures of -78 to 200° C. J. D. Hobson. *Iron & Steel*, v. 32, May 22, 1959, p. 240-243.

Effects of specimen size, temperature and composition on diffusion constants, rates of diffusion and evolution and times required to reach various values of residual hydrogen in a number of alloy steels and one low-carbon steel. (N1, 2-60, 2-61; AY, CN-g, *H*)

392-N.* Precipitation Process in Copper-Chromium Alloys. Robin O. Williams. *American Society for Metals, Transactions*, v. 52, Preprint no. 136, 1959, 26 p.

Changes in sample length, X-ray diffraction patterns and tensile properties in Cu alloys containing up to 1.3% Cr with aging time at 400-500° C. Precipitation mechanisms. 19 ref. (N7b, N7a; Cu-b, *Cr*)

393-N.* The Martensite Transformation in Thin Foils of Iron-Nitrogen Alloys. W. Pitsch. *Philosophical Magazine*, v. 4, May 1959, p. 577-584.

Martensite consists of very thin fiber crystals which are twin orientated. Difference from all orientation relationships found in bulk materials is due to the fact that in foils the transformation mechanism is less hampered by the surrounding parent lattice than in bulk materials. A simple transformation mechanism is reduced, consisting of a pure distortion and a half twin shear. 10 ref. (N6q, M26c; Fe-b, *N*, 4-56)

394-N.* The Atomic Diffusion of Chromium in the Titanium-Chromium System. A. J. Mortlock and D. H. Tomlin. *Philosophical Magazine*, v. 4, May 1959, p. 628-643.

Diffusion rates of Cr in the body-centered cubic phase of the Ti-Cr system

measured by an autoradiographic tracer technique using the radioactive isotope Cr^{51}. The activation energy for tracer diffusion at zero solute concentration is very much lower than that expected for self-diffusion in pure Ti. 10 ref. (N1, 1-59; Ti-b, *Cr*)

395-N.* (German.) Martensite in Titanium Alloys. Ulrich Zwicker. *Zeitschrift fur Metallkunde*, v. 50, May 1959, p. 261-268.

Effect of martensite upon age hardening and the influence of nonstable preparatory modifications of the alpha-phase on martensite formation and mechanical properties. Investigation of Ti-Mo and TiV16A13 alloys shows a dependence of Young's modulus on internal stress, hydrogen content and deformation. 15 ref. (N6q, N7a; Ti-b, *V, Al, Mo, Cr, H*)

396-N.* (German.) Plastic Flow at the Yield Point in Zirconium-Tin Alloys. Lother Bangert. *Zeitschrift fur Metallkunde*, v. 50, May 1959, p. 269-274.

Tensile strength of Zircaloy-2, ultimate elongation and plastic flow at the yield point after age hardening and strain aging. Results indicate scarcely any tendency towards embrittlement by either age hardening or strain aging. (N7a, N7e, Q-general; Zr-b)

397-N.* (German.) X-Ray Examination of Diffusion in the Tin-Mercury System. Fritz Guenther and Guenter Jehmlich. *Zeitschrift fur Metallkunde*, v. 50, May 1959, p. 288-293.

Diffusion of Hg in Sn was tested with thin rolled foils (30 micron) and sheets (2 mm.) by micrographical and graphical methods. 5 ref. (N13; Hg, Sn, 4-53, 4-56)

398-N. Transport Processes in Liquid Alloys. Pt. 1. Transport Cell for Liquid Alloys. Paul C. Mangelsdorf, Jr. *Journal of Chemical Physics*, v. 30, May 1959, p. 1170-1179.

An electrolysis cell was devised, using a thin ribbon-shaped capillary, which permits the measurement in a single experiment of the resistivity, electrolytic mobility and diffusion rate in a single sample of liquid alloy. (N1, 1-53; 14-60)

399-N. (Russian.) New Method of Studying the Solidification Process. G. F. Zasetskii and V. A. Shakhtovich. *Liteinoe Proizvodstvo*, Apr. 1959, p. 34-35.

When sulphur is introduced into the liquid phase of structural steel at various stages of solidification, diffusion rate of sulphur differs in the liquid and solid stages. This difference and the reaction of crystalline sulphur with the Fe makes it possible to fix, at any given point during solidification, the thickness layer of the solid phase, as marked by the sulphur demarcation line. (N12; ST, *S*, 14-60)

400-N.* Self-Diffusion in Indium. J. E. Dickey. *Acta Metallurgica*, v. 7, May 1959, p. 350-353.

Self-diffusion coefficients parallel and perpendicular to the tetragonal axis were measured in paired samples of single crystal In in the range from 44 to 144° C. Mosaic boundaries observed in the single crystals may possibly have been responsible for a component of fast diffusion which contributed to the uncertainties of the measured values. 11 ref. (N1d; In, 14-61)

401-N.* A Simplified Derivation of the Quasichemical Approximation in Order-Disorder Theory. J. M. Honig. *Acta Metallurgica*, v. 7, May 1959, p. 354-356.

Following the procedure of Hijmans and de Boer, the lattice consisting of A and B units is decomposed into representative arrays of "bonds" and "points"; the energy, entropy and free energy for this system of arrays is then found in terms of probabilities of encountering the possible configurations AA, AB, BB, B or A. (N10)

402-N.* (French.) Thermal Analysis of Allotropic Transformations in Plutonium. R. Pascard. *Acta Metallurgica*, v. 7, May 1959, p. 305-318.

Successive transformations, including fusion, of metallic Pu are studied by differential thermal analysis. Heating and cooling curves. Comparison with metallic standards of known heats of fusion give a first set of heats of transformation with a precision of about 20%. 12 ref. (N6p, M23r; Pu)

403-N.* (German.) Age Hardening of AlMgSi Alloys. Konrad Loestlin and Otto Schaaber. *Industrieblatt*, v. 59, May 1959, p. 211-217.

Mn or Cr additions increase the susceptibility to delayed quenching. The isothermal curves of hardness are determined between 0 and 300° C. Characteristic values for cold and elevated-temperature age hardening are shown by TTT curves and time-temperature-hardness diagrams. 10 ref. (N7a, 2-60; Al-b, *Mg, Si*)

404-N.* (Italian.) X-Ray Diffraction Investigation of Recrystallization in Aluman 30. M.

Paganelli. *Alluminio,* v. 38, Apr. 1959, p. 163-168.

Recrystallization after annealing for 1 hr. Data compared with behavior of AP5 (Al.99.5) alloy. (N5; Al-b, *Mn*)

405-N.* Two-Phase Germanium-Zinc "Whiskers". F. A. Trumbore and C. R. Isenberg. *Journal of Applied Physics,* v. 30, May 1959, p. 795-796.

Formation of filaments consisting of core of Zn-Ge eutectic surrounded by shell of Ge, during solidification of small Ge-Zn droplets. 4 ref. (N12q, N3r; Ge, Zn, 14-61)

406-N.* The Structure of the Aluminium-Copper Eutectic and Its Transformation Due to Heating. Noboru Takahashi and Kan-ichi Ashinuma. *Journal of Electronmicroscopy,* v. 7, 1959, p. 37-40.

Lamellar structure and electron diffraction patterns of 67% Al-33% Cu alloys at 25 to 548° C. 3 ref. (N11h, N12q, M26p; Al-b, *Cu*)

407-N.* The Ageing of Steel. B. R. Nijhawan. *Blast Furnace and Steel Plant,* v. 47, May 1959, p. 485-489.

Quench and strain aging; their effects in terms of dislocation theory. 22 ref. (N7a, N7e, M26b; ST)

408-N.* (French.) Solidification Substructures of99.99% Aluminum. H. Biloni and L. H. de Destaillats. *Metaux-Corrosion-Industries,* v. 34, Apr. 1959, p. 137-150.

Conclusions based on epitaxy and corrosion patterns. Formation of banded or dendritic substructure depends on the velocity of interface displacement. 21 ref. (N12n, M27a; Al-a)

409-N.* (Norwegian.) Gases in Ferro-Alloys. N. Christensen. *Tidsskrift for Kjemi, Bergvesen Og Metallurgi,* v. 19, Apr. 30, 1959, p. 57-61.

Oxygen, nitrogen and hydrogen impurities in ferro-alloys. The amount of impurities introduced by ferro-alloy additions into alloy steels is negligible except in the case of certain high-Cr and high-Mn steels. 17 ref. (N15, 3-69; AD-n31, AY, *O, H, N*)

410-N.* (French.) Uranium-Molybdenum Alloys With 0.5-3% Molybdenum. Y. Lehmann. *Revue de Metallurgie,* v. 56, May 1959, p. 457-481.

Micrography, crystal structure, coefficient of expansion, mechanical properties and behavior in cyclic annealing and heat treatment of U-Mo alloys with 0, 5, 1, 2, 3 and 5% Mo. Transformation curves during continuous cooling at velocities between 2.5 and 200° C. per min. are determined by dilatometry. 27 ref. (N7c, M23b, M27a, J23s; U-b, *Mo*)

411-N.* (Italian.) Determination of Critical Points in Steels. Lelio Orsini. *Macchine,* v. 14, May 1959, p. 515-525.

Iron-carbon diagram; structural transformations; equilibrium curves. Procedures and apparatus for determination of critical points. (N8; ST)

412-N.* (French.) Effect of Lead on Cast Iron Used in Ingot Molds. J. Duflot and J. C. Margerie. *Revue de Metallurgie,* v. 56, June 1959, p. 39-41.

Effect on the formation of pearlite and on the shape of graphite. 3 ref. (N8h, N8s, W19c, 3-69; CI, *Pb*)

413-N.* (German.) Banding of Bearing Steel. Hans Joachim Eckstein. *Neue Hutte,* v. 4, May 1959, p. 304-311.

Carbide banding resulting from microsegregation in ingots investigated in 100 CRG roller bearing steel. Effect of temperature of deformation, primary structure, overheating, degree of deformation and of cooling after deformation on the formation of carbide bands. 15 ref. (N8r, Q24c; SS, SGA-c)

414-N.* Thermodynamics and Kinetics of Solid-State Transformations. U. Dehlinger. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 16 p.

Interpretation of transformation phenomena in terms of geometric processes and thermodynamic concepts. Relation of nucleation and growth to dislocations. 32 ref. (N-general, N2, P12)

415-N.* Phenomena Accompanying Solid-Liquid Transformations of Metals and Alloys. A. Schneider and G. Heymer. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 18 p.

Review of theory of fusion and changes in physical properties on melting. Thermochemical relations and bond mechanisms. 72 ref. (N12, P12)

416-N.* Solubility of Nitrogen in 18:8 Stainless Steel. E. T. Turkdogan and S.

Igantowicz. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 8 p.

Solubility of nitrogen in stainless steel at 1000-1300° C. Solubility of pure Ni at 600° C. 12 ref. (N15d, P12e; SS, Ni-a, *N*)

417-N.* Studies of the Early Stages of Diffusional Precipitation in Alloys. G. Borelius and L. E. Larsson. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 11 p.

Electrical resistance and calorimetric investigation of kinetics of early precipitation in Al-Cu alloys. 5 ref. (N7b, P17g; Al-b, *Cu*)

418-N.* Nitrogen and Hydrogen in Iron and Steel. L. S. Darken. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 11 p.

Role of nitrogen and hydrogen as interstitial atoms, as gas in external atmosphere or in voids, blisters or cracks, as associated with foreign atoms and in dislocations or subgrain boundaries. 12 ref. (N15d; Fe, ST, *N, H*)

419-N.* (German.) Surface Diffusion of Silicon and Titanium From a Gaseous Phase Into Iron, Nickel and Copper. A. Schneider, J. Siegfriedt. *Metall*, v. 13, June 1959, p. 546-551.

Weight changes in samples permit accurate study of diffusion processes. Temperature, pressure and rate of reaction are important parameters. 10 ref. (N1; Fe, Ni, Cu, *Ti, Si*)

420-N.* (Ukrainian.) Effect of Phosphorus on the Shape of Temper-Carbon Inclusions. K. P. Bunin and A. K. Repin. *Dopovidi Akademii Nauk Ukrainskoi R.S.R.*, v. 3, Mar. 1959, p. 277-280.

Increase of phosphorus content in white cast iron accelerates graphitization at 1000° C. and retards it at 900° C. When graphitization occurs in a matrix containing molten phosphide eutectic, growth occurs in the laminar graphite inclusions. (N8s, 9-69, 2-60; CI-p, *P*)

421-N. (German.) High-Frequency Testing of Phase Changes in Metal Alloys and Salt Mixtures. Th. Weber, K. Cruse. *Fresenius' Zeitschrift fur Analytische Chemie*, v. 166, no. 5, 1959, p. 233-356.

Apparatus and testing methods. 36 ref. (N14, N6p, 1-53)

422-N.* (Czech.) Kinetics of the First Step in the Graphitization of Malleable Cast Iron. Stanislav Drapal. *Hutnicke Listy*, v. 15, June 1959, p. 501-507.

In the decomposition of ledeburitic cementite, graphite nuclei form and grow, particularly at the boundaries between austenite and cementite. 39 ref. (N8s; CI-s)

423-N.* (German.) The Recrystallization of Zinc. Pt. 1. Primary Recrystallization. Heinz Borchers and Rainer Schwarzwalder. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 315-323.

High-purity Zn was deformed and stored at room temperature, at elevated temperatures (50-100° C.) or exposed at 280-380° C. for several seconds. Recrystallization starts soon after deformation. Grain growth is avoided by short-time annealing at high temperatures. Recrystallized spelter shows banded structures caused by impurities. 22 ref. (N5, N3, 2-61, 3-68, 3-69; Zn-a)

424-N.* (German.) The Recrystallization of Zinc. Pt. 2. Secondary Recrystallization. Heinz Borchers and Rainer Schwarzwalder. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 324-327.

Heating temperature and time and degree of deformation necessary for secondary recrystallization vary with heating velocity. Growth velocity of secondary grain decreases with time while the size is reduced at higher annealing temperatures. 4 ref. (N5, N3, 2-61, 3-67, 3-68; Zn)

425-N.* (German.) Growth Mechanism in Tin Crystals. Ilias Anastasiadis. *Zeitschrift fur Metallkunde*, v. 50, June 1959, p. 328-338.

Sn crystals are prepared by precipitation from aqueous solutions of stannous chloride. Growth mechanism is influenced by the degree of concentration. 28 ref. (N12e; Sn)

426-N.* The Tempering of Martensite in Copper-Aluminium Alloys. R. G. Cope. *Institute of Metals, Journal*, v. 87, June 1959, p. 330-336.

Decomposition of the martensite phase in the Cu-Al system was investigated at temperatures below that of the eutectoid transformation beta $\rightarrow$ alpha + gamma$_2$.

Microstructures of etched specimens were examined and plotted on TTT diagrams. Hardness measurements and X-ray diffraction photographs were used to aid the interpretation of the microstructures. 10 ref. (N6q, M27; Cu-b, *Al*)

427-N.* The Solid Solubility of Lithium in Aluminium. W. R. D. Jones and P. P. Das. *Institute of Metals, Journal*, v. 87, June 1959, p. 338-340.

The mazimum solid solubility of Li in Al was found, by micrographic methods, to be 4.2 wt.% at the eutectic temperature just above 600° C.; the solubility falls to 1.7% at 400° C. and 0.4% at 200° C. 7 ref. (N12p, M24b, Al, *Li*)

428-N. (Book.) The Physical Chemistry of Metallic Solutions and Intermetallic Compounds. v. 2. 300 p. 1959. Her Majesty's Stationery Office, London, £1. 17s. 6 d. for two volumes.

Proceedings of symposium held June 1958 at National Physical Laboratories. Papers abstracted separately. (N-general, P-general; 14-60, 14-68)

429-N.* (Translation—Brutcher no. 4521.) Diffusion Process Occuring During Heat Treatment in Steel-Aluminum Alloy Bimetal. A. O. Kuritsyna, F. V. Korolev and K. N. Korsunskaya. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 2-7.

Diffusion in the joint of a bimetallic Fe-Al alloy and ASS-6-5 strip depends upon temperature and heating time. The diffusion process occurs in four stages. The first consists of migration of Fe and Al atoms; in the second stage additional zones of interaction form, with a somewhat greater displacement of the atoms than in the first stage. The third stage is caused by the rapid rate of diffusion of Al while the fourth stage is on the boundary line. 8 ref. (N1e, J-general; AY, Fe-b, *Al* 4-53)

430-N. (Translation—Brutcher no. 4522.) Cooling of Forgings of Flake-Susceptible Steel. E. S. Tovrenets. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 7-13.

Cyclic cooling at 100-150° C. accelerated the transition of supercooled austenite, started its disintegration in an area of intermediate temperatures and completed the disintegration at higher temperatures. Dissolved hydrogen was removed at elevated temperature while the homogeneity of microstructure was improved. 12 ref. (N8, J26p; 9-70, CN, 4-51)

431-N. (Translation—Brutcher no. 4524.) Carbide Formation During Isothermal Decomposition of Alloyed Austenite in Hypereutectic Steels. I. S. Anitov. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 19-22.

In mono-alloyed steels of 0.09% Carbon with Ni, Mn, Cr, W, Mo or V, transition of carbide-forming elements from solid solution into a carbide phase takes place before and during basic transformation. The intensity of migration from austenite into the carbide phase at 600 C. progesses in the order of Ni, Mn, Cr, W, V, Mo. 3 ref. (N8r, N8g, 2-60; AY, *Ni, Mn, Cr, W, Mo, V*)

432-N. (Translation—Brutcher no. 4525.) Radioisotope Study of the Redistribution of Carbon in Chromium-Nickel Steels. B. I. Bruk and C. C. Nyrkovskaya. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 22-28.

Stainless steel annealed at 900° C., cooled at a rate of 50° per hr. and soaked at 600° C. causes formation of carbon-enriched zones along the boundary of austenite grain of the size 2×10^{-5} mm. Increased soaking time at 600 causes a more intensive carbon diffusion. The presence of Ti in the steel, in the amount of not more than four times that of carbon, produces a sharp retarding of carbon diffusion. 5 ref. (N1e, 2-64, 2-60, 1-59; SS-e, *Ti, C*)

433-N. (Translation—Brutcher no. 4528.) Crystallization of Strontium-Inoculated Cast Iron. A. V. Chernovol. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 37-39.

The graphite form in Sr-inoculated cast iron is changed from a bifurcated crab-like shape to a more compact one. Cast iron with 0.068-0.072% Sr does not produce a globular form during solidifaction or annealing and up to 0.8% does not assure a spheroidal graphite, so that Sr is not a substitute for Mg. 6 ref. (N12, E25q, 2-60; CI-r, *Sr*, AD-p36)

434-N. (Translation—Brutcher no. 4537.) Kinetics of Austenite Decomposition in Steels During Welding. N. N. Prokhorov, E. L. Makarov and V. I. Gospodarevskii. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 13-16.

Medium carbon steels and low alloy steels such as CrNi, CrMnSi, CrAl, CrV and a variety of other alloy steels form cold cracks during welding as a result of austenite decomposition. Steels having a

welding temperature below 300° C. have a greater tendency to cold cracks. 3 ref. (N8, K-general, 2-61; CN-p, AY, 9-72, *Cr, Ni, Mn, Si, Al, V*)

435-N. (Translation—Brutcher no. 4538.) Effect of Alloying on Hardening and Softening of Heat Resistant Iron Base Alloys. D. F. Zhirnov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 17-19.

13-8-8 alloy (13% Cr, 8% Ni and 8% Mn) with various quantities of V, Al, Mo, W, and Cb additions, hardened at 1180° C. and water quenched. Analysis of microstructure established a relationship between hardness changes during annealing and recrystallization temperature, and indicated the effect of alloying elements on recrystallization. (N5, J23c, 2-60; SS, *Mn, V, Al, Mo, W, Cb*)

436-N. (Translation—Brutcher no. 4542.) Effect of Inoculants on Crystal Structure and Sulfur Distribution in Austenitic Cast Steel. N. S. Kreshchanovskii and I. E. Zabludovskii. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 33-37.

Zn in the amount of 0.2% in high Cr-Ni alloy steel hardened at 1555-1560° C. affects the character of crystallization. Sulfur is uniformly distributed in the form of sharp inclusions in the dendritic axis. 0.3% Ce in Cr-Ni austenitic steel showed no noticeable effect on crystallization; sulphur, with the exception of areas where it is more concentrated, is usually equally distributed. 0.5% Ca has a great effect on primary crystallization. (N12, E25q, M26; SS-e, 9-69, AD-p, *Zn, S, Ce, Ca*)

437-N. (Translation—Brutcher no. 4563.) Grain of Solidifying Metal Refined by Vibration. I. I. Novikov. *Liteinoe Proizvodstvo*, Feb. 1959, p. 42.

See item 228-N, 1959. (N12, M27c; AD-p35)

438-N. (Translation—Brutcher no. 4565.) Accelerated Recrystallization of Low-Carbon Steels. G. K. L'vov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, April 1959, p. 8-14.

17 ref. (N5f; CN-g)

439-N.* (Russian.) Transformation of Graphite Inclusions in Cast Iron During Its Saturation With Magnesium. F. N. Tavadze and M. A. Essen. *Liteinoe Proizvodstvo*, June 1959, p. 15-18.

Investigation of cast iron samples during heat treatment at 900-1000° C. The larger part of spheroidal graphite is formed as a result of transformation or original graphite inclusions, distributed along the grain boundary. Formation of graphite inclusions in the core of the grain is seldom encountered. 7 ref. (N8q, 2-64; CI-r, Mg, AD-p36, 9-69)

440-N.* Graphitization of Fe-C-Si Alloys. D. S. Gill and D. S. Eppelsheimer. *Foundry*, v. 87, Aug. 1959, p. 60-61.

After precipitation, secondary carbides grow, deriving carbon from the dissolution of primary cementite in austenite, then decompose into temper carbon and carbon-depleted austenite. 5 ref. (N8s, N7; Fe-b, *C, Si*)

441-N.* The Nature of Martensitic Transformations. G. V. Kurdjumov. *Journal of Metals*, v. 11, July 1959, p. 449-453.

A→M type transformations take place in supercooled beta-solid solutions of Cu-Al, Cu-Sn and Cu-Zn. The mechanism of this type of transformation consists of a regular rearrangement of the lattice in such a way that the relative displacements of neighboring atoms do not exceed the interatomic distances and the atoms do not interchange places. 47 ref. (N6q; Cu-b, *Sn, Zn*, 14-67)

442-N.* Thermodynamics and Kinetics of Martensitic Transformations. Larry Kaufmann and Morris Cohen. Paper from "Progress in Metal Physics". v. 7. Pergamon Press Inc., New York, 1958, p. 165-246.

Effects of composition, temperature and stress on martensitic nucleation and transformation, electrical resistance, free chemical energy, enthalpy and magnetic properties of Fe alloys with various alloy additions. 98 ref. (N8p, N2, P13, P16, 2-61, 2-60, 3-66; Fe-b)

443-N.* (French.) Activation Energy of the Intergranular Autodiffusion in Iron. C. Leymonie and P. Lacombe. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, June 1959, p. 74-80.

Autoradiographic investigation of alpha and gamma iron. Effects of temperature, phases and grain size on the activation energy. 11 ref. (N1a, 2-61, 2-59; Fe)

444-N.* (Italian.) Recrystallization of Zinc. P. Gondi. *Metallurgia Italiana*, v. 51, May 1959, p. 185-199.

Recrystallization with and without Pb (up to 0.5%) at various temperatures. (N5, 2-60, 2-61; Zn, *Pb*)

445-N.* (German.) Strain Aging of Carbon Steel. *Industrie-Anzeiger*, v. 81, July 17, 1959, p. 913-914.

Strain aging caused by precipitation of carbon and nitrogen from their solution in the alpha-crystal, in the vicinity of dislocations. (N7, N7e; CN)

446-N.* (German.) Formation of Cementite During the Hardening of Steel. Albert Stahler and Walter Klempt. *VDI-Zeitschrift*, v. 101, June 21, 1959, p. 757-759.

Heat treatment of steels of various carbon content over a wide range of temperatures; effect of resulting structures on hardness and wear properties; cementation followed by complex heat treatment. (N8k, 2-64, Q9n; CN)

447-N.* Application of Dispersion Hardening to Cobalt. Earl F. Adkins and Robert I. Jaffee. *Cobalt*, no. 3, June 1959, p. 27-30.

Three oxides tested for improvement in mechanical properties, particularly high-temperature creep resistance. 8 ref. (N7, Q-general; Co)

448-N.* Observation of SAP and Present Theories for Its Remarkable High-Temperature Strength. Fritz V. Lenel. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 321-331.

Experimental work on sintered Al powders, as well as some Cu, Ni and Mo-base dispersion-strengthened materials, indicates that particle size of the powder forming the metal matrix and the spacing of dispersed second phase strongly influence elevated-temperature properties of extruded products. 11 ref. (N7, H11, Q-general, 2-62; Al-b, Cu-b, Ni-b, Mo-b, 6-77, SGA-h)

449-N. (French.) Characteristics of Aluminum-Uranium Alloys and Solid State Transformations of UAl_3 to UAl_4. Rene Boucher. *Journal of Nuclear Materials*, v. 1, Apr. 1959, p. 13-27.

In an alloy of constitution UAl_4 + Al, coalescence of UAl_4 and a resulting decrease in hardness are achieved by special heat treatment. The transformation $UAl_3 \rightarrow UAl_4$ depends on the time of heating at 600°C. and on the composition ratio. Stabilization of UAl_3 by Si. 10 ref. (N9m, N6n, 2-60, 2-64; Al-b, *U, Si*)

450-N.* (Russian.) Kinetics of Metal Condensation in Vacuum. L. S. Polatnik and Yu. F. Kotnik. *Doklady Akademii Nauk SSSR*, v. 126, Jan. 1959, p. 74-77.

Investigation by means of electroconductivity and optical density methods of the primary stage of condensate formation in vacuum of Bi, Pb, Sn and Sb. 16 ref. (N16p, 1-73; Bi, Pb, Sn, Sb)

451-N.* (Russian.) X-Ray Analysis of Changes in the Mosaic Structure of a Nichrome-Base Alloy During Aging. L. Kh. Pivovarov and Ya. S. Umanskii. *Izvestiya Akademii Nauk, Seriya Fizicheskaya*, v. 23, May 1959, p. 646-648.

During aging there is a breaking up of structural blocks in a solid solution or an increase in their disorientation. The differentiation in block structure is an important cause of strengthening during aging. 8 ref. (N7a, M26s, Ni-b, *Cr*, 14-67)

452-N.* (Russian.) Structural Changes in Nickel-Beryllium Alloy After Aging and High-Temperature Annealing. N. N. Buinov. *Izvestiya Akademii Nauk, Seriya Fizicheskaya*, v. 23, May 1959, p. 648-649.

In an aged Ni-Be or Cu-Be alloy, by high-temperature annealing, there is a restoration of primary crystalline particles with a disturbance which shows up in X-ray analysis. This restoration proceeds even when they are broken up into inelastic disoriented blocks. (N7c, 2-64, 2-65, 2-62; Ni-b, Cu-b, *Be*)

453-N.* Theory of Order in Ternary Alloys. Pt. 2. K. F. Wojciechowski. *Acta Metallurgica*, v. 7, June 1959, p. 376-379.

Statistical theory of the order-disorder transformations for ternary alloys of arbitrary composition and crystal structure. For ternary alloys each short-range order parameter is represented by several long-range order parameters; in the case of binary alloys there is synonymous dependence of long and short-range order parameters. 7 ref. (N10)

454-N.* The Diffusion of Carbon During Precipitation in Alpha-Iron. R. H. Doremus. *Acta Metallurgica*, v. 7, June 1959, p. 399-402.

The activation energy for precipitation of carbon from alpha-Fe was measured to be 17.1 ± 0.5 k-cal. per mole by starting the precipitation at one temperature and finishing it at another. The activation energy was the same within

experimental error for aging temperatures from 0 to 170° C., for samples strained up to 4%, and for samples of different concentration. 13 ref. (N1, N7; Fe, C)

455-N.* A Correlation of Data on Diffusion of Solutes in Face-Centered Cubic Metals. D. Turnbull and R. E. Hoffman. *Acta Metallurgica*, v. 7, June 1959, p. 407-410.

The activation free energy for solute diffusion seems to correlate with the binding energy of the solute in solution inferred from the heat of solution. 27 ref. (N1, P13a)

456-N.* The Hardening and Embrittlement of Mild Steel by Cyclic Stressing at the Fatigue Limit. J. Holden. *Acta Metallurgica*, v. 7, June 1959, p. 380-388.

The dependence of yield stress at 20° C. and fracture stress at -196° C. upon grain size is investigated for a mild steel before and after prolonged cyclic stressing at the fatigue limit. After cyclic stressing the initial slip is coarse, and restricted to planes which are active in cycling; consequently the hardening revealed by yield and fracture observations is characteristic of the regions of fatigue damage. 20 ref. (N7e, 3-68, 2-59, Q27; Cn)

457-N.* Grain Growth in Zone-Refined Tin. E. L. Holmes and W. C. Winegard. *Acta Metallurgica*, v. 7, June 1959, p. 411-414.

Grain growth experiments with zone-refined Sn of very high purity. A single growth law was obtained over the range of temperatures 167-220° C. The activation energy for grain growth was calculated to be 6.0 ± 0.6 K-cal per g-atom. 20 ref. (N3, C28k; Sn-a)

458-N.* (Czech.) Influence of Molybdenum and Vanadium as Carbide-Forming Alloying Elements in the Precipitation and Diffusion of Carbon in Ferrite. Jan Rusina. *Hutnicke Listy*, v. 14, July 1959, p. 608-610.

Determination of the damping properties of two low-alloy steels after annealing at varying temperatures following quench hardening. The damping properties do not always permit conclusions to be drawn as to the precipitation and diffusion of carbon. (N7b, N1, Q8, 2-64, N8; AY, C)

459-N.* (Czech.) Separation of an Ingot From Ingot Molds. Frantisek Havlicek. *Hutnicke Listy*, v. 14, July 1959, p. 610-611.

In solidification, the mechanism of spontaneous separation is determined by the shape and type of mold. (N12, W19c, 3-73; 5-59)

460-N.* (Russian.) Evaporization of Electrodes in Short Electric Discharges of High Intensities. Vladimir Hermoch. *Czechoslovak Journal of Physics*, v. 9, no. 2, 1959, p. 221-228.

Experiments performed with electrodes of various compositions show that the transportation velocity of vapors depends on the electrode material. 12 ref. (N16n)

461-N.* The Effect of Torsional Strains on Self-Diffusion in Silver Single Crystals. C. H. Lee and R. Maddin. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 397-401.

Diffusion rates of Ag^{110} in cylindrical single crystals of 99.99% pure Ag, which were twisted to a total surface strain of 0.91 during the diffusion anneal at temperature of 700, 750 and 800° C., were measured by sectioning and counting as a function of the strain rates. The enhancement of diffusion by straining is inversely proportional to the temperature at which diffusion occurs. 10 ref. (N1d, 2-64, 2-61, 3-68; Ag, 14-61)

462-N.* The Third Stage of Work Hardening in Aluminum Crystals Deformed at 196° K. S. Sato and A. Kelly. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 413-420.

The resolved shear stress when the stress-strain curve becomes concave to the strain axis depends on orientation, being always higher for crystals with an initial orientation close to the sides of the unit triangle. Marked cross-slip is first seen when the stress-strain curve becomes concave to the strain axis. The lengths of the slip lines vary inversely as the flow stress for all crystals, independent of crystal orientation. 20 ref. (N7e, Q24, 3-72; Al, 14-61)

463-N.* The Origin of the Preferred Orientation in the Columnar Zone of Ingots. D. Walton and B. Chalmers. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 447-456.

The preferred orientation present in the columnar zone of castings is due to dendritic growth ay some time during solidification. The dendritic growth may either be due to thermal supercooling or constitutional supercooling. Thermal

supercooling must be present because of the necessity for providing a driving force before nucleation can occur. 8 ref. (N12b, M26c; 5-59)

464-N.* Tertiary Recrystallization in Silicon Iron. J. L. Walter and C. G. Dunn. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 465-471.

High-purity Si iron may secondarily recrystallize to a cube texture. On prolonged heating this texture may be replaced by a (110) [001] texture. This phenomenon is called tertiary recrystallization. A difference in surface energy between (100) and (110) surfaces provides a driving force for growth of tertiary grains. 21 ref. (N5, M26c; Fe-b, *Si*)

465-N.* A Method for Growing Bicrystals of Copper. J. Intrater and E. S. Machlin. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 471-472.

Single crystals of two different orientations were grown from the melt in one-half of a split graphite mold. Two such crystals were then placed in contact with each other in another split mold, using tapered inserts. The pair of crystals was then remelted, starting 2 in. from the top to insure that the whole top portion of the crystals was maintained molten. By moving the induction cell vertically upward at a speed of 1 in. per hr. a bicrystal was obtained. (N3r; Cu)

466-N. Recrystallization of Heavily Cold-Rolled Uranium Sheet. W. R. Yario and L. T. Lloyd. Argonne National Laboratory. *U.S. Atomic Energy Commission,* ANL-5966, May 1959, 40 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $1.25.

Changes in mean expansion coefficients upon annealing uranium sheet rolled to 80% reduction in thickness at room temperature indicate that three different preferred orientations can be developed upon recrystallization. One preferred orientation, which is essentially the same as that of the as-rolled material, results from annealing for long times at 360° C.; a second type results from annealing between 400 and 600° C.; while a third accompanies grain coarsening at 650° C. 12 ref. (N5, M26c, 2-64; U, 4-53)

467-N.* (French.) Mottled Structure of Condensed Metal Vapors on the (111) Face of a Copper Single Crystal. Lucien Lafourcade, Paul Larroque and Nguyen Quat Ti. *Comptes Rendus,* v. 249, July 15, 1959, p. 230-232.

The crystal surface is cleaned and prepared by ion bombardment with Au or Cu vapors then being deposited. The structure parameters of deposits with reference to crystal lattice and their relationship to the angle of vapor jet with the (111) plane are studied. (N15g, M26; Cu, 14-61, *Au*)

468-N.* (French.) Effect of Small Copper Additions on the Recrystallization of Aluminum Refined by Zone Melting. Omourtague Dimitrov. *Comptes Rendus,* v. 249, July 15, 1959, p. 265-267.

After a deformation of 97% at the temperature of liquid nitrogen, samples with various Cu content were kept at temperatures from — 38 to +87° C. Effects of Cu on nucleation, grain growth and recovery. (N5, N2, N3, Q22n, 3-68, 2-60, 2-63; Al, *Cu*)

469-N.* (German.) Effect of Stabilization Degree on Precipitation Processes in Austenitic Chromium-Nickel and Chromium-Nickel-Molybdenum Steels. Karl Bungardt, Gustav Lennartz and Karlernst Wetzlar. *Archiv fur das Eisenhuttenwesen,* v. 30, July 1959, p. 429-434.

Precipitation occurring after austenitization and water quenching during heat treatments at 700° C. and for various times up to 5000 hr. Effects of Mo, Ni, Si and Mn on precipitation and precipitate composition. 20 ref. (N7, 2-60, 2-64; SS, *Mo, Si, Mn*)

470-N.* (German.) Polygonization and Recrystallization Behavior of Pure Iron With Reference to the Preparation of Single Crystals. Albert Kochendorfer and Hans Ewertz. *Archiv fur das Eisenhuttenwesen,* v. 30, July 1959, p. 441-445.

No single crystals could be grown when starting from structures following gamma ⟶ alpha transformation, then subjecting the samples to tensile deformation and heat treatment after each 2% deformation. When, however, the starting material showed a structure resulting from recrystallization after strong deformation, single crystals, though contaminated by inclusions, were obtained after 4% deformation and recrystallization. (N4, N5, N3r, 3-71, 3-68, 2-64; Fe)

471-N.* Aluminum Grain Boundary Attack by Liquid Gallium. C. Elbaum. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 476-477.

Liquid Ga, possibly saturated with Al, replaces an Al grain boundary. This phenomenon is probably controlled by diffusion in the liquid rather than by diffusion in the grain boundary. This situation arises if the saturation concentration of Al in liquid Ga with respect to a general Al surface is lower than with respect to a high-angle Al grain boundary. 4 ref. (N1; Ga, Al, 14-60)

472-N.* Solid-Solution Strengthening of Magnesium Single Crystals at Room Temperature. E. D. Levine, W. F. Sheely and R. R. Nash. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 521-526.

Constant loading-rate and constant elongation-rate tensile tests were performed at room temperature on single-crystal binary alloys of Mg with In, Cd, Tl, Al and Zn. A correlation of solute strengthening effects with the degree of incompatibility between solute and solvent indicated that a minimum degree of incompatibility must be exceeded to produce significant strengthening. The interaction of solute atoms with substructural boundaries is of prime importance in solution strengthening. 21 ref. (N7; Mg, 14-61, *In, Cd, Tl, Al, Zn,* 14-67)

473-N.* Anomalous Kinetics of the Bainitic Transformation Just Above the Martensitic Range. M. F. Smith, G. R. Speich and Morris Cohen. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 528-530.

The acceleration of the isothermal transformation just above the Ms temperature seems to stem from the formation of martensite which is activated or stress-induced by the very start of the bainitic transformation. This causes a transformation product (which more or less resembles bainite after tempering at the transformation temperature) to appear in the microstructure considerably sooner than would be possible from the growth of bainite itself. (N8m)

474-N. (Translation—BWRA.) Radiographic Investigation of the Phase Composition of Austenitic-Ferritic Weld Metal. N. Ya. Karasik. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 71-76.

X-ray structural analysis of phase changes in three compositions of stainless steel weld metal due to austenitizing, tempering and aging treatments. (N6p, 2-64, M26q, N8r; SS, 7-51)

475-N.* Freezing of a Growing Liquid Column. G. Horvay. *American Society of Mechanical Engineers,* Paper no. 59-HT-11, 1959, 11 p.

Theoretical heat flow and solidification process in a column of liquid metal being fed from the top with new liquid metal is computed for conditions where the temperature measured at the bottom exceeds, or is below, fusion temperature. (N12, P11k; 14-60)

476-N.* Austenitizing Behavior and Rapid Life Test of Drawn Wires for Ball Bearings. Manabu Ueno. *National Research Institute for Metals, Transactions,* v. 1, no. 1, 1959, p. 22-26.

Variation in hardness, bending stress and retained cementite and austenite with austenitizing temperature for low-alloy chromium steels. Effect of different raw materials and vanadium addition and bearing life. (N8n, N8k, Q-general, 2-60; AY, SGA-c, V, 2-64, 3-69)

477-N.* Studies on Nonmetallic Inclusions in Steel. Pt. 1. Carbide in Titanium Steel. Tadashi Yanagihara, Hirozo Kimura and Minoru Chiba. *National Research Institute for Metals, Transactions,* v. 1, no. 1, 1959, p. 76.

X-ray, electron microscope and chemical analysis of electrolytically extracted inclusions. (N8r; AY, *Ti, C,* 9-69)

478-N. Research on the Recrystallization of Aluminum Single Crystals. H. P. Leighly, Jr., Robert A. McCune and Frank C. Perkins. *Wright Air Development Center,* Technical Report no. 58-634, Dec. 1958, 79 p.

Rate of recrystallized grain growth is linear, then slowly decreasing. Simultaneous polygonization hinders of rompletely inhibits recrystallization. 18 ref. (N5; Al-a, 14-61)

479-N.* (French.) Annealing of High Speed Toolsteel. Andre-Heuri Michel. *Chimie & Industrie,* v. 81, Apr. 1959, p. 515-519.

Dilatometry above 450° C. of 18-4-1 high speed toolsteel quenched from 1280° C. by rape oil or liquid air reveals four transformation stages as the temperature is increased. The first stage occurs by expansion ascribed to precipitation from martensite; the second, by shrinkage attributed to precipitation from retained austenite; the third, by expansion resulting from the transformation of retained austenite into a complex of ferrite plus carbide; while the fourth stage is probably

related to precipitation from ferrite. 12 ref. (N8, J26n, M23b; TS-m)

480-N.* (Japanese.) Recrystallization of Aluminum Alloys. Isamu Igarashi and Tamotsu Igarashi. *Light Metals*, v. 9, Mar. 1959, p. 15-22.

Recrystallization of Al-Zn, Al-Mg, Al-Mn, Al-Cr, Al-Cd, Al-Ni, Al-Sb and Al-Pb alloys studied by X-ray diffraction; effect of Mg, Cr, Cd and Mn on recrystallization temperature. (N5, 2-60; Al-b, *Zn, Mg, Mn, Cr, Cd, Ni, Sb, Pb*)

481-N.* (Japanese.) The Effect of Preheating on the Structure of Recrystallized 3S Alloy. Takashi Ikeno and Kizoh Shibata. *Light Metals*, v. 9, Mar. 1959, p. 23-28.

Differences in grain size in sheet rolled from preheated and nonpreheated ingots. In the case of slowly cooled ingots recrystallized grains are not changed greatly when rolled, regardless of preheating, while in the case of rapidly cooled ingots, if preheated, the grains become fine in the outer region where the surface is columnar, and coarser in the inner region where the crystals are granular. (N5, M27c, F23; 5-59, 4-53)

482-N.* (Japanese.) Study of the Aging of Aluminum Alloys by Means of Specific Value Analysis. T. Morinaga, S. Zaima and Y. Takemura. *Light Metals*, v. 9, Mar. 1959, p. 59-66.

Influence of tempering temperature on Vickers hardness, Knoop hardness and Knoop ratio. (N7a, Q29; Al-b)

483-N. (Polish.) Order-Disorder in Metallic Alloys. Janusz Terpitowski and Kazimierz Franciszek Wojciechowski. *Wiadomosci Chemiczne*, v. 13, Jan. 1959, p. 41-90.

Experimental and theoretical analysis. 90 ref. (N10)

484-N.* (French.) Micro-Calorimetric Studies on the Austenite Transformation of a Steel With 12% Manganese and 1.3% Carbon. G. Collette. *Metaux Corrosion-Industries*, no. 407-408, July-Aug. 1959, p. 269-270.

Samples are heated to approximately 1000° C., water quenched to 20° C. and then annealed. Thermodynamics of austenite transformation, carbide precipitation and troostite formation. (N8, P12r; AY, *Mn, C*)

485-N.* Solidification Mechanisms of Eutectic and Gray Iron. Albert DeSy. *Modern Castings*, v. 36, Aug. 1959, p. 76-82.

Theoretical study of mechanisms of transformations and resulting structures. 10 ref. (N12, E25n; CI-n)

486-N.* (Czech.) Effect and Contribution of Arsenic Upon Structure, Graphitization and Properties of Cast Iron. Ivan Pavlik. *Slevarenstvi*, v. 7, Apr. 1959, p. 159-166.

Arsenic does not influence the amount of precipitated graphite although the form is changed. The structure in the presence of As is pearlitic. If the As content exceeds 0.27% a new structural component is formed together with phosphorus and it is assumed that this is formed in the Fe-As-P phase as cementite. Corrosion and wear resistance improve with increasing As content. (N8s, 2-60; CI, *As, P*)

487-N.* Grain Size Control During Ingot Solidification. W. A. Tiller. *Journal of Metals*, v. 11, Aug. 1959, p. 512-514.

Columnar ingots are produced if the alloy is cast with a large superheat and if catalysts are eliminated from the melt. Fine-grained equiaxed ingots are produced by casting with a low superheat, by adding an effective catalyst or an appropriate solute element to the melt. 10 ref. (N12, M27c; 5-59)

488-N. Development of New Mechanisms and Techniques for Obtaining Steels in the Ultra-High Strength Range. D. Gullotti, E. Eichen and J. W. Spretnak. Ohio State University Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131238, May 1957, 56 p. $1.50.

Two possible methods of obtaining steels in the high strength range are the superimposition of plastic deformation on the transformation of austenite to martensite and the production of high-nitrogen low-carbon (0.25% max.) martensite. Increases in tensile strength up to 10% and in elastic limit up to 30% were obtained in the deformation of austenite prior to transformation. In steels having a base composition 0.20% C, 1.60% Si, 0.75% Mn, 1.40% Cr, increasing the nitrogen content from 0.004 to 0.009% increased the 0.2% offset yield strength about 6% and the tensile strength about 3-1/2%. (N8, Q27a, 3-68; AY, SGB-a, *Si, Mn, Cr*)

489-N.* (English.) Grain Behavior in 70-30 Brass Plate Rapidly Heat Treated at High Temperatures. Osamu Izumi and Tadatsugu Yoshiki. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 161-167.

Grain growth in brass specimens annealed at 850° C. Influence of impurities, final cold reduction and ready-to-finish grain size. 4 ref. (N3n, N5, 3-69, 3-68; Cu-n)

490-N.* (Japanese.) Study on Black-Heart Malleable Cast Iron Treated With Acid. Yoshifumi Mima. *Metal Finishing Society of Japan, Journal*, v. 10, May 1959, p. 199-205.

Determination of the rate of diffusion of hydrogen atoms from acid through 3-mm. sections of black-heart cast iron in a vacuum. The rate is dependent on acid normality and temperature and on structure. (N1; CI-s, *H*)

491-N.* (German.) Nuclei Formation During the Precipitation of $CuAl_2$. Ulrich Dehlinger and Hans Pfleiderer. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 407-409.

Formation of a $CuAl_2$ lattice that shows only slight differences with regard to the matrix. The nuclei are stabilized against the distortion energy (elastic energy + surface energy) by short range ordering complexes of the solid solution. 8 ref. (N2g, N7, N10b; Al-b, *Cu*)

492-N.* (German.) Vapor Pressure of Liquid Cadmium-Antimony Alloys. Erich Scheil and Hans Baach. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 386-392.

Vapor pressure measurements lead to the assumption that the melt is in a state of ordering at temperatures near the melting point. CdSb crystals are thought to form when a melt solidifies from a stable ordering state, while solidification from a metastable state creates Cd_3Sb_2 crystals. 9 ref. (N12, M27d, P12c; Cd-b, Sb, 14-60)

493-N.* (German.) Investigation of Ordering Processes in Copper Alloys Based on Measurements of the Thermo-Electric Voltage Against Copper. Otto Dahl and Eberhard Starke. *Zeitschrift fur Metallkunde*, v. 50, July 1959, p. 410-412.

The thermo-electric voltage of Cu-Zn, Cu-Ni, Cu-Ni-Zn and Cu-Au alloys measured on test wires after quenching from 500-700° C. after slow cooling or for the tempered state. Differences in results are thought to be caused by ordering processes. 7 ref. (N10b, P15j, 2-61, 2-64; Cu-b, *Zn, Ni, Au*)

494-N.* Diffusion of Ruthenium in Single Crystals of Silver. C. B. Pierce and D. Lazarus. *Physical Review*, v. 114, May 1, 1959, p. 686-687.

Measurement of diffusion coefficients at 793 to 945° C. using precision sectioning technique and Ru_{103} and Ru_{106} tracers. 7 ref. (N1, 1-59; Ag, 14-61, *Ru*)

495-N.* (German.) Grain-Boundary Migration in Aluminum. Martin May and Friedrich Erdmann-Jesnitzer. *Zeitschrift fur Meiallkunde*, v. 50, July 1959, p. 434-438.

Migration of grain boundaries is influenced by the orientation difference between individual grains, tensile stress and by temperature. 19 ref. (N3, M27f, 3-72, 3-66, 2-61; Al)

496-N.* The Structure of Beryllium, With Particular Reference to Temperatures Above 1200° C. A. J. Martin and A. Moore. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 85-93.

Investigation by electrical resistance measurements, thermal analysis and X-ray lattice parameter measurements; heating and cooling curves for Be specimens of varying impurity content, including commercial purity metal, the pure and impure portions of a zone refined bar, and the condensate and residue from a vacuum distillation process. No evidence of a solid-state change between 25 and 1200° C. was detected. A study of the traces above 1200° C., however, revealed the double thermal arrest in the region of the melting point. 11 ref. (N6p, 2-62; Be)

497-N.* Solid State Transitions in Manganese and Iron Solid Solutions. A Hellawall. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 110-112.

At elevated temperatures many of the transition metals show allotropic modifications, and in particular in Mn and Fe there occur the gamma (f.c.c.) and delta (b.c.c.) allotropes in the same sequence with ascending temperature. Concentrating only upon the f.c.c.-b.c.c. transition temperature, and its elevation or depression by solute elements, it is possible to classify elements as b.c.c. or f.c.c. favoring. 6 ref. (N6p, M26, 2-62; Mn, Fe, 14-67)

498-N.* The Action of Molten Uranium on Graphite. E. L. Swarts. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 553-554.

When molten uranium contacts graphite, a continuous carbide layer clads the graphite. This layer probably protects the graphite against more rapid corrosion, but is itself not stable toward molten uranium. 4 ref. (N12, R6m; U, NM-k36)

499-N.* The Use of Controlled Solidification in Equilibrium-Diagram Studies. W. A. Tiller. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 555-559.

The use of controlled solidification enables the determination of liquidus and solidus surface plus tie-lines for a polycomponent alloy. New experimental techniques for stirring the liquid must be devised before the method can be utilized to best advantage. 7 ref. (N12; M24)

500-N.* Self and Interdiffusion in Liquid Zinc Amalgams. H. W. Schadler and R. E. Grace. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 559-566.

The applicability of Darken's theoretical relation between self and interdiffusion coefficients to diffusion in binary liquid-metal systems is verified for dilute Zn amalgams. The capillary reservoir technique and standard tracer methods were used to measure the self-diffusion coefficients of Hg and Zn and the interdiffusion coefficients as a function of composition and temperature; and electromotive force techniques were used to determine the thermodynamic activity of Zn in dilute An amalgams at 30° C. 11 ref. (N1, 2-60, 2-61; Hg, Zn, 14-60)

501-N.* Influence of Thermal History on Preferred Orientations in the Recrystallization of Commercially Pure Aluminum. R. E. Gree, Jr., B. G. Liebmann and H. Yoshida. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 610-613.

Influence of the state of impurities (precipitated or in solid solution) on recrystallization of strained Al single crystals. 10 ref. (N5, M26c, 3-70; Al-a, 14-61)

502-N.* Solubility and Diffusion of Titanium in Iron. Sheldon H. Moll and Robert E. Ogilvie. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 613-618.

The maximum solubility of Ti in gamma Fe was found to be 0.65% at 1100° C. Interdiffusion coefficients for the alpha phase were determined from observations of the rate of movement of the alpha-gamma interface. A Matano analysis of the concentration gradients yielded reasonable values for the interdiffusion coefficients of the gamma phase. 19 ref. (N1, P12e; Ti, Fe)

503-N.* Order-Disorder Transformations in Iron-Aluminum Alloys. H. J. McQueen and G. C. Kuczynski. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 619-922.

The portion of the equilibrium diagram between 20 and 30 at.% Al in Fe was revised on the basis of dilatometric data. Alloys below 23 at.% Al transform from disordered solution to ordered Fe_3Al structure; whereas those above 23 at.% Al transform first to FeAl structure, and then to Fe_3Al structure. 11 ref. (N10; Fe-b, *Al*)

504-N.* Phase Changes in Precipitation Hardening Nickel-Chromium-Iron Alloys During Prolonged Heating. C. C. Clark and J. S. Iwanski. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 648-651.

Microstructural changes in two commercial high-temperature alloys, Inconel "X" and Incoloy "901". During protracted creep-rupture tests, precipitation phases undergo marked changes. Equilibrium structure was not attained at 1500° F. after 35,000 hr. during which time the principal age-hardening phase changed from f.c.c. to hexagonal. Possible mechanisms for the transformation. 8 ref. (N7, J27, M27, Q3q, 2-62; Ni-b)

505-N.* Controlling Grain Boundary Position in Growth From the Melt. R. L. Fleischer and R. S. Davis. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 665-666.

Technique of seeded growth from the melt in milled graphite boats. Projections are machined on the bottom and cover of the boat, so that the specimen produced will have long grooves on two opposite sides along its length. The grain boundary minimizes its area and hence, normally, its free energy by following the grooves. 10 ref. (N3r, M27f)

506-N. Research on Strain Aging Effects in Titanium. Harold S. Gurev and William M. Baldwin, Jr. Case Institute of Technology. *Wright Air Development Center*, WADC Technical Report 59-223, May 1959, 63 p.

Effects of varying interstitial element content (oxygen, carbon and nitrogen) on the tensile properties of an alpha-beta Ti alloy, Ti-140A, at test temperatures ranging from room temperature to above 1000° F. and at strain rates from 0.05 to 18,000 in. per in. per min. Stress-rupture properties of such alloys and similar interstitial bearing modifications of an alpha alloy, A-110AT, were also determined between 400 and 1000° F. Manifestations of strain aging occur in these alloys, but correlation

of occurrence of yield points and high-temperature embrittlement is lacking. (N7e, Q27a, Q3q, 2-60, 2-62; Ti-b)

507-N.* (German.) Aging of Aluminum-Magnesium Alloys. Leopold J. G. van Ewijk. *Giesserei*, v. 46, Aug. 13, 1959, p. 465-471.

Samples were cast, cold deformed (4%), homogenized and aged at temperatures below 0° C., at room and at elevated temperatures. Influence of various aging conditions on tensile strength, elongation, elastic limit, impact strength and hardness. 25 ref. (N7a, J27d, Q27a, Q23p, Q21e, Q6n, Q29n, 3-68, 2-61; Al-b, *Mg*)

508-N. The Association of Oxygen Atoms in Interstitial Solid Solution in Tantalum. R. W. Powers and M. V. Doyle. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 655-665.

Mechanical relaxation data are interpreted to show that an equilibrium exists in interstitial solid solutions of Ta between groupings of two oxygen atoms and those oxygen atoms which are not so bound together. 13 ref. (N10; Ta, 14-67, *O*)

509-N.* Edge-Nucleated, Growth Controlled Recrystallization in Aluminum. R. A. Vandermeer and Paul Gordon. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 577-588.

Recrystallization nuclei form colonies of grains strung along matrix grain edges, and only a small fraction of the total number of matrix edges produce colonies. The colonies are all present at virtually zero annealing time, each extending along essentially the full length of its matrix edge. The isothermal kinetics of the recrystallization are controlled by the two-dimensional growth of the colonies in the directions orthogonal to the nucleating edges. 15 ref. (N5; Al)

510-N.* Comparison of the Thermal Stability of Some Precipitation-Hardened and Dispersion-Hardened Nickel-Base Alloys. D. H. Feisel and A. Cochardt. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 608-613.

Ni alloy matrices hardened by precipitates of Ni_3Al, Ni_3Ti, or TiC over-age rapidly at temperatures of 1340° F. (727° C.) and above. Ni-base alloys hardened by finely dispersed particles of Al oxide retain their high hardness of 250 to 400 Dph. for very long times at 1340° F. (727° C.). They do not appreciably over-age within 16 hr. at temperatures as high as 2000° F. (1093° C.) 10 ref. (N7, Q29n, 2-61; Ni-b, Al, Ti, C, 14-68)

511-N.* Correlation of Transformation Behavior With Mechanical Properties of Several Titanium-Base Alloys. A. J. Griest, J. R. Doig and P. D. Frost. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 627-632.

Hardness, tensile and X-ray diffraction data were compiled to follow the course of aging in the nominal alloys Ti-8Mn, Ti-8Mn-2Al, Ti-4Mn-4Al, Ti-6Al-4V and Ti-4Fe. The Ti-Mn and Ti-Mn-Al alloys were embrittled after quenching from the alpha-beta field and aging for short times at 800 or 900° F. Omega phase patterns at this time were strong for the Ti-8Mn alloy, weaker and more diffuse for the Ti-8Mn-2Al alloy and were not detected positively for the Ti-4Al-4Mn specimens. 18 ref. (N7a, Q29n, Q27a; Ti-b, *Mn, Al, V, Fe*)

512-N.* Growth of Single Crystals of Stainless Steel. R. D. Leggett, R. E. Reed and H. W. Paxton. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 679-680.

Techniques for growing monocrystals and bicrystals of 20 Cr, 20-20 Cr-Ni, and 18-8 alloys by both the strain-anneal and the Bridgeman techniques. (N3r; SS)

513-N.* The Solid Solubilities of Iron and Nickel in Beryllium. S. H. Gelles, R. E. Ogilvie and A. R. Kaufmann. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 695-702.

Solid solubility limits of Fe in Be were determined between 850 and 1200° C. by analysis of differential type multiphase diffusion couples, using an X-ray absorption technique. The maximum value of the solubility limit was found to be 0.92 $\pm$ 0.02 at.% (5.46 wt.%) at the eutectic temperature, 1225° C. The solubilities of Ni and Be were determined between 900 and 1200° C. and the maximum solubility was found to be 4.93 $\pm$ 0.01 at.% (25.2 wt.%) at the eutectoid temperature, 1065° C. 16 ref. (N12p; Be, *Fe, Ni*)

514-N.* Influence of Cobalt on the Transformation of a Chromium Alloyed Austenite. P. Nicolaides, D. Coutsouradis and L. Habraken. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 702-705.

The TTT-curves of 0.1% C, 13% Cr steels containing up to 12% Co were determined in order to establish whether the effect of Co is similar to that observed in

plain carbon steels. Co increases the incubation time and decreases the transformation rate, though not in a uniform way. The bainitic transformation is displaced to lower temperature and overlaps partially the martensitic zone. 12 ref. (N8, 2-60; AY, *Co*)

515-N.* The Iron-Carbon Eutectoid Temperature. R. P. Smith and L. S. Darken. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 727-728.

The eutectoid temperature is taken as the temperature corresponding to the maximum rate of change of the austenite decomposition products. Results indicate that the lutectoid temperature is 727.2° ± 0.5° C. This is higher than the generally accepted value 723° + 2° C. previously determined. (N8; Fe-b)

516-N.* Note on the Change in Stored Energy Produced by Reversed Deformation. A. S. Iyer and Paul Gordon. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 729-730.

Small compressions soften, rather than harden, the prestretched Cu and at the same time decrease the amount of stored energy. The maximum decrease occurs between 5 and 10% compression; compressions greater than about 15% begin to add stored energy again. (N7e, 3-68; Cu)

517-N.* (German.) Strain Hardening and Recovery of Aluminum and Its Alloys. F. Erdmann-Jesnitzer and H. Hadamovsky. *Aluminum*, v. 35, May 1959, p. 248-257.

Effects of deformation degree, deformation temperature and various heat treatments on hardness and structure. 5 ref. (N7e, N4, Q29n, 2-61, 2-64, 3-68; Al)

518-N.* (German.) Structural Changes Caused by Neutron Irradiation of a Uranium-Molybdenum Alloy. S. T. Konobevskii, N. F. Dravdyuk, K. P. Dubrovin, B. M. Levitskii, L. D. Panteleev and V. M. Golianov. *Nuclear Energy*, v. 9, June 1959, p. 75-89.

The electrical resistance of a 9% Mo uranium alloy was measured and the structure examined by X-ray diffraction and metallographic techniques. The rate of homogenization was inversely proportional to the square of the thickness of the laminae in the eutectoid. Size of the thermal spike and the dissipated energy were found to be smaller than previously determined. (N-general, P15, 2-67; U-b, *Mo*)

519-N. On the Influence of Volume Effects on Order-Disorder Transition. V. W. Ross and D. Ter Haar. *Physica*, v. 25, May 1959, p. 343-356.

Simplified model of a binary substitutional alloy. The influence of the differences in atomic radii of the constituent atoms and in potential energies of the various possible pairs of atoms. 36 ref. (N10)

520-N.* Effect of Pressure on Self-Diffusion in Lead. N. N. Nachtrieb, H. A. Resing and S. A. Rice. *Journal of Chemical Physics*, v. 31, July 1959, p. 135-138.

Data on the self-diffusion of Pb as a function of temperature from 174 to 322° and for pressures from 1 to 8000 atmospheres. The decrease in the self-diffusion coefficient with pressure depends on the melting point, the zero pressure activation energy and the activation volume. (N1d, 2-61, 3-74; Pb)

521-N.* (English.) Theory of Order in Fe_3Al Alloy. K. F. Wojciechowski. *Acta Physica Polonica*, v. 18, no. 1, 1959, p. 15-20.

Statistical theory of order and disorder transitions. Interactions produce further interactions of atoms. Determination of more accurate temperature transitions from order to order was carried out. The interaction energy of the third order is approximately 1/2 of the interaction energy of the second order. (N10; Fe-b, *Al*)

522-N.* (English.) Autoradiographic Investigation of the Diffusion of Chromium in Titanium. A. J. Mortlock. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 13-16.

Interfacial diffusion between Ti and a Ti-Cr alloy was traced with the help of radioactive Cr. The concentration distribution is computed from the self-diffusion activation energy and from the diffusion constant measured for varying holding times at 1000-1115° C. (N1h, M23q, 1-59, 2-61, 3-67; Cr, Ti)

523-N.* (English.) The Diffusion and Precipitation of Helium Injected Into Metals. R. S. Barnes. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 57-64.

Exposure of Be, Cu and Al to an alpha-particle beam causes the formation of He atoms that take interstitial positions in the crystal. When sufficient vacancies are available, the He atoms accumulate, forming small bubbles. (N1c, N15d, 2-67; Be, Cu, Al, *He*)

524-N.* (French.) Short Distance Diffusion in Alloys. R. Graf and A. Guinier. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 17-20

Quench aging of Al alloys. Hardness as a function of time elapsed after quenching. Aging effect is explained by the formation of zones containing an excess of dissolved atoms. 20 ref. (N1e, N7a, Q29n, 3-67; Al-b)

525-N.* (French.) Study of Intermetallic Diffusion by Microhardness Measurements. H. Buckle. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 21-31.

Microhardness as a function of concentration. Diffusion between steel and Cr in Cr-plated steel, and of Cu, Mg, Mn and Si into Al studied by microhardness measurements. 4 ref. (N1h, Q29q; ST, *Cr, Al, Cu, Mg, Mn, Si*)

526-N.* (French.) Radioactive Tracer Study of Self Diffusion. Claude Leymonie and Paul Lacombe. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 33-39.

Various testing techniques such as sectioning and irradiation absorption. Use of F^{59} isotopes for measuring the self-diffusion coefficient of Fe. (N1d, 1-59)

527-N.* (French.) Diffusion in Thin Films Obtained by Vaporization. Pierre Michel. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 41-44.

Some binary alloys can be prepared by vaporization of one component over the other, allowing the alloy to form by solid state diffusion at higher temperatures or, in some cases, at room temperature. 10 ref. (N1c, N15g; Ag, Zn, Sn, Au, *Cu, Mn,* Al, *Cu, Sb,* In, 14-62)

528-N.* (French.) Diffusion in Alpha-Brass, Tested by Zinc Evaporation or Condensation Methods. A. Accary. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 45-55.

Solid-state diffusion is influenced by any Sb, As, P or Si in Al present. 15 ref. (N1, N16n, N16p, 2-60; Cu-n)

529-N.* (French.) Diffusion of Oxygen in Zirconium. G. Sainfort, R. Jacquesson and P. Laurent. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 79-84.

Study of the diffusion mechanism, based on X-ray diffraction, microhardness measurements and micrographs. Diffusion along the grain boundaries takes place at temperatures around 770° C. Three-dimensional diffusion was observed near 980° C. 9 ref. (N1c, R2s, 2-61; Zr, *O*)

530-N.* (French.) Brittleness in the Diffusion Zone Uranium-Zirconium. A. Winogradzki and N. Azam. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 85-94.

Heat treatment of uranium fuel elements manufactured by co-extrusion, together with their Zr sheaths. Annealing at approx. 600° C. causes brittleness of the diffusion layer. No embrittlement was observed after annealing at higher temperatures, although if heating is extended over too long a period pores form during diffusion. (N1c, Q26s, T11g, 2-64, 9-68; U-b, *Zr*)

531-N.* (French.) Uranium-Titanium Diffusion. Y. Adda and J. Philibert. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 103-109.

U and Ti samples are pressure welded together at 600° C., and in a vacuum. During subsequent vacuum heating at temperatures up to 1075° C. diffusion occurs that can be tested by micrographs. 8 ref. (N1c, K5k, 2-64, 1-73; U, Ti)

532-N.* Solidification and Heat Treatment. Gray Iron. Ralph A. Clark. *Foundry*, v. 87, Sept. 1959, p. 108-115.

Fe-C-Si system; carbon equivalents; solidification phenomena; effect of inoculation, phosphorus content and heat treatment on structure. (N12, E25n, E25q, 2-64; CI-n)

533-N.* Solidification and Heat Treatment. Steel and Malleable Iron. B. C. Yearley. *Foundry*, v. 87, Sept. 1959, p. 116-121.

Influence of shape and molding medium on heat removal from solidifying castings. Direction and rate of freezing; design of feeders; heat treatment. 5 ref. (N12, E25n, J-general, 3-73; ST, CI-s)

534-N.* (Czech.) Diffusion of Zinc and Cadmium Into Antimony. Stevo Trajkov. *Hutnicke Listy*, v. 14, Aug. 1959, p. 670-673.

During the diffusion of Cd into Sb at 280-420° C., the gamma-phase (CdSb) forms. In the diffusion of Zn into Sb at 340-480° C., the presence of ZnSb is observed. The epsilon-phase (Zn_3Sb_2) appears at 510° C. 7 ref. (N1h, 2-61; Zn, Cd, Sb)

535-N.* (Czech.) Effect of Changes in the Composition of Malleable Cast Iron on Primary Graphitization. Stanislav Drapal. *Hutnicke Listy*, v. 14, Aug. 1959, p. 680-688.

By an increased carbon content, the isothermal decomposition of ledeburitic cementite and the formation of graphite nuclei are retarded, while an excess of Si accelerates both phenomena. A retarding effect on both processes takes place when the ratio Mn:S= 3:4 is disturbed. 28 ref. (N8s, 2-60; CI-s)

536-N.* (Czech.) Distribution of Precipitates in Austenitic Stainless Steel. Vladimir Cihal and Jaroslav Jezek. *Hutnicke Listy*, v. 14, Aug. 1959, p. 695-700.

Precipitation of carbides in annealing after water quenching from 1250° C. Influence of carbide precipitation on the intergranular corrosion. (N7b, N8r, R2h, 2-64; SS-e)

537-N.* (French.) Diffusion of Aluminum in the Solid State UAl_3-UAl_4 Transformation. R. Boucher. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 111-117.

U-Al alloys with 35.40% U are held at 1050° C. through 15 min., slowly cooled to 750° C. and then quenched. The transformation UAl_3-UAl_4 occurring in subsequent heating and holding at 60° C. (thought to be caused by the diffusion of Al through the UAl_4) is studied by micrographs. Retarding effect of Si. (N1e, 2-60, 2-64; Al-b, *U, Si*)

538-N.* (French.) Ionization of Hydrogen During Diffusion Into a Metal. Albert Herold. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 133-135.

Hydrogen diffuses into Pd or Fe in at least a partly ionized state. This is proved by a simple apparatus. (N1c, N15d, 2-62; Fe, Pd, 4-61, *H*)

539-N.* (French.) Diffusion of Cathodic Hydrogen Into Iron as Influenced by the Presence of Sulphur. Simone Besnard and Jean Talbot. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 147-155.

Armco Fe and electrolytic Fe, with or without zone melting, are charged with hydrogen by exposure to a current in diluted H_2SO_4. To study the effect of sulphur, various amounts of Na_2S are added to the electrolyte. Effect of H and S on elongation; influence of S on grain boundaries. Solubility of H is increased by impurities and by the presence of Na_2S. (N1, R1a, Q23p, M27f, 3-69, 2-66; Fe, *H, S*)

540-N.* (French.) Preferential Location and Diffusion of Hydrogen in Iron. Jacques Plusquellec, Pierre Azou and Paul Bastien. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 157-162.

Position of hydrogen in the alpha iron lattice. Based on X-ray patterns obtained at various testing temperatures and degree of deformation and stress relief of hydrogen charged steel, the octahedral position is assumed. 9 ref. (N15e, 3-68, 2-61, 2-64; Fe, *H*)

541-N.* (French.) Diffusion in a Polyphase System. J. Philibert and Y. Adda. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 163-175.

Diffusion between U and Zr, U and Mo, U and an U-Mo alloy, is investigated at temperatures between 650 and 1000° C. Diffusion coefficient and Kirkendall effect are influenced by temperature and concentration. 10 ref. (N1, 2-61, 2-60; U-b, Zr, Mo)

542-N.* Dimensional Stability of a Precision Ball Bearing Material. E. B. Mikus, T. J. Hughel, J. M. Gerty and A. C. Knudsen. *American Society for Metals, Transactions*, v. 52, Preprint no. 154, 1959, 9 p.

Dimensional stability of various hardened structures of 52100 steel. Four structures were studied which contained from 0 to 15% retained austenite. Testing over a range of temperatures from -30 to +165° F. and at stresses up to 20,000 psi. revealed that both stress and temperature influenced the dimensional stability of 52100 steel. The presence of more than 1.5% retained austenite in the structure resulted in pronounced instability. 4 ref. (N8n, P10d, 3-66, 2-61; ST, SGA-C)

543-N.* Diffusion of Oxygen in Alpha and Beta Titanium. William P. Roe, Howard R.

Palmer and William R. Opie. *American Society for Metals, Transactions*, v. 52, Preprint no. 159, 1959, 8 p.

Diffusivities were determined using microhardness data as measures of oxygen content for Ti75A cylinders oxidized in TiO_2 powder at temperatures of 700-1150° C. 10 ref. (N1, Q29q; Ti, *O*)

544-N.* (English.) Electrical Resistance During the Isothermal Aging of Quenched Al-Zn Alloys. V. Houl and Y. Erling. *Annales Academiae Fennicae Scientiarum*, Series A, v. 6, no. 20, 1959, p. 2-11.

The existence of two independent aging mechanisms is indicated. The measured values confirm the relation between low-temperature aging and the appearance of Guinier-Preston zones. (N7a, P15g; Al, Zn)

545-N.* (Polish.) Effect of Austenitizing Temperature on Martensitic Transformation in Fe-C-Ni and Fe-C-Mn Alloys Below Room Temperature. W. Cias. *Prace Instytutow Hutniczych*, v. 11, no. 2, 1959, p. 55-69.

Cooling curves. Effect of increases in C, Ni and Mn content on martensitic transformation. 7 ref. (N8p, 2-60, 2-61; Fe-b, *C, Ni, Mn*)

546-N. (Russian.) Growth of Single Crystals From Germanium-Silicon Alloys. I. N. Belokurova, M. G. Kekua, D. A. Petrov and A. D. Suchkova. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 9-12.

Single crystals grown from a melt by slow cooling show inhomogeneities in the distribution of Si and in the electrial resistivity. By an alternative method—growth from a melt steadily fed from an ingot, single crystals with uniform Si distribution and resistivity are produced. 6 ref. (N3r; Ge, Si)

547-N. (Russian.) Solubility and Activity of Oxygen in Melts. V. V. Averin, A. Yu. Polyakov and A. M. Samarin. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 13-21.

Experiments with Fe-Cr, Ni-Fe, Co-Fe and Ni-Co alloys. Solubility and activity of oxygen depend on the composition of the oxide phase. 13 ref. (N16m, P12; Fe-b, Ni-b, *Cr, Co*, 14-60)

548-N. (Russian.) Sub-Structure Changes in Cold Deformed Aluminum Occurring in Annealing. E. P. Kostyukova and B. M. Rovinskii. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 55-59.

Effects of deformation degree and annealing temperature on substructure studied with the help of back-reflection X-ray patterns. 6 ref. (N4, N5, 3-68, 2-64; Al)

549-N. (Russian.) Transfer of Components in an Iron-Tungsten Alloy Exposed to a Steady Electric Field. D. F. Kalinovich, I. I. Kovenskii, M. D. Smolin and I. N. Frantsevich. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 71-74.

Transfer of W and Fe investigated by radioactive tracers. Effect of temperature. (N1e, P15, 2-61, 1-59; Fe-b, *W*)

550-N. (Russian.) Conditions for the Superplasticity of Cast Eutectics. A. A. Presnyakov and G. V. Starikova. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 75-77.

Al-Si, Al-Ni and Al-Fe alloys are allowed to solidify in a metal or a graphite mold and the values for elongation and reduction of area at various temperatures are then determined. Effect of crystallization conditions on plasticity. 4 ref. (N12, Q23p, 2-61, 3-71; Al-b, *Fe, Si, Ni*)

551-N. (Russian.) Formation of Recrystallization Centers With High Heating Velocities. P. D. Izbranov, V. A. Pavlov and N. M. Rodigin. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 109-110.

Transformer steel is annealed after strong deformation through 2 sec. and at a high heating rate. Effect of texture on nucleation and recrystallization. 7 ref. (N5, N2, 3-68, 2-64; AY, *Si*, SGA-n)

552-N. (Russian.) Supersaturation of Cast Iron With Magnesium. P. I. Stepin. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 111-113.

Diffusion occurring between metallic Mg and cast iron in a hermetically sealed container at temperatures up to 1155° C. At a temperature near the eutectic point, the laminar graphite dissolves. During cooling, formation of secondary graphite takes place. (N1c, E25q, N8s, 2-60; CI, *Mg*)

553-N. (Czech.) Importance of Single Crystals. Bohdan Sestak. *Hutnicke Listy*, v. 14, Aug. 1959, p. 657-659.

Survey covering preparation and use. 17 ref. (N3r)

554-N. (English.) Random Walks and Drift in Chemical Diffusion. A. D. LeClaire. Paper from "Symposium on Solid State Diffusion" North Holland Publishing Co., Amsterdam, 1959, p. 1-11.

Theory developed for self diffusion and chemical diffusion. (N1c)

555-N. (French.) Dissolution Energy of Rare Gases in Metals. J. Blin. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 65-72.

Theoretical computation of Xe and Kr in Ag, Cu, U. 6 ref. (N1, N15e; Ag, Cu, U, *Xe, Kr*)

556-N. (French.) Apparatus for Studying the Diffusion of Rare Gases in Stainless Steel. J. A. Stohr and L. Alfille. Paper from "Symposium on Solid State Diffusion". North Holland Publishing Co., Amsterdam, 1959, p. 73-78.

(N1a, 1-53; SS)

557-N. (Book-French.) Symposium on Solid State Diffusion. 175 p. 1959. North Holland Publishing Co., Amsterdam.

Current research on solid state diffusion occurring between metals, and that of a gas into a metal. Papers separately abstracted. (N1)

558-N.* On the Aging Behavior of the Alloy Ti-6A1-4V. J. M. Dupouy, M. B. Bever and B. L. Averbach. *American Society for Metals, Transactions,* Preprint no. 141, v. 52, 1959, 12 p.

Effects of aging in the range 800-1100° F. on mechanical properties. As aging progressed, the tensile strength, yield strength and hardness went through two and, in some instances, three maxima and the ductility developed minima. The lower the aging temperature, the longer were the times required to reach these maxima and minima and the lower were the values of the strength properties. 15 ref. (N7a, 2-61, Q-general; Ti-b, *Al, V*)

559-N.* Compatibility of a Number of Metals and Alloys With Graphite. Arnold F. Gerds and Manley W. Mallett. *American Society for Metals, Transactions,* Preprint no. 145, v. 52, 1959, 16 p.

The graphite was heated in intimate contact with the test metal in welded metallic capsules. Cu was the least reactive material tested in contact with graphite. Ni was only slightly more reactive. Outside of a very hard carbide band at the graphite-metal interface, no evidence of interaction of carbon with Mo was found. Inconel "X" was the most compatible alloy tested in contact with graphite, although some pickup was observed. Alnicro was the next best alloy. Nichrome V, Inconel, and Types 316 and 318 stainless steels were all much more reactive. 5 ref. (N1; Cu, Ni, Mo, SS, NM-k36, 14-60)

560-N.* Kinetics of Decomposition of Alpha Prime in a Titanium-Copper Alloy. Mario P. Gomez and D. H. Polonis. *American Society for Metals, Transactions,* Preprint no. 147, v. 52, 1959, 18 p.

Since the amount transformed is assumed proportional to the variation in electrical resistivity, a mechanism is proposed which explains variation in the state of strain of the matrix; variation in the number and relative amounts of the phases involved in the transformation; depletion of solute in the alpha prime. 17 ref. (N7d; Ti-b, *Cu*)

561-N.* Gas-Metal Reactions During Box Annealing of Low Carbon Steel. R. M. Hudson and G. L. Stragand. *American Society for Metals, Transactions,* Preprint no. 150, v. 52, 1959, 16 p.

Considerable amounts of gas are evolved from steel by heating in vacuum at elevated temperatures. Gas-metal reactions during heat treatment produce changes in furnace atmosphere composition. Experiments were conducted in which gas samples were taken from the atmosphere surrounding steel coils and from within steel coils during annealing. The presence of carbonaceous gases within the coil may result from reactions such as oxidation of carbides by water or by oxides and from thermal cracking and oxidation of organic material, such as cold reduction lubricants that are present on the steel surface. 10 ref. (N15, J23, 1-73; CN-g)

562-N.* The Strength of Martensite Formed From Cold-Worked Austenite. J. C. Shyne, V. F. Zackay and D. J. Schmatz. *American Society for Metals, Transactions,* Preprint no. 163, 1959, 16 p.

Effects of certain thermal-mechanical treatments on the structure and properties of ultra-high-strength steels. Plastic deformation of metastable austenite increased the strength of the subsequently formed martensite. The increases in

yield and tensile strength were proportional to the degree of austenite deformation. Associated with the increase in strength was a refinement of the martensite plate size. By such processing ultimate tensile strengths as great as 465,000 psi. and yield strengths over 400,000 psi. can be achieved. 12 ref. (N8, 3-68, Q27a; ST, SGB-a)

563-N. (Russian.) Transformation in Micro-Volume of Low-Carbon Steel Containing Silicon. I. N. Bogachev and I. S. Rubel. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 189-195.

Dissolution of carbides present in transformer steels during heating up to 1150° C. Formation of carbides from the alpha-solution by diffusion processes during cooling from 1000° C. Influence of temperature on the speed of carbide formation. (N8r, 2-61; CN-g, *Si*, SGA-n)

564-N. (Russian.) Effect of Deformation on Graphitization and Black Shortness of Steel. A. A. Baranov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 214-219.

Samples of two openhearth steels were upset on a forging press at various temperatures and then heat treated to cause graphitization. Effect of forging temperatures. 4 ref. (N8s, Q26s, F22, 2-61, 3-68; ST-e)

565-N. (Russian.) Effect of Hot Rolling and Recrystallization Annealing on Structure and Properties of 08kp Steel. B. S. Natapov, G. I. Vasilenko, S. I. Ryabtsev and E. I. Panasenko. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 225-229.

Effects of final hot rolling temperature and heating velocity during annealing after cold deformation on the recrystallization process and temperature. Hardness and deep drawing properties as function of the annealing temperature. 5 ref. (N5, F23, Q29n, 1-66, 2-61, 2-64; CN-g)

566-N. (Russian.) Application of the Theory of Percussion Waves to the Computation of the Growth of Martensite Crystals. F. L. Lokshin. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 146-150.

Theory and mathematics of martensite formation. (N8p)

567-N.* Transformation Kinetics and Mechanical Properties of Uranium-0.5 W/O Columbium-0.5 W/O Molybdenum Alloy. Eugene G. Zukas, *American Society for Metals, Transactions*, Preprint no. 177, v. 52, 1959, 12 p.

Two solution treatment temperatures were used, one in the high-temperature gamma-phase field (950° C., 1740° F.) and the other in the (beta + gamma) phase field (675° C., 1245° F.). The lower solution treatment temperature was used to increase the amount of retained beta-phase. Hardness, density, metallography and X-ray diffraction were used to determine the transformation boundaries. Isothermal transformation diagrams are presented. 7 ref. (N7c, J27a, Q-general; U-b, *Cb, Mo*)

568-N. (Russian.) Effect of Magnesium on the Contact Angle Between Graphite and Liquid Cast Iron. I. E. Brainin and S. I. Shapovalov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 2, 1959, p. 74-77.

Measurement of the contact angle between a horizontal graphite plate and a specimen of molten cast iron containing various amount of Mg to elucidate the effect of Mg on the shape of graphite particles in cast iron. 7 ref. (N8s, 2-60; CI, *Mg*)

569-N.* Diffusion of Uranium-Zirconium. Y. Adda and J. Philibert. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 137-147.

The existence of a Kirkendall effect in the bcc. gamma-phase U-Zr is in agreement with recent results. Small concentrations of carbon can totally inhibit diffusion—which, at the time of sheathing the uranium, leads to a weak bond between the metal and its sheath (sheathing by drawing under pressure at 600° C.) Additions of Zr can fix the carbon present in the uranium, and "normal" diffusion does not occur. 23 ref. (N1e; U-b, *Zr*)

570-N.* The Kinetics and Crystallography of the Transformations Between the Primary Phases of Uranium and Its Dilute Alloys. B. R. Butcher and A. N. Holden. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 419-428.

The beta→alpha phase change may take place either by a normal diffusion controlled nucleation and growth reaction, or by a low-temperature mode which bears many resemblances to a martensitic phase change. The outstanding characteristic of the latter is that the growth of the

alpha-phase takes place slowly and isothermally. The gamma→alpha phase change may also take place by a diffusion-controlled nucleation and growth mechanism, and there seem to be at least three other modes of transformation. 32 ref. (N7c, M26; U-b)

571-N. (Russian.) Formation of Epsilon Martensite in the Plastic Deformation of Steel. A. P. Gulyaev and Ya. E. Sanchuk. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 181-185.

Effects of various heat treatments, removal of nitrogen by vacuum annealing and deformation temperature. 5 ref. (N8p, Q24, 2-61, 2-64, 2-60; SS)

572-N. (Russian.) Magnetic Analysis of Carbide Formation During the Annealing of Tungsten and Vanadium Steel. S. N. Krasotskaya. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 194-201.

Changes in the distribution of carbon over the alpha and Fe_3C phases and in the stability of chi-carbide, caused by variation of the tungsten or vanadium content. 6 ref. (N8r, 2-61, 2-64; AY, *W, V*)

573-N. (Russian.) Strain Hardening of Al-Zn Alloys. Yu. V. Krivusha. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 212-216.

Effects of deformation degree and composition ratio on hardness. Lattice parameter as a function of Zn concentration. 5 ref. (N7e, Q29n, M26, 2-60, 3-68; Al-b, *Zn*)

574-N. Recrystallization of Deformed Alpha-Uranium Single Crystals. L. T. Lloyd. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-6001, July 1959, 57 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

The orientation relationships between deformed alpha-uranium single crystals and recrystallized grains grown in them by annealing were expressed as rotations in degrees about axes located at various positions from the plane of the deformed orientation. Metallographic observations show that the grains grow preferentially with respect to deformation orientations. (N5, 3-68, M26c; U, 14-61)

575-N.* (German.) Effect of Additions on the Aging of Cu-Be Alloys. Hans Thomas and Ursula Wilke-Dorfurt. *Zeitschrift fur Metallkunde,* v. 50, Aug. 1959, p. 466-472.

The effect of Co, Ni, Fe, Al, Si, Cr or Mn additions to a Cu-Be alloy containing 2% Be, on aging velocity, hardness changes and the formation of a tetragonal intermediate phase. 21 ref. (N7a, J27d, M24, 2-61, 2-60; Cu-b, Be, *Co, Ni, Fe, Al, Si, Cr, Mn*)

576-N. (Russian.) Recovery of Properties After Aging. Testing of Fe-Mo and Fe-W Alloys. Van Zhun' and B. G. Livshits. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 227-232.

Samples were artificially aged after quenching and then heat treated in a bath of liquid Pb to restore the properties of the quench hardened state, and water quenched to give permanently to the degree of restoration reached. Effect of aging temperature and time and of secondary heat treatment on electrical resistivity, hardness and coercivity. 10 ref. (N7a, 2-64, P15g, Q29n, P16a; Fe-b, *Mo, W*)

577-N. (Russian.) Temperature at Which Recrystallization of Tungsten-Columbium Alloys Begins. S. S. Gorelik and B. I. Krimer. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 233-277.

The surface of samples of varying composition is subjected to deformation by grinding. X-ray analysis of recrystallization occurring during annealing. 4 ref. (N5, 2-60, 2-61; W-b, *Cb*)

578-N.* Comparisons Between Free Energies of Activation for Grain Growth, Grain-Boundary Self-Diffusion, and Liquid Self-Diffusion. E. L. Holmes and W. C. Wingard. *Canadian Journal of Physics,* v. 37, Aug. 1958, p. 899-906.

Values of free energies of activation for grain-boundary self-diffusion and liquid self-diffusion are derived for Pb, Sn, Ag, Zn and Cd. Boundary migration during normal grain growth is also derived for zone-refined Pb and Ag. (N3, N1d, P13a; Pb-a, Ag-a, Sn, Zn, Cd)

579-N.* (German.) Crystallography of Martensitic Transformations Occurring in Thin Films and Larger Volumes of Fe-N and Fe-C Alloys. Wolfgang Pitsch. *Archiv fur das Eisenhuttenwesen,* v. 30, Aug. 1959, p. 503-512.

Austenite-martensite transformation is understood as a double process of lattice distortion and twinning. 25 ref. (N8p, M26; Fe, *N, C,* 14-62)

580-N.* General Theory of Order in n-Component Alloys. K. F. Wojciechowski.

Acta Physica Polonica, v. 18, no. 2, 1959, p. 153.

Generalized Bragg-Williams methods, accounting for interaction of distant atoms. Zeroth approximation of theory provides a way of calculating transition temperature and specific heat. (N10, P12r)

581-N.* Compatibility of Beryllium With Other Metals Used in Reactors. J. D. Baird, G. A. Geach, A. G. Knapton and K. B. C. West. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 328-333.

Investigation of maximum reaction under conditions of intimate contact and in absence of oxide films. Interlayers which prevent reaction between the incompatible metals found. 16 ref. (N1h; Be)

582-N.* Radiation Effects of High-Energy Electrons in Metals. C. E. Dixon. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 475-487.

Determination of displacement energy in Cu and Ni, acceleration of the ordering process in Cu-Au alloys, acceleration of a phase transformation in a Cu-Fe alloy, increase in Young's modulus, hardness and flow stress in Cu and electrical resistivity changes in Cu at various irradiation temperatures. 30 ref. (N10, N6p, Q29n, Q21, P15g, 2-67; Cu-b, *Au, Fe*, Ni)

583-N. Reaction of Nitrogen With Niobium. William M. Albrecht and W. Douglas Goode, Jr. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1360, July 6, 1959, 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Reaction rate of Cb with nitrogen is determined gravimetrically and volumetrically from 675 to 1600° C. Diffusion coefficients and terminal solubility for nitrogen in Cb are determined from 800 to 1600° C. 21 ref. (N15, N1, P12e; Cb)

584-N.* (Rumanian.) Replacement of Malleable Cast Iron by Cast Iron Modified With Magnesium. L. Sofroni, Fr. Crisan and C. Cosneanu. *Studii si Cercetari de Metalurgie*, v. 4, no. 2, 1959, p. 139-179.

Changes of graphite shape and content and of the sulphur present in the Fe as functions of Mg content. Castability as influenced by temperature. Influence of graphitization on the cooling rate over the eutectic range; dependence of the volume of shrinkage cavities and of the graphitization temperature on the C + Si content; structural changes caused by heat treatment. 6 ref. (N8s, 2-60, E25p, 2-61, 9-67, M26, 2-64; CI-r,AD-p36, *Mg*)

585-N.* (Rumanian.) Structural Transformations of S.G. Cast Iron Caused by Heat Treatment After Deformation. Irina Cornea and Stefan Zamirca. *Studii si Cercetari de Metalurgie*, v. 4, no. 2, 1959, p. 181-187.

Influence of deformation degree and annealing temperature on ferritization. A phosphide eutectic present has a retarding effect on the decomposition of pearlite and on ferritization. Formation of two new phases—X and X'. 5 ref. (N6p, N8j, 2-64, 3-68, 2-61; CI-r)

586-N.* Gases in Cast Iron. L. W. L. Smith. *British Cast Iron Research Assoc., Bulletin and Foundry Abstracts*, v. 14, July 1959, p. 841-851.

Effects of oxygen, hydrogen and nitrogen upon solidification processes, carbide stabilization, annealing time, pinhole and blowhole defects in cast iron. (N15, N12; *O, H, N*, 9-68)

587-N.* Effect of Prior Carbide on Austenite-Martensite Transformation. H. R. Sen Gupta and S. C. Das Gupta. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 109-117.

Influence of varying amounts of carbide formed by different austenizing treatments of steels containing 6 to 15% Cr and 0.7 to 1.3% C on M_S temperature, transformation below M_S, isothermal formation of martensite and stabilization phenomenon. 7 ref. (N8p, N8r; AY, SS)

588-N.* Influence of Special Additives on the Structure and Properties of Tungsten Wire. E. I. Mozjukhin and H. N. Sinha. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 127-133.

Effect of thoria or Al-Si-K additives on recrystallization properties and hardness. Theoretical mechanism. (N5, N3m, Q29n; W, AD-p, 4-61, *Al, Si*)

589-N.* Austenite Formation in the Hypo and Hypereutectoid and Eutectoid Plain

Carbon Steels. C. Dasarathy. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 135-153.

Mode of austenitization of pearlite in a eutectoid steel and pearlite accompanied by ferrite or cementite in hypo and hypereutectoid steels. Austenite nucleation sites and growth patterns. Factors controlling solutions of ferrite, pearlite and cementite. Significance of distance between adjacent carbide particles. 29 ref. (N8f; CN)

590-N. The Strengthening of Austenitic Solid Solutions. F. Eberle, J. Hoke, E. J. Rozic and W. E. Leyda. Babcock & Wilcox Co. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131992, Apr. 1958, 70 p. $1.75.

Experiments to develop peak-strength alloys for use at 1800° F. Alloys with a Fe-Cr-Ni or a Cr-Ni base appeared to be better than those with Fe-Cr-Co, Cr-Co or Fe-Cr-Ni-Co bases. These two alloys had superior cold ductility, superior oxidation resistance at lower Cr contents in the presence of certain unfavorable strengthening elements and the ability to develop a higher strength level. The compositions 10 Fe, 20 Cr, 70 Ni and 20 Cr, 80 Co showed the highest 100-hr. rupture strength at 1800° F. (N7, Q-general; Fe-b, *Cr, Ni, Co*, 14-67)

591-N.* Phase Transformations in Carbon Steels During Heating at Increased Rates. G. T. Fomin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 54-55.

Effect of the heating rate on the ferrite-austenite transformation investigated by dilatometric measurements and the determination of magnetic properties. 7 ref. (N8f, M23b, P16e, 3-67; CN-r)

592-N.* Some Physico-Chemical Processes Occurring in Fissionable Materials Under Irradiation. S. T. Konobeevsky, K. P. Dubrovin, B. M. Levitsky, L. D. Panteleev and N. F. Pravdyuk. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 574-586.

Low-temperature thermal cycling, effect of irradiation on the width and position of X-ray diffraction lines, stress relaxation in uranium during irradiation and thermal cycling, structural changes in a uranium-9% Mo alloy given. 14 ref. (N1c, M28n, Q7j, 2-67; U-b, *Mo*)

593-N.* Crystallographic Studies of Irradiated Uranium. J. Bloch, J. P. Mustelier, P. Bussy and J. Blin. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 593-601.

Measurements of hardness and density. Recrystallization observed by heating from the alpha phase into the beta range. Hardness of uranium as a function of exposure to neutrons for very slight irradiations. 7 ref. (N5, Q29n, P10a, 2-67; U)

594-N. (Book.) Preparation of Single Crystals. Semi-Conductor Monographs. W. D. Lawson and S. Nielsen. 255 p. 1958. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y.

Techniques and apparatus for growing single crystals of semiconductive compounds. Methods for purification including zone melting, distillation, sublimation, filtration, electrodeposition, extraction and chromatography. Detection of trace impurities. Mechanism of crystal growth; origin, type and properties of lattice defects. 195 ref. (N3r, C-general; EG-j)

595-N. (Translation—AIP.) Unit Cell Determination of a Precipitation Phase From One Rotation Photograph of a Single Crystal of the Original Phase Along With Particles of the New Phase. I. A. Bagariatski. *Soviet Physics Crystallography*, v. 3, Jan. 1958, p. 8-14.

Method of determining, with only one rotating X-ray photograph, the coordinates of the reciprocal lattice points of the precipitation phase in a Ti-Cr alloy. Many orientations with respect to the original single crystal in the reciprocal lattice of a cubic crystal in the original phase are indicated. (N7b; M26; Ti-b, *Cr*)

596-N. (Translation—Brutcher no. 4715.) Ultrasonic Treatment of Metals and Alloys in the Solid State Applied to Intensify Diffusion Processes and Diffusionless Transformations. E. A. Al'ftan. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 19-24.

Intensification of the effects of various heat treatments, aging and strain hardening by ultrasonic treatment. Principles followed in the design of ultrasonic equipment. 15 ref. (N1, J-general, N7e, N6, 1-74)

597-N. (Translation—Brutcher no. 4716.) Characteristic Transformations in the High-Speed Recrystallization of Steel. G. K. L'vov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 203-205.

After cold deformation of 60% the steel was heated by high frequency at a velocity of 1500° C. per sec. and held at 650 and 850° C. through various times up to 6 sec. Effect of holding time on tensile strength, elongation and ferritic structure. (N5, Q27a, 2-64, 3-67, N8j; ST)

598-N.* Effects of Impurities on the Crystallographic Modifications of Calcium Metal. J. F. Smith and B. T. Bernstein. *Electrochemical Society, Journal*, v. 106, May 1959, p. 448-451.

Pure calcium has two allotropic modifications, f.c.c. and b.c.c., with a transition temperature of about 450° C. Nitrogen and carbon cause the appearance of a low symmetry phase; hydrogen, the appearance of a h.c.p. phase. 8 ref. (N6p, M26, 3-69; Ca)

599-N.* Use of Radio-Active Isotopes in Investigation of the Diffusion and Thermodynamic Characteristics of Solid Solutions. A. A. Zhoukhovitsky. *International Journal of Applied Radiations and Isotopes*, v. 5, May 1959, p. 159-174.

"Thick layer" and "thin layer" absorption methods to determine diffusion coefficient whereby measurements of radiation absorption are unnecessary. Impression method by means of micro-anode dissolution in Fe and Ag. (N1, P12, 1-59)

600-N.* (French.) Study of Self-Diffusion in Metals by Means of Radio-Isotopes. C. Leymonie and P. Lacombe. *International Journal of Applied Radiations and Isotopes*, v. 5, May 1959, p. 175-195.

Absorption methods depend on the radiation characteristics of the isotopes. Intergranular self-diffusion study by means of comparison of the values of concentration in the grain boundaries. Conditions for use of the sectional method. (N1d, 1-59)

601-N.* (Japanese.) Graphitization of Malleable Cast Iron Containing Titanium and Nitrogen. Yoshisada Ueda. *Japan Foundrymen's Society, Journal*, v. 31, Aug. 1959, p. 719-723.

Graphitization and nitrogen content influenced by Ti content and heat treatment. (N8s, 2-64; CI-s, *Ni, Ti*)

602-N.* Controlled-Transformation Stainless Steels. K. J. Irvine, D. T. Llewellyn and F. B. Pickering. *Iron and Steel Institute, Journal*, v. 192, July 1959, p. 218-238.

Qualities and properties of controlled transformation stainless steels, including essentials of transformation control and composition with special attention to martensite transformation range. (N8p; ST)

603-N.* The Effect of Copper on Martensite Breakdown and Hardenability of a 0.3% C Steel. A. S. Kenneford. *Iron and Steel Institute, Journal*, v. 192, July 1959, p. 215-217.

Addition of Cu to medium-carbon steel increases hardness and hardenability, raises temperature of the end of the third stage of martensite breakdown, delays softening during tempering, slightly increases volume change at alpha → gamma transformation and increases overall hardness and hardenability. (N8p, 2-60; CN-p, Cu)

604-N.* Effects of Chloride on the Orientation of Nickel Deposits. B. C. Banerjee and A. Goswami. *Electrochemical Society, Journal*, v. 106, July 1959, p. 590-592.

Chloride additions favor lateral growth and counterbalance outgrowth caused by impurities. (N12d, 3-69; Ni)

605-N. Effect of Fission Rate and Lamella Spacing Upon the Irradiation-Induced Phase Transformation of U-9 Wt.% Mo Alloy. M. L. Bleiberg. *Journal of Nuclear Materials*, v. 1, July 1959, p. 182-190.

Neutron irradiation of samples with various interlamellar spacing and different levels of U^{235} enrichment at temperatures from -90 to +200° C. Kinetics of neturon induced-phase transformation. 7 ref. (N6p, N1e, 2-67; U-b, *Mo*)

606-N.* Recovery of Electron-Irradiated Copper. Pt. 1. Close Pair Recovery. J. W. Corbett, R. B. Smith and R. M. Waltker. *Physical Review*, v. 114, June 15, 1959, p. 1452-1459.

Stage 1 recovery in Cu at low temperature is due to two processes, one—close pair recombination—is present in irradiated Cu, during the first three of five substages of stage 1. (N4, N1c, 2-63; Cu-a, 2-67, 2-63)

607-N.* Recovery of Electron-Irradiated Copper. Pt. 2. Interstitial Migration. J. W. Corbett, R. B. Smith and R. M. Walker.

Physical Review, v. 114, June 15, 1959, p. 1460-1472.

Recovery of irradiated Cu in the last two substages of stage 1 at low temperature due to diffusion of interstitial atoms. Defect activation energy; relevance of results to higher temperature recovery in Cu. (N4, N1c, 2-63; Cu-a, 2-67, 2-63)

608-N.* Observations on the Aging of Low-Carbon Sheet Steel. E. R. Morgan. *Society of Automotive Engineers, Transactions*, v. 67, 1959, p. 34-38.

Theory for yielding and aging and effect on other properties. (N7a; CN-g)

609-N. (French.) Self Diffusion of Gamma Phase in Uranium. Y. Adda and A. Kirianenko. *Journal of Nuclear Materials*, v. 1, July 1959, p. 120-126.

Diffusion couples made of natural uranium enriched with U^{234} used for studying self-diffusion of uranium at 800 to 1050° F. Self-diffusion coefficient; activation energy and frequency factor. (N1d, 2-62; U)

610-N.* (Russian.) Inhomogeneity of Martensite in 30 KhGSA Steel After High Frequency Hardening and Quenching. Ya. I. Spektor and A. P. Gracheva. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 12-17.

X-ray tests are performed to determine the inhomogeneity of carbon distribution. 4 ref. (N8p, 2-64; AY)

611-N.* (Russian.) Recrystallization Mechanism of Solid Solutions. L. P. Kurilekh. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 30-38.

Effect of composition ratio and annealing temperature on recrystallization and hardness of Fe-Ni, Fe-Mn, Fe-Si, Fe-Cr and Fe-Co alloys. 10 ref. (N5f, Q29n, 2-64, 2-60; Fe-b, *Ni, Mn, Si, Cr, Co*)

612-N.* (Russian.) Strain Hardening and Recrystallization of Vanadium Alloyed Ferrite. L. I. Mirkin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 39-41.

Samples containing 0.80-3.23% vanadium are subjected to cold deformation and subsequent vacuum heat treatment. Hardness as a function of heat treatment temperature. Changes of internal friction and the elastic module during heating. 5 ref. (N7e, N5, 2-64, Q29n, Q22, 3-68, Q21e, 1-73; Fe-b, *V*)

613-N.* (Russian.) Phase Transformations in Iron Alloys. S. A. Eliseev and B. G. Livshits. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 42-43.

Hardness, electrical resistivity and magnetic saturation of Fe-V and Fe-V-Mo and Fe-V-Al alloys after cold deformation followed by quenching from 1150° C. and annealing. Characteristics of the K-state were observed with an Fe-V-Al alloy. 7 ref. (N10a, Q29n, P15g, P16r, 3-68, 2-64; Fe-b, *V, Mo, Al*)

614-N.* (Russian.) Change of the Phase Constitution of 18-8 Steels as a Function of Deformation Degree and Temperature. A. N. Chukhleb and V. P. Martynov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 44-46.

Effect of deformation at various temperatures on martensite formation, tensile strength, yield point and elongation. (N8p, Q27a, Q23b, Q23p, 3-68, 2-61; SS)

615-N.* (Russian.) Formation of a Eutectoid With Laminar Graphite. R. P. Todorov and G. I. Koshovnik. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 47-48.

Conditions for the formation are high Si content (3.5-4.5%) of the Fe and a moderate cooling velocity, such as is obtained in dry sand molds. (N8s, 2-60, 3-67; CI, *Si*)

616-N.* Growth of Whiskers by Reduction of Halogenides. H. Wiedersich. *Electrochemical Society, Journal*, v. 106, Sept. 1959, p. 810-815.

Reduction of $FeCl_2$ and $SiCl_4$ produced whiskers. Growth of the crystals is due in part to the partial pressure of $FeCl_2$ or $SiCl_4$. (N3r; Si, Fe, 14-61)

617-N.* The Effect of Alloying Elements on the Recrystallization of a Nickel-10% Cobalt Alloy. Stephen Floreen. *Institute of Metals, Journal*, v. 87, July 1959, p. 384.

Effect of Al, Cu and Co on the recrystallization temperature. (N5, 2-60; Ni-b, *Co*)

618-N.* Solute Segregation During Ingot Solidification. W. A. Tiller. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 338-350.

Solidification theory with reference to the effects of growth conditions on mode of solidification in ingots and castings. 11 ref. (N12; 5-60, 5-59)

619-N.* Application of the Mayer Method to the Melting Problem. H. N. V. Temperley. *Physical Society, Proceedings*, v. 74, Aug. 1, 1959, p. 183-195.

Theoretical analysis of the melting of metals by means of the antiferromagnetic Ising model applied to a lattice gas having only repulsive interactions. Transition is first order. (N12n)

620-N.* (Czech.) Phase Analysis of Welded Joints. I. Hrivnak. *Zvaranie*, v. 8, Sept. 1959, p. 258-261.

Metallography and electron microscope analysis of welds of several austenitic and ferritic steels. Phase transformations were observed after long-time annealing at 800° C., and this considerably decreased the mechanical properties. The diffusion of both metals causes a critical transition layer which is unsatisfactory in the high-temperature ranges. (N-general, N1, M21e; SS-e, SS-d, 7-51)

621-N.* (Japanese.) Behavior of Carbides Due to Heat Treatment in High-Tungsten and Molybdenum High Speed Steels. Pt. 2. Study of Carbides in High Speed Steels by Electrolytic Isolation. Sadao Koshiba, Shin Kimura and Hideki Harada. *Tetsu to Hagane*, v. 45, June 1959, p. 608-614.

Determination of the total amounts of carbides in heat treated high-tungsten high speed steels and Mo high speed steels in the as-annealed states. Higher tempering temperatures resulted in a greater precipitation of carbides from the austenite. (N8r, S11; TS-m)

622-N.* (Japanese.) Metallographic Study of Nitrogen Absorption in 20% Cr-Fe Alloys. Effect of Carbon Content. Pt. 4. Function of Nitrogen as an Alloying Element in Heat Resisting Materials. Masazo Okamoto and Ohmi Miyakawa. *Tetsu to Hagane*, v. 45, June 1959, p. 614-621.

Influence of carbon content on austenite formation due to nitrogen absorption of alloys containing 0.04, 0.14 or 0.22% carbon. Behavior of the austenite as affected by heat treatment. (N8f, 2-64; Fe-b, *Cr*)

623-N. Self-Diffusion in Gamma Uranium. S. J. Rothman, L. T. Lloyd, R. Weil and A. L. Harkness. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-5971, July 1959, 38 p. (Available from U. S. Office of Technical Services, Washington 25, D.C.) $1.25.

Data are fitted by an Arrhenius-type equation and agree well with previously reported results. The value obtained is lower than that predicted by Zener's theory and the activation energy is much less than the value expected from various empirical correlations. 34 ref. (N1d; U)

624-N. Precipitation Processes in Copper-Rich Copper-Iron Alloys. A. Boltax. Nuclear Metals, Inc. *U. S. Atomic Energy Commission*, NMI-1210, Aug. 28, 1959, 44 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

On slowly cooling alloys of 3.25% Fe from 1050° C. to room temperature, two distinct stages in the precipitation process were detected. Above 850° C., a coarse fcc. precipitate is formed which transforms to bcc. form below 850° C., whereas below 850° C. the precipitation reaction involves the formation of fine fcc. coherent particles which are stable at room temperature. 35 ref. (N7b; Cu-b, *Fe*)

625-N.* (English.) Magnetic Domains in Cementite. M. Hillert and N. Lange. *Jernkontorets Annaler*, v. 143, no. 7, 1959, p. 414-425.

Cementite displays a zebra-striped pattern when examined in polarized light with crossed polars. This pattern has been observed in cementite of different origin and is independent of the mechanism of formation of the cementite. Proof of the magnetic nature of the pattern was obtained by mounting a thin specimen in the gap of an electromagnet and studying it in the microscope. One of the sets of stripes disappeared as the specimen was magnetized and returned in a new pattern when the magnetic field was again decreased. 5 ref. (N8k, P16; ST)

626-N.* (French.) Cast Iron With Finely Distributed Graphite. Jacques Pomey. *Fonderie*, no. 163, Aug. 1959, p. 357.

Phase transformations studied during the heat treatment by thermomagnetic and dilatometric measurements on Fe-C alloys, steels of various composition and white cast iron. (N8, M23b, M23a, 2-64; Fe-b, *C*, ST, CI-p)

627-N.* (Japanese.) Carbides in Tungsten High Speed Steels. Pt. 7. Tomoo Sata, Taiji Nishizawa and Kousuke Murai. *Tetsu to Hagane*, v. 45, Apr. 1959, p. 409-415.

The carbides were isolated electrolytically from two kinds of high speed steels—18-4-1 and 11-4-2—and were

studied by chemical analysis and X-ray examination. The carbides in the annealed structure are composed of M_6C, $M_{23}C_6$ and MC. By austenitizing treatment, $M_{23}C_6$ dissolves into the matrix, but part of the M_6C remains. 18 ref. (N8r; TS-m)

628-N.* (Japanese.) Aging of 16-15-6 Type Alloys. Pt. 2. Masazo Okamoto, Ryohei Tanaka, Akira Stato and Takeo Ishizuka. *Tetsu to Hagane*, v. 45, Apr. 1959, p. 423-432.

Effect of nitrogen, Ni and carbon content on aging characteristics of the low-Ni Timken 16 Cr, 15 Ni, 6 Mo (7.5 Mn) type alloys was studied by measurements of differential dilatation, hardness and microstructure. Maximum amount of nitrogen addition was limited to about 0.3%. (N7a, 2-60, Q29n; SS, *Mo*, Mn, *N*)

629-N. (Russian.) Effect of Deformation on Structure and Properties of the Heat Resisting Ni-Cr Alloy EI437. M. L. Bernshtein and Z. V. Svistunova. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 517-535.

Changes in hardness and resistivity caused by cold deformation in rolling or drawing, various cooling speeds after holding at 1080° C., and time and temperature of subsequent aging. 11 ref. (N7e, Q29n, P15g, 2-64; Ni-b, *Cr*)

630-N. (Russian.) Mechanism of Recrystallization Caused by Deformations Reaching the Critical Degree. S. S. Gorelik and M. B. Guterman. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 536-547.

Samples of Armco iron are subjected to a tensile deformation of 7.5-8% and vacuum heated up to 820° C. Recrystallization phenomena such as coalescence of adjacent grains or boundary migration are studied micrographically. 9 ref. (N5f, 2-64, 3-68; Fe)

631-N.* Neutron Irradiation Effects in a Copper-Aluminum Alloy. C. R. Houska and B. L. Averbach. *Journal of Applied Physics*, v. 30, Oct. 1959, p. 1525-1531.

Irradiated polycrystalline copper alloy with 14.5 at.% Al has a change of short-range order configuration in five neighboring shells. X-ray data are related to defect model of local radiation damage. (N10a, 2-67; Cu-b, *Al*)

632-N.* Diffuse X-Ray Scattering in Powder Patterns Arising From Displacements in Cubic Solid Solutions. C. R. Houska and B. L. Averbach. *Journal of Applied Physics*, v. 30, Oct. 1959, p. 1532-1534.

Calculation of diffuse scattering from static atomic displacement for cubic powder patterns. Excess scatter due to elastic interaction in solid solution. (N10a, M22g, 2-67; 14-67)

633-N.* Stabilization of the Martensitic Transformation in Iron-Nickel Alloys. John Woodilla, P. G. Winchell and Morris Cohen. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 849-851.

Kinetics of stabilization with respect to the isothermal component of the martensitic reaction. Although the carbon (or nitrogen) content may be very low in these alloys, it plays an important role in the stabilization phenomenon. In fact, if these interstitial elements are removed by moist-hydrogen treatment, no evidence of stabilization is found. 8 ref. (N8p; Fe-b, *Ni*)

634-N.* The Effect of Vibrations on Ordering in CuAu. H. C. Burghard, Jr., and Franz R. Brotzen. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 863-868.

Effects of 5, 10 and 15-kc. vibrations were investigated over a range of ordering temperatures of 280 to 360° C. A decrease in the rate of ordering was observed at all frequencies and ordering temperatures. 20 ref. (N10; Cu-b, *Au*)

635-N.* Strain-Hardening Exponent of Cross-Rolled Beryllium Sheet. S. R. Maloof. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 872-873.

Load-strain data after yielding and prior to necking are converted to true stress and true plastic strain, and plotted on log-log paper. The value of the strain hardening exponent of Be is not a sufficient criterion for predicting the formability of the metal. 5 ref. (N7e; Be, 4-53)

636-N.* The Effect of Radiation on the Rate of Diffusion of Arsenic Into Germanium. Norman L. Peterson and Robert E. Ogilvie. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 873-874.

Concept of the Frenkel defect and other lattice defects suggests that radiation may alter the rate of many metallurgical phenomena, especially those which are diffusion controlled. 6 ref. (N1, 2-67; *As*, Ge)

637-N.* Alpha ⇌ Beta Transformations in Titanium. S. J. Wiskel, W. V. Youdelis and J. Gordon Parr. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 875-876.

Transformation, in a sample of levitation melted iodide Ti, studied with a Leitz hot stage microscope. Structures indicate a sheer transformation beta → alpha, athermally nucleated, but capable of isothermal progression. (N6; Ti)

638-N.* The Transformation Temperature of Hafnium. D. K. Deardorff and Haruo Kato. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 876-877.

Transformation temperature to Hf from hcp. to bcc. is 1750 ± 20° C., in contrast to previously published values which are believed inaccurate. Temperatures were measured at which a sudden decrease was observed in the electrical resistance of Hf alloys continuing up to 18 at.% Zr, followed by extrapolating the temperatures to 0% Zr. 5 ref. (N6; Hf)

639-N.* (Japanese.) A Unified and Systematic Interpretation of the Formation Mechanism of Three Principal Segregations. Pt. 4. Solidification and Segregation of Larger Steel Ingots. Shinsaku Onodera and Yutaka Arakida. *Tetsu to Hagane*, v. 45, Jan. 1959, p. 16-21.

V, inverse V and negative segregations are formed as the liquid-solid interface in solidifying steel advances inwards. 13 ref. (N12; ST, 9-69)

640-N.* (Japanese.) Factors Controlling the Graphitization at Subcritical Temperature of High-Carbon Steel. Pt. 2. Study on the Graphitization of High-Carbon Steel. Naomichi Yamanaka and Kunio Kusaka. *Tetsu to Hagane*, v. 45, Jan. 1959, p. 45-51.

Effects of cold working, annealing atmosphere and other process variables. 8 ref. (N8s, 2-64, 3-68; CN-r)

641-N.* (Japanese.) Influence of Various Elements on the Graphitization of High-Carbon Steel. Pt. 2. Study of the Graphitization of High-Carbon Steel. Naomichi Yamanaka and Kunio Kusaka. *Tetsu to Hagane*, v. 45, May 1959, p. 499-506.

Si promotes graphitization after water quenching and cold drawing, while Mn has an inhibiting effect. Ti, Zr and boron promote graphitization after water quenching and accelerate graphitization after cold drawing. Vanadium restrained graphitization after cold drawing, but accelerated it after water quenching. Effects of Sn, Ni, P, Te and Sb. 8 ref. (N8s, 2-60; CN-r, Si, Mn, Sn, Sb, Te, Ni, Ti, Zr, *B*)

642-N.* (Japanese.) Carbides in High-C High-V High Speed Steels. Pt. 8. Study on Carbides in Commercial Special Steels by Electrolytic Isolation. Tomo-o Sato, Taiji Nishizawa and Kousuke Murai. *Tetsu to Hagane*, v. 45, May 1959, p. 511-516.

X-ray and chemical analyses of carbides isolated electrolytically from several high-vanadium high-speed steels and the effect of carbon, tungsten and vanadium content on the constitution of carbides in these steels. 16 ref. (N8r; TS-m)

643-N.* (Japanese.) Relation Between Magnetic and Mechanical Properties of the Transformation-Type Magnet Alloys. Pt. 1. Workability of Permanent Magnet Materials. Yasuo Kumura. *Tetsu to Hagane*, v. 45, Aug. 1959, p. 804-808.

In quench-hardening magnet steels, coercive force is proportional to square root of the volume of retained austenite and the best value of magnet is obtained when fine particles of martensite needles are distributed in the retained austenite and the ratio of martensite to austenite is 2 to 1. The magnet steels are mechanically hard in the quenched state, but are machinable in the annealed state without martensite structure. 17 ref. (N8p; ST, SGA-n)

644-N.* Iron-Alumina Materials. Arno Gatti. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 753-755.

Investigation of the system iron plus alumina. Various methods of dispersing and amounts of alumina were used. Alloys containing up to 16% alumina by weight are ductile at all temperatures tested. The iron-alumina materials have a higher yield stress and improved creep resistance over that of pure Fe. (N7; Fe, *Al*)

645-N.* A Study of the Recrystallization Kinetics and Tensile Properties of an Internally Oxidized Solid-Solution Aluminum-Silver Alloy. A. Gatti and R. L. Fullman.

Metallurgical Society of AIME, Transactions, v. 215, Oct. 1959, p. 762-769.

A very fine dispersion of Al oxide is produced by internal oxidation of solid-solution alloy of 0.14% Al in Ag. The particle size of the Al oxide is approximately 50 to 100 Å in radius. The yield strength of the alloy is increased markedly by internal oxidation. A further increase in strength is produced by cold working the internally oxidized alloy. 15 ref. (N5, R2s; Ag-b, *Al*, 14-67)

646-N.* Stabilization Phenomena in Beta-Phase Au-Cd Alloys. Howard K. Birnbaum. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 786-792.

"Normal" transformation of the beta phase (CsCl structure) to the orthorhombic beta prime (47.5 at.% Cd) and to the tetragonal beta (50.0 at.% Cd) phases occurred, after cooling from elevated temperatures at moderate rates, at about 60 and 30° C., respectively. Annealing the 47.5 at.% Cd alloy above the "normal" transformation temperature stabilized the beta phase relative to the beta prime and eventually caused transformation to the beta phase on cooling. 14 ref. (N6, 2-64; Au-b, *Cd*)

647-N.* Alloying Behavior of Ni_3Al (Gamma Prime Phase). R. W. Guard and J. H. Westbrook. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 807-814.

Influence of a number of alloying additions on structure and hardness. Three general effects are observed; solid-solution hardening, strain aging, and defect hardening arising from deviations from stoichiometry. The solid-solution hardening phenomena are complicated relative to binary terminal solid solutions due to the possibility of virtually independent substitution for the component elements and to the concomitant effects of strain aging. 27 ref. (N7, N7e, 2-60; Ni-b, *Al*, 14-67)

648-N.* Effect of Neutron Irradiation on the Martensite Transformation in Iron-Nickel Alloys. L. F. Porter and G. J. Dienes. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 854-863.

Irradiation lowers the M_s temperature of the alloy, causes changes in the electrical and magnetic properties of the high-temperature phase which indicate either an acceleration of phase separation or a clustering Ni, and enhances strain recovery on specimens partially transformed to martensite prior to irradiation. Possible mechanisms are offered to account for these effects. 21 ref. (N8p, 2-67; Fe-b, *Ni*)

649-N. (English.) Precipitation Process of Carbon in Alpha Iron. Tetsuro Suzuki and Yuzo Tomono. *Physical Society of Japan, Journal,* v. 14, May 1959, p. 597-601.

Studied by measuring the internal friction and observing the precipitates by electron microscope. 9 ref. (N7; Fe, *C*)

650-N. (French.) Relation Between the Alpha-Phase of Cold Work and the Parent Austenite in Low-Carbon 18-8 Steels. P. Bastien and R. Margerand. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, Oct. 1959, p. 463-470.

4 ref. (N8, M26c; SS)

651-N. (French.) Method for Preparation of Bicrystals of Aluminum Having Pre-Determined Orientations. C. Goux and J. Montuelle. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, Oct. 1959, p. 497-504.

(N12n, M26c; Al)

652-N. (Russian.) Mutual Penetration of Surface Layers of Metals as a Reason for Wear With Incomplete Lubrication. L. V. Elin. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 48-58.

(N1h, 18-73, Q9)

653-N. (Russian.) Aging Behavior of the Bronzes BrOF6.5-0.15 and BrOTsS4-4-2.5. A. V. Novikov and A. A. Presnyakov. *Tsvetnye Metally,* no. 6, 1959, p. 79-83.

4 ref. (N7a; Cu-s)

654-N.* The Evaporation of Various Alloys at High Temperature in Vacuo. W. A. Blonn. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 30-34.

Rates of evaporation are temperature dependent only when the pressure is less than 100 micron. Coupons of materials intended for use in vacuum furnace construction were subjected to temperatures up to 2280° F. in vacuums of 0.1-10 micron. Rates of evaporation range from 4.7×10^{-3} for 80 Ni-20 Cr to 1.2×10^{-2} grams per sq. cm. per hr. for type 430 stainless steel. (N16n, 2-61, 1-73)

655-N.* Mechanism of Evolution of Gases From Liquid Metal Under Vacuum.

A. M. Semarin and R. A. Karasev. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 35-37.

If the liquid metal is kept under sufficiently high vacuum to exclude oxidation of the metal by the oxygen in the furnace atmosphere, two sources of oxygen are left in the system: the oxygen dissolved in the metal and that contained in the refractory material of the crucible. Oxygen isotopes were used to differentiate these two sources of oxygen and to study the features of the mechanism of evolution of the oxygen dissolved in the liquid metal depending on the carbon content. (N16m, 1-73, 1-59)

656-N.* Diffusion of Aluminum, Magnesium, Silicon and Zirconium in Nickel. Herbert W. Allison and Harold Samelson. *Journal of Applied Physics*, v. 30, Sept. 1959, p. 1419-1424.

Diffusion rates of Al, Mg, Si and Zr alloyed as single additives in Ni, measured at temperatures between 800 and 970° C. as shown by weight gain caused by surface oxidation of additive. (N1; Ni, *Al, Mg, Si, Zr*)

657-N.* (German.) Carbon Separation in the Aging of Chromium and Chromium-Tungsten Steel. H. Krainer, K. Ebner and M. Storek. *Harterei-Technische Mitteilungen*, v. 14, no. 1, 1959, p. 24-50.

The carbon separation from the martensite is delayed by additives such as W and Cr. At low aging temperatures, up to 400° C.; the separation of carbides takes place while formation of the carbides is reached at temperatures above 400° C. 34 ref. (N8f, N7a, 2-60; TS, *Cr, W*)

658-N.* (Japanese.) Effect of Aluminum and Nitrogen on the Graphitization of High-Carbon Steel. Pt. 1. Graphitization of High Carbon Steel. Pt. 2. Naomichi Yamanaka and Kunio Kusaka. *Tetsu to Hagane*, v. 45, Feb. 1959, p. 110-117.

Effect of water quenching, cold drawing, air-cooling, furnace cooling, nitrogen content, Al content on graphitization. (N8s, 2-60, 2-64; CN-r, *N, Al*)

659-N.* (Japanese.) Effect of Heating Rate on Properties of Heat Treated 13% Cr Stainless Steel. Seita Sakui, Tsutomu Mori and Chiaki Yamamoto. *Tetsu to Hagane*, v. 45, Feb. 1959, p. 117-122.

Two different heating rates were applied. The effect of the varying heat treatments on recrystallization temperature, grain size and directionality. (N5, N8p, 2-64, M27c; SS)

660-N.* (Russian.) The Influence of Thermal Magnetic Aging on the Chemical Composition of Iron-Cobalt-Nickel-Aluminum Alloys. A. M. Morozova and F. E. Degina. *Fizika Metallov i Metallovedenie*, v. 7, no. 1, 1959, p. 40-47.

Influence of Al, Ni, Cu and Co in Fe Co-Ni-Al alloys, with special reference to stability. The most obvious results were produced by the cooling process. (N7a, 2-60; Fe-b, Cu, *Ni, Al, Co*)

661-N.* The Kinetics of Solution of Tungsten Carbide in Molten Cobalt. L. Skolnick. Paper from "Kinetics of High-Temperature Processes". John Wiley & Sons, Inc., New York 16, 1959, p. 92-97.

The dissolution of WC in molten Co is limited by a phase-boundary reaction. The high activation energy for this process, of 175 ± 45 k.-cal. per mole, and other indirect evidence suggest a mechanism in which an intermediate compound is formed at the boundary between solute and liquid. 16 ref. (N1; Co, W, 6-69)

662-N.* Metal-Gas Reactions. C. E. Birchenall. Paper from "Kinetics of High-Temperature Processes". John Wiley & Sons, Inc., New York 16, 1959, p. 277-281.

Reactions of solid metals with gases by means of dissolution and diffusion, formation of volatile or liquid products or of solid phases. 25 ref. (N15d)

663-N.* (Japanese.) Effects of Stress Caused by Preventing Thermal Contraction on the Amount of Retained Austenite. Pt. 1. Effects of Stress in Cooling on Austenite Stability. Iwao Hagiwara, Shogo Kanazawa and Uko Kumada. *Japan Institute of Metals, Journal*, v. 23, May 1959, p. 299-302.

Effects of thermal stress on retained austenite; tensile stress induced by preventing the thermal contraction increased linearly with decreasing temperature and indicated the maximum value at Ms temperature. (N8n, Q25p; ST)

664-N.* (Japanese.) X-Ray Study on Aging and Precipitation of Deformed Al-Ag Alloys. Mutsuo Ohta. *Japan Institute of Metals, Journal*, v. 23, May 1959, p. 303-307.

Specimens were cold rolled 50%, and then annealed at 150° C. for varying

times. The state of zones and gamma prime-precipitates were investigated by X-ray small-angle scattering photographs. Precipitation of gamma prime-phase during annealing at 150° C. begins earlier in these specimens than in the specimens cold rolled immediately after quenching. (N7, 3-68, M21f; Al-b, *Ag*)

665-N.* (Japanese.) Release of the Stored Energy of Cold Compressed Commercial Aluminum by Annealing. Genjiro Mima and Mitsugu Tokizawa. *Japan Institute of Metals, Journal*, v. 23, May 1959, p. 307-311.

Recovery and recrystallization processes of statically and dynamically cold worked metals. The total released energy under static compression is somewhat larger than that under impact compression but both increase in proportion to the degree of compression. (N5, 3-68, 2-64; Al)

666-N.* (Japanese.) Reactivity of Zinc Powder. Pt. 5. Replica Study on the Surface Structure of Caustic Electrolytic Zinc Powder (E-Zn). Yoshio Kubota. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 445-448.

Electrolyte temperature, stirring and additives affect particle shape and number of branches, thickness and layer interstices. Effect of grinding and HCl etching after electrolysis. (N12b, N12d, M20q, M20r; Zn, 6-68)

667-N.* (Japanese.) Structural Changes Produced by Aging of a Cu-Cr-Ti Alloy. Pt. 1. Precipitation of a Cu-Cr-Ti Alloy. Toshio Doi. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 477-481.

Solution treatment and aging for various times and temperatures of Ti alloys with 0.54% Cu and 3.06% Cr. Precipitate composition and crystal structure are related to aging time and temperature. 6 ref. (N7a, M26; Ti-b, *Cu, Cr*)

668-N.* (Japanese.) Precipitates of a Cu-Cr-Ti Alloy Studied by Extraction-Replica Technique. Pt. 2. Toshio Doi. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 482-485.

Ti alloy with 0.54 Cu and 3.06% Cr solution treated and aged for various times and temperatures. Identification of precipitates obtained. 7 ref. (N7; Ti-b, *Cu, Cr*)

669-N. (Czech.) Isolation of Carbides From Steel and Similar Alloys. Hanus Tuma. *Chemicke Listy*, v. 53, no. 9, 1959, p. 909-921.

55 ref. (N8r; ST)

670-N. (Dutch.) Factors Influencing the Formation of Graphite or Carbides in Cast Iron. A. Bordes. *Metalen*, v. 14, Oct. 15, 1959, p. 298-303.

(N8s, N8r; CI)

671-N. (Russian.) Effect of Preceding Phase Transformation on Diffusion in Metals. V. T. Borisov, V. M. Golikov and G. B. Shcherbedinskii. *Doklady Akademii Nauk SSSR*, v. 125, Apr. 1959, p. 786-789.

Effect of surface separation of inner grain on the diffusion rate when the polycrystal grain was crushed by a previous phase transformation. 5 ref. (N1, 3-68)

672-N. The Stability of Austenitic Stainless Steels at Low Temperatures as Determined by Magnetic Measurements. E. P. Reed and R. P. Mikesell. *Proceedings of the 1958 Cryogenic Engineering Conference*, Sept. 1958, p. 84-100.

17 ref. (N8p, 2-63; SS-e)

673-N. Continuous Evaporation of Aluminum in Vacuum. L. Holland. *Vacuum*, v. 7-8, Apr. 1959, p. 161-172.

Using a 14-mm. cube of TaC and a power input of 10 kw., an evaporation rate of 2 g. per min. is achieved. 23 ref. (N16n, 1-73; Al)

674-N. (French.) Micrographic Relationships Between the Cold Worked State of an Aluminum Single Crystal and the State of Polygonization After Annealing. Robert Daumas and Jean Montuelle. *Comptes Rendus*, v. 249, no. 16, Oct. 19, 1959, p. 1511-1513.

(N5, 2-64; Al, 14-61)

675-N. (Polish.) Theory of Introducing Alloying Components Into High Alloyed Casting Alloys. J. A. Niechendzi. *Przeglad Odlewnictwa*, v. 9, no. 2, 1959, p. 33-41.

Cooling rate, solidification time and feeding rate play a significant role in the formation of austenitic structures within the Ni-Cr-Fe matrix. (N12, N8f, J27b, 2-60; SS-e, AD-p)

676-N. (Russian.) Equilibrium Crystallization of a Solid Solution. M. V. Pikunov. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 151-158.

10 ref. (N12, 14-67)

677-N. Diffusion of Oxygen in Silicon. R. A. Logan and A. J. Peters. *Journal of*

Applied Physics, v. 30, Nov. 1959, p. 1627-1630.

Diffused layers containing oxygen convert to n-type semiconductors upon heat treatment. Relationship between donor formation and oxygen concentration. (N1, 2-64; Si, *O*)

678-N. Grain Boundary Diffusion of Zinc in Copper Measured by the Electron-Probe Microanalyzer. M. R. Achter, L. S. Birks and E. J. Brooks. *Journal of Applied Physics*, v. 30, Nov. 1959, p. 1825-1827.

Diffusion of Zn vapor at 550° C. Determination of lattice diffusion coefficient and grain boundary diffusion coefficient in Cu single crystal. (N1, 2-61; Zn, *Cu*, 14-61)

679-N. (Hungarian.) Thermodynamics of the Crystallization of Metals. Aurel Horvath. *Kohaszati Lapok*, v. 92, Oct. 1959, p. 463-466.

(N12)

680-N.* Electrical Resistivity Recovery in Cold-Worked and Electron-Irradiated Nickel. A. Sosin and J. A. Brinkman. *Acta Metallurgica*, v. 7, July 1959, p. 478-494.

Electrical resistivity recovery of 99.98% pure Ni at 25 to 600° C. Kinetics of recovery and interpretation in terms of defect migration. Similarity between recovery in Ni and in Cu. 23 ref. (N4, Q22n, P15g, 2-67, 3-68; Ni-a)

681-N.* Effect of Applied Tensile Stress on Phase Transformations in Steel. L. F. Porter and P. C. Rosenthal. *Acta Metallurgica*, v. 7, July 1959, p. 504-514.

Determination of influence of applied tensile stress on the transformation of a eutectoid carbon steel to bainite, pearlite or martensite by measurements of electrical resistance and extension during rapid quenching or isothermal transformation. Explanation of behavior in terms of dislocation theory. 23 ref. (N8h, N8m, N8p, 3-66, Q24m; CN-r)

682-N.* The Grey Tin to White Tin Transition in Tin-Mercury Alloys. R. W. Smith. *Canadian Journal of Physics*, v. 37, Oct. 1959, p. 1079-1084.

Transition temperature is -8.15 ± 0.1° C. Above this temperature Hg attacks gray Sn to form a white Sn amalgam. $HgSn_{12}$ transforms below this temperature. Structure growth on Sn-Hg alloys at -30° C. 13 ref. (N6p, M24b, 2-63; Sn-b, Hg)

683-N.* Diffusion of Radioactive Antimony in Silicon. J. J. Rohan, N. E. Pickering and J. Kennedy. *Electrochemical Society, Journal*, v. 106, Aug. 1959, p. 705-709.

Diffusion coefficients measured by radiotracer technique were higher than previously reported where a p-n junction technique was used. (N1a, 1-59; Sb, Si)

684-N.* An Unusual Grain Boundary Diffusion Effect in Impure Nickel. H. Mykura. *Philosophical Magazine*, v. 4, Aug. 1959, p. 907-911.

Formation of ridges at the grain boundaries of Ni during thermal etching is observed. The effect is attributed to the diffusion of vacancies along the grain boundaries into the specimen, caused by the formation of internal gas bubbles. 5 ref. (N1, M27f, M20q; Ni)

685-N.* Energy Dependence of Recovery in Irradiated Copper. J. W. Corbett and R. M. Walker. *Physical Review*, v. 115, July 1, 1959, p. 67-70.

Concentration of the five sub-stages of stage 1 recovery in electron-irradiated Cu as a function of energy of bombarding electrons. Effect of recoil energy distribution. (N4, 2-67; Cu-a)

686-N.* Kinetics of Vacancy Motion in High-Purity Aluminum. W. DeSorbo and D. Turnbull. *Physical Review*, v. 115, Aug. 1, 1959, p. 560-563.

Temperature dependence of recovery after quenching determined for resistivity of Al in terms of vacancy motion in the lattice. Activation energy for self-diffusion in Al calculated for mono-vacancy mechanism. Effects of impurities. (N1b, N1d, P15g, 3-69, 2-61; Al-a)

687-N. (Transiation-Brutcher no. 4634.) Conditions for the Transition of Carbon Into Solid Solution During the Induction Heating of Chromium Steel. I. N. Kidin. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 405-419.

Effects of heating temperature and rate and Cr content on the quantity of carbon found in solid solution after quenching. 5 ref. (N8p, J2g, 2-61, 3-67; AY, *C*, 14-67)

SECTION P

PHYSICAL PROPERTIES and TEST METHODS

1-P.* The Magnetization of Cobalt-Aluminum, Cobalt-Silicon, Iron-Aluminum and Iron-Silicon Alloys. D. Parsons, W. Sucksmith and J. E. Thompson. *Philosophical Magazine*, v. 3, Oct. 1958, p. 1174-1184.

Rate of change of magnetic moment with composition in several ferromagnetic Co-rich and Fe-rich alloys of these systems is derived from measurements of the variation of spontaneous magnetization with temperature. In the Fe-Al and Fe-Si alloys, the initial rate of change of moment with composition corresponds to a simple dilution of the Fe by the solute element, and increases in the range of compositions where ordering is known to exist. In the Co-Al and Co-Si alloys, the rate of change of moment with composition does not correspond to the number of valence electrons normally associated with the solute elements. 15 ref. (P16, 2-60; Co, Al, Si, Fe)

2-P.* (Japanese.) Effect of Low-Temperature Deformation on Recovery Phenomena of Aluminum-Magnesium Alloys. Jiro Wada and Masanobu Sasagawa. *Light Metals*, no. 31, July 1958, p. 13-15.

Recovery phenomena of electrical resistance and tensile stress of alloys with 2 to 6% Mg annealed at various temperatures after deformation at -196° C. Annealing of the alloys containing 4 and 6% Mg between -75 and +20° C. increased electrical resistance and tensile strength. Electrical resistance of alloys with 2% Mg decreased over the same temperature range. Annealing at -75 to +60° C. increased tensile stress of 2% alloys. 5 ref. (P15g, Q27a, 2-64, 3-68; Al, *Mg*)

3-P.* (Japanese.) Kinetics of Reaction of Commercial Pure Titanium and Titanium Alloys With O_2, N_2, and H_2. Pt. 3. Hidetake Kusamichi, Yoshiro Yagi, Toru Yukawa and Hidenori Toda. *Light Metals*, no. 31, July 1958, p. 55-59.

Wires of pure Ti alloy with 0.2% C, with 5% Al, and with 2% Al and 2% Fe were subjected to hydrogen at 1 atm. and the solubility of hydrogen was measured at elevated temperatures. Heat of dissolution of hydrogen in metal was calculated. Results compared to published data. 9 ref. (P12e, N15e, 2-62; Ti, *H, O*, N, 4-61)

4-P.* (Russian.) Magnetizing Processes in Silicon-Iron Crystals. Ia. S. Schur and V. R. Abels. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 556-563.

Under magnetic field action, complex changes occur in magnetic structure of Si-Fe crystals, which depend upon field size, appearance of initial magnetic structure and field orientation in relation to crystallographic axes. Structure changes may consist of boundary displacement, orientation changes of magnetizing region and of the type of magnetic structure. The regularity of magnetic structure changes, under field action, in Si-Fe crystals are in general for soft magnetic strip materials, especially for those having a crystalline lattice type of Fe and a sufficient large anisotropic coefficient. 4 ref. (P16; Fe, Si)

5-P. Single Crystal Anisotropy and Magnetostriction Constants of Several Ferromagnetic Alloys. R. C. Hall. Westinghouse Electric Corp. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151036, Apr. 1958, 41 p. $1.25.

Effects of radiation on magnetic materials. Anisotropy and magnetostriction

of single crystals of several soft ferromagnetic materials measured prior to irradiation. Single crystals were prepared of Fe and Ni, of binary alloys of Ni-Fe, Si-Fe, Co-Ni, Co-Fe and Al-Fe, of several ternary alloys, and of magnetite. The effect of the order-disorder reaction on these properties was measured where possible. New data presented for the Co-Ni and Co-Fe systems. Generally, ordering was found to lower anisotropy in the A_3B type of order-disorder system. On the other hand, ordering has a complicated and inconsistent effect on magnetostriction. (P16b, M24b, N10, 2-67, 3-72; Al, Co, Fe, Ni, Si, SGA-n, 14-61)

6-P. On the Interpretation of Radiation Effects in the Noble Metals. D. K. Holmes, J. W. Corbett, R. M. Walker, J. S. Koehler and Frederick Seitz. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/2385, 1958, 20 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Irradiations have been carried out at temperatures near 10° K. with fast reactor neutrons, electrons and gamma rays and deuterons. Change in electrical resistivity with bombarding flux, release of stored energy during annealing; change of lattice parameter and linear dimensions during bombardment and annealing. 7 ref. (P15g, P10d, 2-67; EG-c)

7-P. Effects of Transients and Longer-Time Anneals on Irradiated Uranium-Zirconium Alloys. William V. Johnston. Knolls Atomic Power Laboratory, U. S. Atomic Energy Commission, KAPL-1965, Oct. 3, 1958, 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Small pieces of Zircaloy-clad U-Zr alloys (7 and 8%) irradiated from 0.4 to 1.5 at. % burnup of the total core atoms were heat treated at temperatures between 510 and 980° C. for 1 sec. to 500 hr. Resulting changes in density, electrical resistivity and microstructure appear to be due to the growth of inert gas bubbles formed in the epsilon phase and to a transformation occurring in the delta phase. 5 ref. (P10a, P15g, M27, 2-64, 2-67; U, Zr)

8-P. (Dutch.) Basic Physical Concepts of Magnetic Materials. G. W. Rathenau. *Metalen*, v. 13, July 31, 1958, p. 252-257.

10 ref. (P16; SGA-n)

9-P. (Polish.) Thermodynamic Properties of Liquid Metallic Solutions. Pt. 2. The Bi-In System. Janusz Terpilowski. *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 227-237.

Tests performed with 11 alloys of 5 to 95 at. % In at 380 to 520° C. by the method of measuring electromotive forces. 23 ref. (P12, M24b; Bi, In, 14-60)

10-P. (Russian.) Stability of Unevenly Heated Electrically Conducting Liquid in a Magnetic Field. E. M. Zhukhovitskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 385-394.

Investigation of a convection movement arising in an electrically conducting liquid in presence of an outer magnetic field in a limitless vertical cylinder. 12 ref. (P16, P11j; 14-60)

11-P. (Russian.) Computation of the Basic State of a Nonmagnetic Iron With a Single Nonmagnetic Axis. A. Ts. Amatuni. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 395-399.

In a definite boundary of an outer magnetic field directed parallel to anisotropic axis in a definite correlation, the anisotropic constant fluctuates from zero magnetism to some definite end point; which means that a phase transition of the first order takes place. 7 ref. (P16, 3-72; Fe)

12-P. (Russian.) Thermodynamics of Ideal Crystals. S. K. Savvinkh. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 400-411.

General formulas for thermodynamic functions applied to equation of state and thermal capacity of crystalline A. 9 ref. (P12r; A-r)

13-P. (Russian.) Magnetic Surface Effect of a Pulsating Two-Component Field Acting on Its Field Surface. Yu. D. Sytchev. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 412-419.

Surface effect can be utilized in analyzing work of induction heaters. Pulsation is understood to mean a nonmoving sinosoidal distribution in field space. 6 ref. (P16, J2g)

14-P. (Russian.) Magnetic Properties of Magneto-Anisotropic Samples of Ferromagnetic Powders. Pt. 4. Ya. S. Schur, E. V. Schtolts and G. S. Kandawrova. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 420-425.

Structures existing in a fine powder (1-10 microns) at room temperature disappear at -190° C. and a different structure forms. This new structure is related to the decreasing anisotropic constant at a lower temperature. 9 ref. (P16; Bi, Mn, 6-68)

15-P.* Mechanical and Physical Properties of Three Low-Shrinkage, Copper-Base Casting Alloys. J. G. Kura and R. M. Lang. *American Society for Testing Materials, Proceedings*, Reprint, v. 58, 1958, 16 p.

Ultimate strength, yield strength, elongation, reduction of area, Young's modulus, compressive strength, V-notch Charpy impact strength, Brinell hardness, fatigue, machinability, shrinkage, density and specific gravity, electrical resistivity, thermal conductivity and thermal expansion of 80-10-10, 85-5-5-5 and Navy "M" alloys at various temperatures from -40 to 550° F. 5 ref. (P-general, Q-general, 2-62; Cu-b, Cu-s)

16-P.* The Electrical Conductivity and Hall Effect of Silicon. E. H. Putley and W. H. Mitchell. *Physical Society, Proceedings*, v. 72, Aug. 1, 1958, p. 193-200.

Electrical conductivity and Hall effect measured over the range 20 to 500° K. on single crystals of Si with extrinsic carrier concentrations between 2 and 5 x 10^{12} cc. 8 ref. (P15p, P15g; Si, 14-61)

17-P.* Heat Content of Zirconium and of Five Compositions of Zirconium Hydride From 0° to 900°C. Thomas B. Douglas and Andrew C. Victor. *National Bureau of Standards, Journal of Research*, v. 61, July 1958, p. 13-23.

Measurements by a precise Bunsen ice calorimeter, a "silver core" furnace and a "drop" method. At each temperature up to 550° C. the heat contents of the hydrides relative to 0° C. varied linearly with composition in accord with the phase diagram of the system. The effective heat capacity of each hydride sample reached its maximum value between 550 and 600° C., due to the endothermic formation of the high-temperature beta phase. 13 ref. (P12r; Zr)

18-P.* Magnetic Susceptibilities of Alloys of Cerium With Thorium. L. F. Bates and M. M. Newmann. *Physical Society, Proceedings*, v. 72, Sept. 1, 1958, p. 345-352.

Temperature dependence of the resistivity of 90, 60, 40, 20 and 5 at.% Ce-Th alloys is investigated over the range 90 to 293° K. Thermal expansion of the 60% alloy is also measured over this range. All the alloys exhibit a sharp decrease in susceptibility at low temperatures. 15 ref. (P16, 2-63; Ce, Th)

19-P.* Galvanomagnetic Effects in p-Type Bismuth Telluride. J. R. Drabble. *Physical Society, Proceedings*, v. 72, Sept. 1, 1958, p. 380-390.

Resistivity components, Hall coefficients and low field magneto-resistance coefficients are measured on a number of single crystal specimens of p-type bismuth telluride at 77° K. Results are used to discuss the variation of the resistivities and the Hall coefficients with temperature over the range 77 to 290° K. and, in particular, to obtain the conductivity mobility for holes for current flow parallel to the cleavage planes. 5 ref. (P15; 14-61, Bi, Te)

20-P.* Magnetothermal Resistance and Magnetothermoelectric Effects in Bismuth Telluride. A. E. Bowley, R. Delves and H. J. Goldsmid. *Physical Society, Proceedings*, v. 72, Sept. 1, 1958, p. 401-410.

Scattering laws for the charge carriers are derived from the magnetothermoelectric effect and also from the magnetothermal-resistance effect for p-type material. It has, however, not been possible to fit a simple scattering law to the results from the magnetothermal-resistance effect in n-type material. (P11, P15, P16; Bi, Te)

21-P.* Optical Properties of Evaporated Chromium Films. Robert M. Hill and Charles Weaver. *Faraday Society, Transactions*, v. 54, Oct. 1958, p. 1464-1476.

Structures of very thin, vacuum-evaporated films of Cr investigated by optical methods. The optical constants for a series of films of varying thicknesses are

calculated from reflectivity and transmission measurements and the films are found to be inhomogeneous. The changes in the optical constants with thickness are inconsistent with either the Maxwell-Garnett theory of spherical particles or with Schopper's theory of ellipsoidal aggregates. 15 ref. (P17; Cr, 14-62)

22-P.* Thermodynamics of Nonstoichiometric Nickel Tellurides. Pt. 2. Dissociation Pressures and Phase Relations of Tellurium-Rich Compositions. Edgar F. Westrum, Jr., and R. E. Machol. *Journal of Chemical Physics*, v. 29, Oct. 1958, p. 824-828.

Modifications of the manometric technique permit fine accuracies at high temperatures with corrosive substances where the pressure is sensitive to impurities or to composition changes. Results, together with data on the vapor pressure of pure Te, define the partial molal free energies and entropies of Te and, together with direct eutectic temperature measurement, delineate features of the phase diagram for compositions with more than 60 at. % Te. 8 ref. (P12; Ni, Te, 14-68)

23-P.* (Russian.) Emission Spectrum of the Electrons in Iron-Chromium Alloys. N. D. Borisov, V. V. Nemoshkalenko and A. M. Fefer. *Doklady Akademii Nauk SSSR*, v. 121, no. 2, 1958, p. 264-267.

Spectra of highly purified electrolytic iron, with 4 to 75% purified Cr and spectra of Cr alone tested from 300 to 1200° C. Conclusions on the relative position of energy band made from the measurements. (P15k; Fe, Cr)

24-P.* (Russian.) Hall Effect of Pure Nickel in the Range of Helium Temperatures. N. V. Volkenshtein, G. V. Fedorov and S. V. Vonsovski. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 35, July 1958, p. 85-88.

Hall effect studied on 99.99% Ni over a wide temperature range and down to the temperature of liquid helium. Ferromagnetic constant R_1 decreases with the falling temperature and reaches a minimum at 20-30° K. 17 ref. (P16, 2-62; Ni-a)

25-P. Gamma Phase in Uranium Alloys. R. G. Loasby. *Physical Society, Proceedings*, v. 72, Sept. 1, 1958, p. 425-428.

Resistance and magnetic susceptibility properties of two alloys based on gamma-uranium interpreted in terms of a theoretical structure derived from X-ray analysis. 6 ref. (P16, M21f; U)

26-P. Magnetic Properties of the Praseodymium and Neodymium Metals. Tsuyoshi Murao. *Progress of Theoretical Physics*, v. 20, Sept. 1958, p. 277-286.

17 ref. (P16; Pr, Nd)

27-P. Freezing Point of Zinc as a Primary Point of the International Temperature Scale. C. R. Barber and Anne Horsford. *Royal Society Proceedings*, v. 247, Sept. 16, 1958, p. 214-224.

Substitution of the Zn point for the S point as a primary fixed point of the International Temperature Scale would lead to greater precision in definition of the scale. 9 ref. (P12n; Zn)

28-P.* Thermal Conductivity and Thermoelectric Power of Germanium-Silicon Alloys. M. C. Steele and F. D. Rosi. *Journal of Applied Physics*, v. 29, Nov. 1958, p. 1517-1520.

At 300° K. for an alloy containing 56 at. % Si, the thermal conductivity was found to be six times smaller than the value for pure Ge. Solid solution alloying can significantly increase the figure of merit of thermo-electric materials. (P11h, P15g; Ge, Si)

29-P.* Electrical Properties and Thermal Expansion of the Laves Phases, $CaMg_2$ and $MgCu_2$. J. F. Smith and J. R. Ogren. *Journal of Applied Physics*, v. 29, Nov. 1958, p. 1523-1525.

Electrical resistivities, temperature coefficients of resistivity, and Hall coefficients were measured on single crystals of hexagonal $CaMg_2$ and on polycrystals of cubic $MgCu_2$. Appreciable scatter in measured resistivities on different specimens was observed, presumably due to variations in the degree of crystalline perfection. (P15, P11g; Ca, Mg, Cu, 14-61, 14-68)

30-P.* Approximate Elastic Spectrum of Beta-AuZn From Temperature Diffuse Scattering of X-Rays. Milton Schwartz and Leonard Muldawer. *Journal of Applied Physics*, v.29, Nov. 1958, p. 1561-1568.

Temperature vibration diffuse scattering of X-ray from beta Au-Zn was measured at room temperature over various regions of reciprocal space and the equal intensity contours agree qualitatively with those of other cubic materials. Analysis of the Debye temperatures of the Au and Zn atoms in the alloy shows that the root mean square atomic displacement of the lighter atoms is larger than that of the heavier atoms. (P17, P12r, Au, Zn)

31-P.* Effect of Elongation on the Electrical Resistivity of Metals. Pt. 1.. Aluminum. Pt. 2. Molybdenum. H. R. Peiffer. *Journal of Applied Physics*, v. 29, Nov. 1958, p. 1581-1584.

Changes introduced in the face-centered cubic metal Al upon elongation at 78° K., changes in body-centered cubic metal Mo at 298° K. For both metals the resistivity caused by point defects and the residual resistivity are directly proportional to the elongation. (P15g, 3-68; Al, Mo)

32-P.* Electrical Properties of Bismuth Telluride. R. Mansfield and W. Williams. *Physical Society, Proceedings*, v. 72, Nov. 1, 1958, p. 733-741.

Measurements of electrical conductivity, Hall coefficient, thermo-electric power and Nernst coefficient on specimens cut from zone melted Bi_2Te_3 and on a single crystal. The current flow was parallel to the cleavage planes and the galvanomagnetic effects of the single crystal were measured with the magnetic field perpendicular and parallel to the cleavage planes. 6 ref. (P15; Bi, Te, 14-61, 14-68)

33-P.* Magnetic Susceptibility and Electrical Resistance Properties of Some Uranium Alloys. L. F. Bates and R. G. Loasby. *Physical Society, Proceedings*, v. 72, Nov. 1, 1958, p. 757-764.

Quenched alloys of U with Zr, Cb and Mo, metals which have 4, 5 and 6 outer electrons respectively, were measured over the temperature range 90 to 300° K. General features of the three systems are the same, with anomalies at about 0.5 and 2.0 at.% of the solute. 6 ref. (P15, P16; U-b)

34-P.* Copper Nuclear Magnetic Resonance in Cu-Ni and Cu-Mn Alloys. A. C. Chapman and E. F. W. Seymour. *Physical Society, Proceedings*, v. 72, Nov. 1, 1958, p. 797-809.

Cu^{63} resonance observed in Cu-Ni alloys containing up to 9.2% Ni, at 3 and 7 megacycles per sec. in the temperature range 20 to 290° K. The resonance shows a reduction in intensity and a shift to lower frequency and substantially independent of temperature. The line width is not much greater than in pure Cu. 18 ref. (P18m; Cu, Ni, Mn)

35-P.* Some Observations on Field Emission From Mercury Whiskers. Robert Gomer. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 126-132.

Field emission from Hg whiskers was obtained by growing them in a modified field emission tube on a W substrate that was electrically connected to an external voltage source. Whiskers gave field emission patterns which could be identified from symmetry as 110 oriented (f.c.c. pseudo-system) single crystals. 8 ref. (P15K, M26; 14-61, Hg)

36-P.* (German.) Susceptibility Measurements on Heat Resistant Nickel-Chromium and Cobalt-Nickel-Chromium Alloys. Wilheim Wink and Werner Jellinghaus. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 567-573.

Variations in composition of the solid solution and appearance of new phases in Ni-Cr and Co-Ni-Cr alloys proven through susceptibility measurements. Influence of field strength, temperature, cold deformation and annealing upon the susceptibility. 7 ref. (P16n, P16p, 2-61, 2-64, 3-68, 3-71; Co, Cr, Ni, *Pd*)

37-P. Heating and Cooling of Flat Strip. Pt. 2. A. H. Vaughan. *Industrial Heating*, v. 25, Nov. 1958, p. 2216-2218, 2220, 2222, 2224, 2226.

Radiation, convection, heat content and emissivity are discussed to enable practical application of ideal heating and cooling curves. (P11, F21b; ST, 4-53)

38-P. On the Hall Effect in Bismuth. Rosemary A. Coldwell-Horsfall and D. Ter Haar. *Physica*, v. 24, Oct. 1958, p. 848-854.

18 ref. (P15p; Bi)

39-P. Exponential Experiments With Organic Moderated Uranium Lattices. W. W. Brown. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/595, 1958, 12 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Measurement of the nuclear properties of both moderator and lattices. Fuel used consists of 1-in. diameter U rods of enrichments 0.721 (natural) and 0.912 at.% U^{235}. For each enrichment, lattices of moderator to fuel volume ratios 1.5, 2.0, 3.0 and 4.0 were studied. (P18, T11g, T11h; U, 14-63)

40-P. Plutonium Recycle R in Power Reactors. P. Greebler, W. H. Harker, J. M. Harriman and E. L. Zebroski. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF. 15/P/2000, 1958, 17 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Physics model used included such effects as shifting thermal and epithermal neutron spectra and interaction of resonances of the various isotopes. Effects of partial batch cycling and special power variations. (P18, T11g; Pu, 14-63)

41-P. (German.) Behavior of Heat Conducting Alloys in Nitrogen and Gases Containing Nitrogen. Harald Pfeiffer. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 575-584.

New apparatus to determine the behavior of wire heating elements. (P11h, X10, 2-66; N)

42-P.* (German.) Hysteresis Loop of an Iron-Chromium Alloy With 24% Cr Influenced by the Temperature. Albrecht v. Kienlin. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 661-662.

At 475° C. a hysteresis loop resulted that showed irregularities typical for the Perminvar effect. (P16a; Fe, *Cr*, SGA-n)

43-P.* (German.) Thermodynamic Analysis. Calorimetry and Thermodynamics of Lead-Bismuth Alloys. Willy Oelsen and Ruth Bennewitz. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 663-672.

Peritectic reaction was found to take place at 184° C. 28 ref. (P12, N12r, Pb-b, *Bi*)

44-P.* Piezoresistance Constants of n-Type InAs. A. J. Tuzzolino. *Physical Review*, v. 112, Oct. 1, 1958, p. 30.

Piezoresistance constants as a function of temperature from 77 to 300° K. From the small magnitude found for the three constants throughout the temperature range investigated, it is concluded that results of this experiment are consistent with a spherical conduction-band model for InAs. (P15p, 2-61; In, As)

45-P.* Effects of Pressure on the Superconducting Transition Temperatures of Sn, In, Ta, Tl and Hg. L. D. Jennings and C. A. Swenson. *Physical Review*, v. 112, Oct. 1, 1958, p. 31-43.

Transition temperature data for Sn and In show considerable curvature when plotted versus pressure, but give a roughly linear relationship when plotted against volume. No curvature was found for Ta. (P15g, 3-74; Sn, In, Ta, Tl, Mg)

46-P.* Magnetic Properties of Terbium Metal. W. C. Thoburn, S. Legvold and F. H. Spedding. *Physical Review*, v. 112, Oct. 1, 1958, p. 56-58.

Magnetic measurements over the range from 4 to 375° K. Tb is found to have a paramagnetic Curie point of 237° K. Tests with fields of from 50 to 800 oe. indicate an order-to-disorder transition at approximately 230° K., which is a Néel point. (P16, 2-63; Tb)

47-P.* Magnetization Curves of Superconductive Tin Alloys. E. A. Lynton and B. Serin. *Physical Review*, v. 112, Oct. 1, 1958, p. 70-72.

An appreciable amount of magnetic flux remains inside the specimen when it first becomes completely superconducting in decreasing fields. This flux subsequently leaks or migrates out of the specimen as the field is reduced to zero. (P15g, P16; Sn-b)

48-P.* Thermal Conductivity of Selenium at Low Temperatures. G. K. White, S. B. Woods and M. T. Elford. *Physical Review*, v. 112, Oct. 1, 1958, p. 111-113.

Measurements of glassy Se and polycrystalline metallic (hexagonal) Se at temperatures from 2 to about 100° K. (P11h, 2-63; Se)

49-P.* Thermal Expansion of Some Crystals With the Diamond Structure. D. F. Gibbons. *Physical Review*, v. 112, Oct. 1, 1958, p. 136-140.

Linear coefficient of thermal expansion of Si, Ge and In antimonide measured in the range 4.2-300° K. using an interferometric method. Si and InSb have negative values at low temperatures, probably due to fourfold coordination in the lattice, covalent bonding and openness of structure. (P11g, M26q; Si, Ge, In, Sb)

50-P.* Experimental Determination of the Fermi Surface in Lead. A. V. Gold. *Royal Society of London, Philosophical Transactions*, v. 251, Nov. 6, 1958, p. 85-112.

The oscillatory variation of magnetic moment with magnetic field (de Hass-van Alphen effect) studied in Pb single crystals in the range 1.2 to 4.2° K. and at fields up to 80 KG. using an impulsive-field tech. nique. 10 ref. (P16n; Pb, 14-61)

51-P.* Spontaneous Magnetization of Nickel + Copper Alloys. S. A. Ahern, M. J. C. Martin and W. Sucksmith. *Royal Society, Proceedings*, v. 248, Nov. 11, 1958, p. 145-152.

Spontaneous magnetization of a ferromagnetic alloy may be deduced exclusively from the determination of magnetic isothermals, or in conjunction with magnetocaloric measurements. Values of a Ni-Cu alloy containing 30.73 at.% Cu were obtained near its Curie temperature using both of these techniques. 19 ref. (P16; Ni-b, Cu-b)

52-P.* Investigation of the Structural Changes Taking Place in a Uranium-Molybdenum Alloy Under the Action of Neutron Irradiation. S. T. Konobeevskii, N. F. Pravdiuk, K. P. Dubrovin, B. M. Levitskii, L. D. Panteleev and V. M. Golianov. *Soviet Journal of Atomic Energy*, v. 4, Jan. 1958, p. 33-45.

Rate of diffusion leading to homogenization under the action of irradiation in annealed specimens is inversely proportional to the square of the grain size. In a homogeneous specimen (gamma-phase) irradiation causes a change in properties and structure which rapidly (in 2-4 hr.) attains a limiting value, which is explained as being due to radiation annealing. 4 ref. (P10d, 2-67; U-b, *Mo*)

53-P.* Nucleation of Ferromagnetic Domains in Iron Whiskers. R. W. DeBlois and C. P. Bean. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 253-261.

The maximum experimentally obtained coercive force for an iron whisker of 483 oe., with a probable error judged to be about ± 10 oe., is within 15% of the value $2K_1/M_S$ = 560 oe. theoretically predicted for an ideal specimen of iron at 25° C. 13 ref. (P16c; Fe, 14-61)

54-P.* (English.) Construction and Behavior of Constituents in the Molten Slag of the Fundamental System. Rokuro Sakagami and Yukio Matsushita. *University of Tokyo, Institute of Industrial Science*, Report, v. 7, Mar. 1958, p. 180-223.

Measurements of emf. made on K_2O-SiO_2, Na_2O-SiO_2, BaO-SiO_2, CaO-SiO_2, CaO-Al_2O_3-SiO_2, CaO-MgO-Al_2O_3-SiO_2 systems. Composition voltage measured for CaO-SiO_2 and BaO-SiO_2 systems and values of activities derived. Expressions developed giving relationship between decomposition voltage emf. and the activities of CaO and SiO_2. Amphoteric behavior of Al_2O_3, MgO and TiO_2 in multiple slag systems. 43 ref. (P12b, P15, D11n, D11r; RM-q)

55-P. Effect of Increasing the Area of Iron to Zinc on the Rate of Reversal of Potential in a Zinc-Iron System. Henry L. Shuldener and Leo Lehrman. *Corrosion*, v. 14, Dec. 1958, p. 545t-552t.

For the same composition solution, reversal of potential was always faster when the ratio of Fe to Zn area was increased. 7 ref. (P15; Zn, Fe)

56-P. Ferromagnetic Resonance in Iron Whiskers. D. S. Rodbell. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 247-252.

12 ref. (P16; Fe, 14-61)

57-P. (French.) Growth Mechanism of Alpha-Uranium Exposed to Temperature Cycles. S. F. Pugh. Paper from "Symposium on Special Problems in Metallurgy," Presses Universitaires de France, Paris, France, 1958, p. 3-9.

Longitudinal growth of U bars with fine grain thought to be caused by axial dilation

and slip of crystals. 15 ref. (P10d, 2-61; U)

58-P. (Russian.) Electrochemistry of Rare Elements. S. I. Cklyarenko. *Khimicheskaya Nauk i Promyshlenost*, v. 3, no. 4, 1958, p. 455-463.

(P15; EG-b)

59-P. (Russian.) Study of Hydrogen Overvoltage on Germanium. E. A. Fimov and I. G. Erusalinchik. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 1967-1970.

(P15; Ge)

60-P. (Russian.) Electroreduction Process on Oxidized Steel. Pt. 2. Hydrogen Evolution. A. S. Afanas'ev and E. N. Chankova. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 2015-2019.

(P15; ST)

61-P. (Translation-AIP.) Lorentz Constant for Steels. R. E. Krzhizhanovskii. *Soviet Physics, Technical Physics*, v. 3, no. 1, 1957, p. 178-181.

The Lorentz constant for steels is a quantity which depends on temperature and composition so that this dependence varies from one type of steel to another. Lorentz value, as shown by two alloy steels, depends on structure of the alloy and is a function of its heat treatment. (P15g, 2-64; ST)

62-P. (Translation-AIP.) Specific Heat of Bismuth Between 0.3 and 4.4°K. *Soviet Physics JETP*, v. 34, Sept. 1958, p. 426-429.

15 ref. (P12r; Bi)

63-P. (Translation-AIP.) Structure of Superconductors. Pt. 12. Investigation of Bismuth-Rubidium Alloys. N. N. Zhuravlev, T. A. Mingazin and G. S. Zhdanov. *Soviet Physics JETP*, v. 34, Oct. 1958, p. 566-571.

Provisional melting diagram is constructed for the Bi-Rb system on the basis of thermal, microscopic and X-ray data. Four compounds were established for the Bi-Rb system: Bi_2Rb, $BiRb_3$, and two others which presumably are Bi_2Rb and $BiRb_2$. 10 ref. (P12, M24b; Bi, Rb, 14-68)

64-P. (Translation-AIP.) Structure of Superconductors. Pt. 13. Investigation of Bismuth-Cesium Alloys. N. N. Zhuravlev. *Soviet Physics JETP*, v. 34, Oct. 1958, p. 571-573.

Provisional melting diagram for the Bi-Cs system. Three compounds found were Bi_2Cs, $BiCs_3$ and $BiCs_2$. 6 ref. (P12, Bi, Ce, 14-68)

65-P. (Translation-AIP.) Temperature Anomaly in the Resistance and Hall Effect in Gold. Iu. P. Gaidukov. *Soviet Physics JETP*, v. 34, Oct. 1958, p. 577-582.

Dependence of Hall effect on temperature and magnetic field in samples of Au with normal and abnormal temperature dependence of the resistance. (P15p, 2-61; Au)

66-P. (Translation-Columbia.) Direct Observations of the Domains in a Ferromagnet by Means of a Secondary Emission Electron Microscope and an Electron Mirror. G. V. Spivak, N. G. Kanavina, I. S. Sbitnikova, I. N. Prilezhaeva, T. N. Dombrovskaia and V. K. Azovtsev. *Academy of Sciences of the USSR, Bulletin*, v. 21, 1957, p. 1169-1174.

9 ref. (P16c, M21e; SGA-n)

67-P. (Translation—Columbia.) Domain Structure of Ferromagnets at High Temperatures. J. Kaczer. *Academy of Sciences of the USSR, Bulletin*, v. 21, 1957, p. 1161-1168.

11 ref. (P16c, 2-62; SGA-n)

68-P. (Translation—Columbia.) Dynamic Behavior of the Domain Structure in Silicon-Iron Crystals. L. V. Kirenskii, V. D. Dylgerov and M. K. Savchenko. *Academy of Sciences of the USSR, Bulletin*, v. 21, 1957, p. 1157-1160.

(P16c; Si, Fe, 14-61)

69-P. (Translation—Columbia.) Low-Temperature Resistivity of Nickel Alloys and Its Variation in Magnetic Fields. E. I. Kondorskii, O. S. Galkina and L. A. Chernikova. *Academy of Sciences of the USSR, Bulletin*, v. 21, 1957, p. 1109-1115.

11 ref. (P15g, P16, 2-63; Ni-b)

70-P. (Translation—Columbia.) Resistivity and Effect of a Strong Magnetic Field on Resistivity of Iron-Nickel Alloys at Low Temperatures (14-77° K.). E. I. Kondorskii and I. E. Ozhigov. *Academy of Sciences of the USSR, Bulletin*, v. 21, 1957, p. 1116-1117.

(P15g, P16, 2-63; Fe-b, *Ni*)

71-P. (Translation—Columbia.) Role of Closure Domains in Technical Magnetization Processes. Ia. S. Shur, V. R. Abel's and V. A. Zaikova. *Academy of Sciences of the USSR, Bulletin,* v. 21, 1957, p. 1149-1156.

Behavior of Si-Fe crystals (4% Si). 8 ref. (P16c; *Si,* Fe-b)

72-P. (Translation—Columbia.) Superstructure and Temperature Dependence of Magnetic Anisotropy Energy of Nickel-Iron Alloys. I. M. Puzei. *Academy of Sciences of the USSR, Bulletin,* v. 21, 1957, p. 1083-1092.

9 ref. (P16, 2-61; Ni-b, *Fe*)

73-P. (Translation—Columbia.) Temperature Dependence of the Differential Susceptibility of Cobalt in Strong Magnetic Fields. L. Pal and T. Tarnotsi. *Academy of Sciences of the USSR, Bulletin,* v. 21, 1957, p. 1058-1065.

20 ref. (P16p, 2-61; Co)

74-P. (Translation—Columbia.) Temperature Dependence of the Magnetic Anisotropy Energy in Nickel. I. M. Puzei. *Academy of Sciences of the USSR, Bulletin,* v. 21, 1957, p. 1077-1082.

11 ref. (P16, 2-61; Ni)

75-P. (Translation—Columbia.) Temperature Dependence of Some Magnetic Properties of Nickel. L. V. Kirenskii, R. S. Nosova and N. V. Reshetnikova. *Academy of Sciences of the USSR, Bulletin,* v. 21, 1957, p. 1093-1098.

Temperature dependencies of the galvanomagnetic effect in Ni in saturation fields with different methods of demagnetization. 10 ref. (P16, 2-61; Ni)

76-P. (Translation—Columbia.) Temperature Dependence of the Magnetic Susceptibility of Nickel-Base Alloys. D. I. Volkov and V. I. Chechernikov. *Academy of Sciences of the USSR, Bulletin,* v. 21, 1957, p. 1099-1102.

7 ref. (P16p, 2-61; Ni-b)

77-P. (Translation—Con Bur.) Potentials of Copper, Antimony, Bismuth and Lead in Nitric Acid Solutions. V. V. Tenkovtsev. *Journal of Applied Chemistry of the USSR,* v. 30, 1957, p. 1161-1163.

4 ref. (P15; Cu, Sb, Bi, Pb)

78-P. Irradiation of Prototype CP-4 (EBR-I) Reactor Fuel Slugs in the CP-3' Goat Hole. S. H. Paine, P. J. Persiani and W. F. Murphy. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5855, Aug. 1958, 24 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Effect of irradiation upon small U^{235} cylinders simulating in size those designed for the initial CP-4 experimental breeder reactor (EBR) fuel loading. Exposures were performed in the graphite reflector in a biological experimental facility known as the "goat hole". Experiments were performed under different conditions of encapsulation and at different fission rates. 5 ref. (P10d, T11g, 2-67; U)

79-P. Burnup and Specific Power Calculations for the Thermal Neutron Irradiation of Thorium-Uranium Alloys. A. L. Bement. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission,* HW-56631, Jul. 14, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Variation in burnup with flux density is essentially linear for the irradiation times investigated. A marked contribution to the burnup by the U^{235} atoms exists. Terms of the burnup equation are developed with reference to the total atom percent burnup as a function of average thermal neutron flux. (P18, 2-67; Th, U)

80-P.* (Italian.) Application of Radioisotopes in Electrochemistry. *Galvanotechnica,* v. 9, Sept. 1958, p. 221-232.

"Tracers" used to clarify phenomena of electrodeposition and other little known aspects of electrochemistry such as polishing, electrolytic protection and corrosion. 36 ref. (P15, 1-59)

81-P.* (Russian.) Solubility of Carbon in Alpha Iron. E. F. Petrova, M. I. Lapshina and L. A. Schwartzman. *Doklady Akademii Nauk SSR,* v. 121, no. 6, 1958, p. 1021-1024.

Carbon concentration and solubility in ferrite in equilibrium with cementite at low temperatures and in equilibrium with gamma iron at higher temperatures. 8 ref. (P12e; C, Fe)

82-P. Preliminary Analysis of Fission-Induced Dimensional Changes in Single Crystals of Uranium. S. H. Paine and J. H. Kittel. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5676, Oct. 1958, 18 p. (Available from U. S. Office of

Technical Services, Washington 25, D. C.) $ .75.

Irradiation of true single crystals and lineage crystals of U. Following irradiation, crystals became elliptical cylinders with oblique ends, lengthening axially and shortening in the diameter corresponding with the <100> direction. Lineage crystals elongated in the <010> direction at appreciably higher rates than the single crystals. (P10d; 14-61, 2-67, U)

83-P.* (Russian.) Temperature Dependence of Coercive Force of Nickel and Iron-Nickel Alloys. E. Konoorskii and Rosenberg. *Doklady Akademii Nauk SSSR*, v. 120, no. 4, 1958, p. 753-756.

The coercive force of Ni and Fe-Ni alloys depends upon the alloy thickness. The force is increased with reduction in thickness, as shown with heat treated samples. (P16a, 2-61, 2-64; Ni-b, *Fe*)

84-P. (Japanese.) Cooling and Heating by Semiconductors. N. Makino and H. Shidara. *Metals*, v. 28, Nov. 1958, p. 866-870.

Application of Peltier effect using n-p junction as a thermo-electric element. (P15g; EG-j)

85-P.* Effect of Cooling Rate From Ms Temperature to Room Temperature on Magnetic Properties of 3.5% Chromium Magnet Steel. W. L. Hodnapp and E. A. Loria. *American Society for Metals, Transactions*, v. 52, Preprint no. 122, 14 p.

Effect of the alteration of cooling rate from 500° F. to room temperature is associated with retained austenite. The most rapid rate of cooling (water) produces the least amount of austenite, while the slowest rate (furnace) results in the greatest amount of retained austenite according to X-ray determinations. 12 ref. (P16, 2-64, N8n; ST, *Cr*, SGA-n)

86-P.* (German.) Specific Heat of Iron and Nickel. Siegfried Valentiner. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 685-688.

Values found for the range 0° C. to the curie point. 14 ref. (P12r; Fe, Ni)

87-P.* (German.) Calorimetry and Thermodynamics of Bismuth-Tin Alloys. Willy Oelsen and Karl Friedrich Golucke. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 689-698.

From calorimetric measurements performed with samples of different composition, the constitutional curve was derived. Formation of solid solutions. 17 ref. (P12, M24b; Bi, *Sn*)

88-P.* Structure and Magnetic Properties of Some Alloys of the Fe-C-Al System. N. Dzheru, P. Iliescu, A. Moroanu and E. Crucianu. *Revue de Metallurgie (Bucharest)*, v. 3, no. 2, 1958, p. 5-18.

About 50 samples were microscopically investigated. The most favorable combination of magnetic properties was obtained by tempering for 1 hr. at 350° C. The results point to the economic value of these alloys as magnetically stable material. By hardening in different media (water, oil), a martensite or austenite structure can be obtained. 5 ref. (P16, M27, 2-64; Fe, Al)

89-P.* An Adiabatic Dropping Calorimeter for Enthalpy Measurements at High Temperatures. Heat Content of Silicon From 1200 to 1550° C. M. Olette. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 18-26.

Copper-block dropping calorimeter. Data on pure Si, with curve of enthalpy versus temperature. 33 ref. (P12r, X24e; Si)

90-P.* Surface Tension of Pure Liquid Iron, Cobalt, and Nickel at 1550° C. P. P. Kozakevitch and G. Urbain. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 27-34.

Measured by the sessile-drop method. By control of the atmosphere (partial pressure of oxygen less than 10^{-15} atm.), and use of pure oxide refractories, it was possible to obtain less than 0.001% dissolved oxygen in the drop. "Capillary constant" was found. 18 ref. (P13h; Fe, Co, Ni, 14-60)

91-P.* Equilibrium of Carbon and Oxygen in Molten Iron Saturated With Carbon. Pt. 2. Effect of Silicon in the Range of 0 to 5.20%. Paper from "Physical Chemistry of Steelmaking". Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 42-45.

Effect of Si content on solubility and on activity coefficient of C in Fe. Oxygen content and activity coefficient of O_2. 7 ref. (P12d, P12b, D11h; Fe, *C, O, Si*)

92-P.* Thermic Coefficient of Resistivity of Tin in Thin Layers. Mircea Oncescu.

Revue de Physique, v. 3, no. 1, 1958, p. 71-76.

Temperature coefficient of resistivity measured at 77 and 293° K. Experimental procedures, results. 9 ref. (P15g, Sn, 14-62)

93-P.* Alpha-Particle Irradiation of Ge at 4.2° K. G. W. Gobeli. *Physical Review*, v. 112, Nov. 1, 1958, p. 732-739.

Degenerate n-type and p-type Ge samples were irradiated with polonium alpha-particles. Thermal recovery was studied up to 78° K. Experiments with various annealing procedures, using electrical resistivity as a measure, indicated that there were two distinct regions of thermal recovery, with maximum rates of change occurring near 33 and 67° K. (P15p; Ge, 2-63, 2-67)

94-P.* Fundamental Absorption Edge in Cadmium Sulfide. David Dutton. *Physical Review*, v. 112, Nov. 1, 1958, p. 785-792.

Absorption and reflection spectra of CdS in temperature range 90-340° K. as determined by photo-electric measurements on single crystals using polarized light. Equations for temperature and frequency dependence of the absorption coefficient in the edge over a substantial range of absorption magnitudes. (P17; Cd, *S*, 14-68, 14-61)

95-P.* High-Vacuum Studies on Surface Recombination Velocity for Germanium. H. H. Madden and H. E. Farnsworth. *Physical Review*, v. 112, Nov. 1, 1958, p. 793-800.

Values of mean lifetime obtained by decay-of-photoconductivity method and corresponding values of surface recombination velocity determined from geometrical considerations. The recombination velocity of clean and annealed (100) Ge surfaces was insensitive to room-temperature absorption of 0 at pressures as high as 5×10^{-8} mm. Hg. (P15g, 1-73; Ge)

96-P.* Magnetoresistance in PbS, PbSe and PbTe at 295, 77.4 and 4.2° K. Robert S. Allgaier. *Physical Review*, v. 112, Nov. 1, 1958, p. 828-836.

The longitudinal magnetoresistance was generally larger (4 to 5 times in some cases) then the transverse at both 77.4 and 4.2° K. Results did not appear to be significantly different for n-type and p-type material. Data favor a model with considerable mass anisotropy (prolate allipsoids). (P16; Pb-b, *S*, *Se*, *Te*, 14-68)

97-P.* Preparation and Electrical Properties of Mercury Telluride. T. C. Harman, M. J. Logan and H. L. Goering. *Physics and Chemistry of Solids*, v. 7, Nov. 1958, p. 228-235.

HgTe was prepared by direct reaction of Hg vapor with liquid Te. The compound was zone melted and annealed in Hg vapor under various pressures. The composition near stoichiometry was altered by the anneal Hall coefficient and resistivity as a function of temperature. 8 ref. (P15p; Hg, Te, 14-68)

98-P.* Thermodynamics of the Au-Pt System. R. J. Weiss and K. J. Tauer. *Physics and Chemistry of Solids*, v. 7, Nov. 1958, p. 249-251.

The electronic, lattice and mixing free energies are separated for the Au-Pt system and it is shown that the asymmetric segregation in this system can be ascribed to the filling of the d band at about 30% Au. 7 ref. (P12a, M24b; Au, Pt)

99-P.* Electrical Resistivity and Superconductivity of Some Uranium Alloys and Compounds. B. S. Chandrasekhar and J. K. Hulm. *Physics and Chemistry of Solids*, v. 7, Nov. 1958, p. 259-267.

A series of alpha (orthorhombic) and quenched gamma (body-centered cubic) binary alloys of U with Cb and Mo were investigated at temperatures down to 1° K. The gamma alloys are particularly unusual in possessing a negative temperature coefficient from room temperature down to the superconducting transition point. Both systems exhibit superconducting transitions, the gamma alloys in the vicinity of 2° K. and the alpha alloys closer to 1° K. 34 ref (P15g; U-b)

100-P.* Heat Capacity of Dilute Magnesium-Aluminum Alloys Below 4.2° K. John Rayne. *Physics and Chemistry of Solids*, v. 7, Nov. 1958, p. 268-274.

Resulting variation of the electronic term with solute concentration suggests that a new overlap across the Brillouin zone is initiated at an electron concentration of about 2.02. No abrupt change of the Debye temperature with solute concentration is observed. 18 ref. (P12r, 2-63; Mg-b, *Al*)

101-P.* Thermodynamics and Properties of Liquid Solutions. O. J. Kleppa. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 56-86.

Application of thermodynamic theory to study of liquid metal systems. Experimental method of deriving thermodynamic information including phase equilibrium, chemical equilibrium and calorimetric methods. Data on heat of mixing and excess entropy of various binary solutions. 35 ref. (P12, 14-60)

102-P.* Thermal Considerations in Freezing. C. M. Adams, Jr. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 187-217.

Derivation of equations for heat flow during solidification of a pure metal from a plane, from a cylindrical and from a spherical chill surface. Expressions of freezing rates and times for spheres and cylinders. Total heat removal during solidification of chill castings; effect of superheat. Equations expressing heat conduction in mold-metal systems for plain mold wall with perfect thermal contact between metal and mold. Effect of thermal contact resistance between metal and mold. Heat flow during solidification of cast alloys which freeze over wide temperature range. 21 ref. (P11, P12, N12; ST, Al-a)

103-P.* (English.) Calorimetric Measurements on the Structural Energy of an Annealed Metal of High Purity. H. U. Astrom. *Arkiv for Fysik*, v. 14, no. 3, 1958, p. 263-275.

Isothermal micro-calorimetric method applied to Ag. Increasing temperature leads to an isothermal absorption of energy, which becomes larger with increasing grain size and purity of the metal. (P12; Ag)

104-P.* (French.) Effect of Impurities of the First Long Period on the Resistivity of Copper and Aluminum. C. R. Vassel. *Physics and Chemistry of Solids*, v. 7, Oct. 1958, p. 90-93.

Residual resistivity of K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Zn, Ga, As and Se in Cu; and of Ca, Ti, Cr, Mn, Fe, Cu and Zn in Al. 14 ref. (P15g, 3-69; Cu, Al, *K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Zn, Ga, As, Se*)

105-P.* (Rumanian.) Semiconductor Properties of Resistance Alloys. T. Dulamita, D. Drimer and E. Fokt. *Studii si Cercetari de Metalurgie*, v. 3, no. 2, 1958, p. 151-160.

The resistance of Ni alloy wires was tested under a vacuum at different temperatures. A decrease in conductivity followed by an increase while the temperature is gradually raised is thought to reveal semiconductor characteristics. 6 ref. (P15g, 2-60, 2-61; Ni-b, *Cr, Cu*)

106-P. Photoconductive Response of Single Crystal Germanium Layers Prepared by the Pyrolytic Decomposition of GeI_2. Donald C. Cronemeyer. *Journal of Applied Physics*, v. 29, Dec. 1958, p. 1730-1735.

(P15g; 14-61, Ge)

107-P. Theoretical Calculation of Distribution Coefficients of Impurities in Germanium and Silicon, Heats of Solid Solution. Kurt Weiser. *Physics and Chemistry of Solids*, v. 7, Nov. 1958, p. 118-126.

The crystalline impurity was chosen as the reference state, and the change in enthalpy and entropy was estimated for the transfer of impurity atoms to the solid and the molten host substance, respectively. 16 ref. (P12; Ge, Si, 3-69)

108-P. (French.) Temperature Spectra and Their Use. Maria Bolgiu. *Revue de Metallurgie (Bucharest)*, v. 3, no. 2, 1958, p. 113-121.

Differential thermal analyses under vacuum are proposed to interpret a whole series of obscure phenomena. Certain mechanical properties of iron and steels may result not only from transformations of the crystalline lattices, but also from those caused by transformations in the energy state of the atoms. 6 ref. (P17; Fe)

109-P.* Characteristic Temperature of Silver From X-Ray Reflections. J. Boskovits, M. Roilos, A. Theodossiou and K. Alexopoulous, *Acta Crystallographica*, v. 11, Dec. 10, 1958, p. 845-847.

The integrated intensity of diffraction lines (111 and (422) from a Ag wire was measured at six different temperatures between 81 and 774° K, which were determined from the angular shift of diffraction line (422). By applying the formula of the usual Debye theory to each neighboring pair of temperatures a value was obtained for the middle of the temperature interval. (P12r, M22g; Ag)

110-P.* Influence of Method of Demagnetization on the Reversible Permeability of a High-Permeability Nickel-Iron Alloy. R. C. Jackson, E. W. Lee and A. G. H. Troughton. *British Journal of Applied Physics*, v. 9, Dec. 1958, p. 495-497.

Measurement of the reverse permeability shows that its dependence upon biasing field depends on method of demagnetization used. Results explained in terms of

residual magnetization, some specimens possessing residual magnetization even after a high-temperature anneal. 4 ref. (P16q; Ni-b, *Fe*)

111-P.* Temperature Dependence of the Characteristic Energy Loss of Electrons in Aluminum. Lewis B. Leder and L. Marton. *Physical Review*, v. 112, Oct. 15, 1958, p. 341-343.

Above room temperature the energy loss change agrees with the change expected due to decreased electron density resulting from expansion of the lattice. Below room temperature the energy loss change is much greater than expected on the above basis. 9 ref. (P12, 2-61; Al)

112-P.* Hall Effect, Magnetoresistance, and Size Effects in Copper. Ted G. Berlincourt. *Physical Review*, v. 113, Oct. 15, 1 1958, p. 381-387.

Measurements of the Hall Coefficient of several annealed polycrystalline Cu strips of resistivity ratio and thicknesses ranging from 0.05 to 1.6 mm have revealed the existence of a marked size effect at low temperature. 30 ref. (P15p, P16, 2-63, 3-73; Cu)

113-P.* (Russian.) Solubility of Magnesium, Zinc, Tin and Iron in Hydrochloric Acid. A. G. Loshkarev. *Zhurnal Prikladnoi Khimii*, v. 31, Oct. 1958, p. 1493-1497.

Solubility rate is limited to the solvent's rate of diffusion into the metal surface. Rate solubility of Zn and Fe in HCl is limited to the rate of electrolysis. (P12e, Nl; Fe, Mg, Sn)

114-P.* (Russian.) Anodic Polarization of Zinc in Sulphuric Acid. G. P. Maitak. *Zhurnal Prikladnoi Khimii*, v. 31, Oct. 1958, p. 1504-1511.

Anodic passivation and electrochemical polishing takes place. Passivation is unstable and increases with increase of acid concentration. (P15, R10c, Zn)

115-P.* Measurement of Surface Recombination Velocity of Silicon. A. H. Benny and F. D. Morten. *Physical Society, Proceedings*, v. 72, Dec. 1, 1958, p. 1007-1012.

Measurement of filaments spectral distribution of photoconductivity. Velocity is function of carrier concentration at the surface. 10 ref. (P15g; Si)

116-P.* The Change of Spontaneous Magnetization With Hydrostatic Pressure. D. Gugan. *Physical Society, Proceedings*, v. 72, Dec. 1, 1958, p. 1013-1026.

Measurements of Ni and its alloys and Co by disk permeameter producing high magnetic fields. Verifies thermodynamic relation obtained on Ni-Fe system. 24 ref. (P16, 2-74; Ni, *Fe*, Co)

117-P.* Saturation Magnetostriction of Ni Crystals at Low Temperature. W. D. Corner and F. Hutchinson. *Physical Society, Proceedings*, v. 72, Dec. 1, 1958, p. 1049-1052.

Measured at 20-500° K. by capacitance bridge method. Curves allow extrapolation to absolute zero. (P16; Ni, 2-62)

118-P. Free-Carrier Absorption in n-Type Ge. Robert Rosenberg and Melvin Lax. *Physical Review*, v. 112, Nov. 1, 1958, p. 843-852.

(P15; Ge)

119-P.* Grid Emitting Properties of Titanium. J. A. Champion. *British Journal of Applied Physics*, v. 9, Dec. 1958, p. 491-495.

Emission from thin films of Ba and Ba oxide deposited on Ti compared with similar films on W. Emission from Ti much lower than from W in the range 700-1000° C. Concludes that Ti would have good grid emission supression properties in this range. 5 ref. (P15k, Ti, Ba, 14-62)

120-P.* Influence of the Method of Demagnetization on the Reversible Permeability of a High-Permeability Nickel-Iron Alloy. R. C. Jackson, E. W. Lee and A. G. H. Troughton. *British Journal of Applied Physics*, v. 9, Dec. 1958, p. 495-497.

Measurement of the reversible permeability shows that its dependence upon biasing field depends upon the method of demagnetization used. 4 ref. (P16q; Ni-b, *Fe, Cu, Mo*)

121-P.* Magnetoresistance and Fermi Surface of Alkali Metals. F. Garcia-Moliner. *Physical Society, Proceedings*, v. 72, Dec. 1958, p. 996-1000.

Anisotropy of Fermi surface estimated by magnetoresistance effects in low fields of Na, Rb, K, Cs, Li. 14 ref. (P16; Na, Rb, K, Cs, Li, 3-72)

122-P. (Translation-AIP.) Effect of Iodine on the Electric and Photoelectric Properties of Se. D. M. Nasledov and B. V. Sokolov. *Soviet Physics, Technical Physics*, v. 3, no. 4, 1958, p. 660-668.

Small additions of I inhibit crystallization of amorphous Se and lower its activation energy. Concentrations of I greater

than 0.2% have opposite effect. 9 ref. (P15k, N12; Se, *I*, 3-69)

123-P. (Translation—AIP.) Electric and Thermoelectric Properties of AlSb. D. N. Nasledov and S. V. Slobodchikov. *Soviet Physics, Yechnical Physics*, v. 3, no. 4, 1958, p. 669-676.

Electrical conductivity, Hall effect, thermal emf. at 78-1250° K. 6 ref. (P15; Al, Sb, 14-68)

124-P. (Translation—AIP.) Retardation of Electrons in Some Metals and Semiconductors. A. Ia. Viatskin and A. F. Makhov. *Soviet Physics, Technical Physics*, v. 3, no. 4, 1958, p. 690-696.

Range of electrons, equal to film thickness; dependence of current passing through film upon incident electrons, energy for Ge, Cu, Si, Bi. 9 ref. (P15k; Ge, Cu, Si, Bi, 14-62)

125-P. (Translation—AIP.) Electric and Magnetic Properties of the System ZnSb-CdSb. I. M. Pilat, L. D. Chizh and S. Iu. Voityshen. *Soviet Physics, Technical Physics*, v. 3, no. 4, 1958, p. 734-735.

Dependence of electrical conductivity and activation energy, mobility isotherms and dependence of magnetic susceptibility and thermal emf. on composition. (P15, P16, M24c; Zn, Sb, Cd, 14-68)

126-P. (Translation—Columbia.) Changes in the Structure and Properties of Nickel Solid Solutions During Heat Treatment. B. G. Livshits. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 9, 1957, p. 1216-1222.

Measurement of resistance, expansion, hardness and saturation magnetization in Nichrome, Mo Permalloy and Invar alloyed with Mo. 6 ref. (P15, P16; 2-64, Ni-b, *Mo*)

127-P. (Translation—Columbia.) Decay of Magnetic Permeability in Silicon Iron. Iu. S. Vail'. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 9, 1957, p. 1268-1274. (P16q; Fe, *Si*)

128-P. (Translation—Columbia.) Magnetic Moments and Curie Constants of Ferromagnetic Alloys. F. M. Gal'perin. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 9, 1957, p. 1308-1311.

Properties of Fe-Cr and Fe-Ni alloys. (P16; Fe-b, *Ni, Cr*)

129-P. (Translation—Columbia.) Investigation of the Magnetic Susceptibility of Iron and Nickel-Base Solid Solutions. V. V. Parfenov. *Academy of Sciences of the USSR, Bulletin*, v. 21, (1957), p. 1312-1318. (P16n; Fe, Ni, 14-67)

130-P.* Electrical Resistivities of Some Semiconductors at High Pressures. S. D. Hamann. *Australian Journal of Chemistry*, v. 11, Nov. 1958, p. 391-398.

Resistivities of B, I, TiS_2, $TiSe_2$, ZrS_2, ZrS_3, $ZrSe_2$ and $ZrTe_3$ measured at room temperature under static pressures between 1 and 40,000 atm. In every instance the resistivity decreased with increasing pressure but the change was never great enough to render the materials metallic. 20 ref. (P15; B, I, Ti, Zr, *S, Se, Te*, 14-68)

131-P.* The Sulphides, Selenides and Tellurides of Titanium, Zirconium, Hafnium and Thorium. Pt. 2. Chemical Properties. Joy Bear and F. K. McTaggart. *Australian Journal of Chemistry*, v. 11, Nov. 1958, p. 458-470.

Reactions of the main phase of these systems include those with O, Cl, alkali metals, S and Se, acids, alkalis, oxidizing agents, alcohols, H and thermal degradation in a vacuum. A number of heats of formation are given. 20 ref. (P12, M24b; Ti, Zr, Hf, Th, *S, Se, Te*, 14-68)

132-P.* The Sulphides, Selenides and Tellurides of Titanium, Zirconium, Hafnium and Thorium. Pt. 3. Electrical Properties. F. K. McTaggart. *Australian Journal of Chemistry*, v. 11, Nov. 1958, p. 471-480.

Resistivities, types of conduction (metallic N or P semiconduction), thermoelectric power and rectifying properties of each of the phases now known to exist in the 12 systems. 4 ref. (P15, M24b; Ti, Zr, Hf, Th, *S, Se, Te*, 14-68)

133-P.* Secondary Positive Ion Emission From Metal Surfaces. Richard C. Bradley. *Journal of Applied Physics*, v. 30, Jan. 1959, p. 1-8.

Emission from surfaces of Mo, Ta and Pt under bombardment by inert gas ions of low energy in high vacuum. Ion species characteristic of the base metal, of surface compounds and of a few bulk impurities were found. Method can be applied to investigation of sputtering, surface and bulk compositions and surface kinetics. (P17d; Mo, Ta, Pt)

134-P.* (French.) Physical Properties of Gallium Monocrystals Near the Melting Point. Ch. 4. Effect of Temperature on

Electrical Resistance. Marc Erny. *Metaux-Corrosion-Industries*, v. 33, July-Aug. 1958, p. 305-323.

Resistance was measured in range of 15 to 29.75° C. Above 27° C. resistance ceases to be linear function of temperature. (To be continued.) (P15g, 2-61; Ga, 14-61)

135-P.* (Russian.) Temperature Stabilization of Magnetic Properties of Permalloy. I. M. Puzei. *Doklady Akademii Nauk SSSR*, v. 120, no. 4, 1958, p. 768-770.

First constant of anisotropy at room temperature and nitrogen temperature of -195.86 show that from 480 to 530° and higher, constants have a normal temperature dependence intrinsic to pure metals. That is, with lowering temperature the absolute value of anisotropy increases. (P16, 2-61; Ni-b)

136-P.* (Russian.) Effect of Pressure on Solubility of Hydrogen in Columbium and Tantalum. P. S. Permivov. *Doklady Akademii Nauk SSSR*, v. 121, no. 6, 1958, p. 1041-1042.

Study of Ta-H and Cb-H, in which H concentration reaches value close to atomic relation 1:1., at 620-680°. Chemically pure powder of Ta and Cb, 0.1 mm. in size, used. In both systems the increase of pressure above atmospheric leads at first to sharp rise in solubility and then a continuing slower logarithmic rise. 5 ref. (P12e; Cb, Ta, *H*)

137-P.* (Russian.) Study of Cation Adsorption on Platinum Platinate by Measuring Adsorption Potentials. A. D. Obrucheva. *Doklady Akademii Nauk SSSR*, v. 120, no. 5, 1958, p. 1072-1075.

Specific adsorption of anions of chlorine, bromine and iodine and cations of thallium on platinated Pt electrodes. (P15; Pt, Tl)

138-P.* (Russian.) Dissolution of Sheet Steel in Different Fluxes Used in Tinning. A. I. Vitkin. *Zhurnal Prikladnoi Khimii*, v. 31, Oct. 1958, p. 1607-1608.

Contamination of Sn baths by Fe caused by the penetration of Fe into the flux. (P12e, L16; ST, Sn, RM-q)

139-P.* (Russian.) Adsorption of Bromine and Iodine Ions on Platinum. N. A. Balashova. *Zhurnal Fizicheskoi Khimii*, v. 32, Oct. 1958, p. 2266-2273.

Adsorption of both ions depends upon the potential in correspondence with the charge on Pt surface, but the amount of ions adsorbed is, in all cases, above that necessary for the building up of an electrical double layer. (P15, 2-61; Pt, Br, I)

140-P.* (Russian.) Effect of Addition Agents on Electrical Properties of Gallium Arsenide. S. K. Averkieva and O. V. Emar'yarhehko. *Zhurnal Teknicheskoi Fiziki*, v. 28, no. 9, 1958, p. 1945-1947.

In group II, Zn and Cd act in GaAs as acceptors; in Group VI, S, Se, Te as donors as in other $A^{III}B^{V}$ compounds. Copper acts as acceptor; in group III-V In, Si, Ge, Sn and Sb do not form electrically active centers in GaAs. 4 ref. (P15g; Ga-b, As, EG-j, AD-q41)

141-P.* (Ukrainian.) Intensity of Magnetization of Two-Components Cermets. A. I. Raichenko and I. M. Fedorchenko. *Dopovidi Akademii Nauk Ukrain'skoi RSR*, no. 8, 1958, p. 835-837.

Estimating the intrinsic saturation induction of cermets composed of metals of complete mutual solubility. Calculation may be carried out for alloy of arbitrary average concentration and for any degree of sintering. The distribution of magnetization by concentration at the given degree of sintering. (P16, 6-70)

142-P. Crystallographic and Magnetic Properties of Several Spinels Containing Trivalent JA-1044 Manganese. D. G. Wickham and W. J. Croft. *Physics and Chemistry of Solids*, v. 7, Dec. 1958, p. 351-360.

18 ref. (P16, M26, M24c; Mn, Zn, Ge, Co)

143-P. (Russian.) Adsorption of Hydrogen Upon Nickel, Platinum, Iron, Chromium and Other Metals. N. N. Kaftaradze. *Izvestiya Akademii Nauk, SSSR*, Sept. 1958, p. 1045-1053.

(P13d; *H*, Ni, Pt, Fe, Cr)

144-P. (Russian.) Volumetric Magnetostriction of Iron-Nickel-Molybdenum Alloy. I. M. Puzei and B. V. Molotilov. *Izvestiya Akademii Nauk, SSSR, Seriya Fizicheskaya*, v. 22, no. 10, 1958, p. 1251-1253.

(P16b; Fe-b, *Ni*, *Mo*)

145-P. (Russian.) Sensitivity Dependence of Magnetostriction Collectors Upon Their Magnetic Properties. Ya. S. Shur, M. G. Lizhinskaya, and K. B. Vlasov. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya*, v. 22, no. 10, 1958, p. 1259-1262.

(P16b)

146-P. (Russian.) Determination of Solubility of Hydrogen in Magnesium and Magnesium Alloys. M. V. Sharov and V. V. Serebryakov. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1226-1228.

Apparatus for saturating of Mg with H. Results of two methods of determining the percentage of H in different Mg alloys. (P12e; *H*, Mg)

147-P. (Russian.) Effect of Plastic Deformation Upon Anomalous Behavior. Electric Resistance of Gold at Low Temperature. N. E. Alekseevskii and Yu. P. Gaidukov. *Zhurnal Experimental'noi i Teoreticheskoi Fiziki*, v. 35, Sept. 1958, p. 804-808. (P15g, 2-63, 3-68)

148-P. (Russian.) Germanium With Aluminum Additions. S. G. Kalashnikov and K. P. Tissen. *Zhurnal Tekhnicheskoi Fiziki*, v. 28, no. 9, 1958, p. 1890-1895.

Al is good alloying element for obtaining Fe with high electric conductivity and long electrode life. 15 ref. (P15g; Ge-b, Al, EG-j)

149-P. (Russian.) Electron Reflections and Secondary Electron Emissions From Metallic Surfaces in the Region of Primary Electrons With Low Energy. I. M. Bronshtein and V. V. Roshin. *Zhurnal Tekhnicheskoi Fiziki*, v. 28, Oct. 1958, p. 2200-2208. (P15k, P15n)

150-P. (Russian.) Theory of Ion-Electron Emissions From Metals. Pt. 1. S. V. Izmailov. *Zhurnal Tekhnicheskoi Fiziki*, v. 28, no. 10, 1958, p. 2209-2216. (P15k)

151-P.* The Electrical Resistance of Oxide Films on Zirconium in Relation to Corrosion. R. D. Misch and F. H. Gunzel, Jr. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 15-20.

Conductivity of anodic and corrosion films of Zr increased during heating in vacuum. Changes in conductivity were attributed to the diffusion of anion vacancies into the oxide. Corrosion films produced in water at 350° C. appeared to have higher coefficients. Zircaloy-1 and Zircaloy-2 had the highest corrosion rates and diffusivities, as judged by the conductivity changes. 14 ref. (P15g, R-general; Zr-b)

152-P.* Magnetic and Electrical Anisotropies of Iron Sulfide Single Crystals. Eiji Hirahara and Miuki Murakami. *Physics and Chemistry of Solids*, v. 7, Dec. 1958, p. 281-289.

Direction of the antiferromagnetic spins is parallel c-axis of the crystal below T_{alpha} (temperature of alpha-transformation) and perpendicular to the c-axis above T_{alpha}. Behavior of the spin orientation in the temperature range between T_{alpha} and Tn (the Neel temperature) clarified. 23 ref. (P15, P16, 3-72; Fe, S, 14-61)

153-P.* (German.) Vapor-Pressure of the Compounds InAs, GaAs, InP and GaP. O. G. Folberth. *Physics and Chemistry of Solids*, v. 7, Dec. 1958, p. 295-300.

Method consists of freezing melt in equilibrium with vapor phase. Vapor-pressure calculated from the amount of high-volatility component in the vapor phase during freezing process. 18 ref. (P12c; In, Ga, As, P, 14-68)

154-P.* Neutron-Irradiation Effects on Copper-Aluminum Alloys. M. S. Wechsler and R. H. Kernohan. *Physics and Chemistry of Solids*, v. 7, Dec. 1958, p. 307-326.

Solid-state reaction that causes a decrease in electrical resistivity is accelerated by irradiation at 32-45° C. Effect is absent in pure Cu and increases with Al content. When conducted at -120° C. no decrease in resistivity is observed. 44 ref. (P15q, 2-67; Cu-b, *Al*)

155-P.* (Russian.) Magnetic Structure and Processes of Magnetization of Magnetites. Ya. Shur. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya*, v. 22, no. 10, 1958, p. 1177-1180.

Magnetic properties of iron magnetites regularly change with their magnetic structures. As the size of the magnetite (Fe_3O_4) is decreased, the form of its magnetic structure is simplified and magnetization process becomes more difficult. (P16; Fe, O)

156-P.* (Russian.) Magnetostriction of Nickel-Iron-Molybdenum Alloy. I. M. Pyzei and B. V. Molotilov. *Izvestiya Akademii Nauk, SSSR, Seriya Fizicheskaya*, v. 22, no. 10, 1958, p. 1244-1250.

Temperature relation of magnetostriction saturation of polycrystalline alloys at various hardening and annealing temperatures. (P16b, 2-60, 2-64; Ni-b, Fe, Mo)

157-P.* (Russian.) Magnetostriction Properties of Binary Alloys. G. P. D'yakov.

Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, v. 22, no. 10, 1958, p. 1254-1258.

Study of magnetostriction constants and characteristics of magnetostriction in monocrystal system Fe-Ni. (P16b; Fe-b, *Ni*)

158-P.* (Russian.) Anisotropy of Coercive Force in Magneto-Anisotropical Samples Made From Fine Powders. E. B. Shtol'ts, Ya. S. Shur and G. S. Kandayrova. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1269-1272.

Coercive force of magneto-monoaxial powders of the following: Co, Mn-Bi, magnetite and gamma oxide of iron. With change of particle size there is no change in the properties of the coercive force. Anisotropy of coercive force in magneto-anisotropical iron-magnetites is indicative as to type of magnetic structure. (P16; Co, Mn-b, *Bi,* Fe, *O,* 6-68)

159-P.* (Russian.) Rate of Dissolution and Zinc Amalgam in Hydrochloric Acid. S. A. Nikolaeva. *Zhurnal Fizicheskoi Khimii,* v. 32, Oct. 1958, p. 2257-2261.

Stirring affects both dissolution and steady state potential of the amalgam. Addition of $ZnCl_2$ shifted the potential to the positive, lowering the dissolution rate; addition of KCl lead to the negative shift, increasing the rate. (P12e; Zn-b, *Hg*)

160-P.* (Russian.) Effect of the Components of an Oxide Melt on Its Interfacial Tension With Iron. S. I. Popel. *Zhurnal Fizicheskoi Khimii,* v. 32, Oct. 1958, p. 2398-2402.

In case of $CaO-SiO_2-Al_2O_3$ melts, tension is high and slightly increases on substituting SiO_2 for calcium and aluminum oxides. Enrichment of the oxide phase in ferrous oxide is accompanied by a large decrease in the interfacial tension. (P13h, D11n)

161-P.* (Russian.) Cathodic Polarization in Slag Containing Titanium. V. I. Musikhin and O. A. Esin. *Zhurnal Fizicheskoi Khimii,* v. 32, Oct. 1958, p. 2410-2414.

Polarization accompanying the complete and partial reduction of Ti ions in melts of $CaO-MgO-Al_2O_3-B_2O_3-TiO_2$. (P17g, N1, 2-60, 2-61; Fe, Ti, RM-q)

162-P.* (Russian.) Activation Energy of Various Processes in Solid Metals. K. A. Osipov. *Doklady Akademii Nauk SSSR,* v. 121, no. 4, 1958, p. 637-639.

Activation energy in self-diffusion, crystal growth and recrystallization, plastic deformation, failure and dislocation shifts. (P13a)

163-P.* (Russian.) Determination of Surface Tension in Iron Group. V. N. Eremenko, Yu. N, Ivashchenko, V. I. Nizhenko and V. V. Fesenko. *Izvestiya Akademii Nauk SSSR,* July 1958, p. 144-146.

Ni tested at 1520-1470°; Co at 1500-1520° and Fe at 1650°. (P13h; Co, Fe, Ni)

164-P.* (Russian.) Magnetic Structure Changes in Silicon Iron Crystals Under Elastic Stress. V. A. Azikova and Ya. S. Shur. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1185-1189.

Changes consist of replaced boundaries, change in type of magnetic structure, change in form of magnetic structure. Changes are irreversible. (P16, 3-66; Fe-b, Si)

165-P.* (Russian.) Magnetic Structures of Residual Magnetized Magnetite and Changes During Demagnetization With Alternating Pole. I. E. Startseva and Ya. S. Shur. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1189-1193.

Form of magnetic structure in state of residual magnetization depends upon crystallographic surface orientation and pole orientation of preliminary magnetized sample in relation to crystallographic axis. (P16; Fe, O, RM-q)

166-P.* (Russian.) Stabilizing Temperature of Magnetic Properties in Alloys. I. M. Puzei. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1194-1199.

In some temperature ranges there is detected a reversed process in the constant of the anisotropic system Fe-Co-Ni. (P16, 2-61; Fe-b, *Co, Ni*)

167-P.* (Russian.) Effect of Thermomagnetic Treatment of Magnetically Weak Magnetite. A. I. Glaser and Ya. S. Shur. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1205-1211.

Electromagnetic effect of temperature relation in saturated magnetization. Kinetics of thermodynamic treatment of alloys. (P16; Fe, O, RM-q)

168-P.* (Russian.) Investigation of Kinetics in Determining Magnetic Structure of 65% Permalloy. SH. I. Zusman. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1212-1216.

Kinetic changes of magnetic properties during low-temperature treatment; relationship between processes bringing about formation of rectangular and deformed hysteresis loops. (P16a; Ni-b, *Fe*)

169-P.* (Russian.) Determining Concentration Distributions of Powdered Alloys. A. I. Raichenko. *Ukrainskii Phizichenii Zhurnal Akademii Nauk, Ukrainskii RSR*, v. 3, no. 3, 1958, p. 407-417.

Concentration distribution functions in powdered alloy, prepared from two metals with unrestricted mutual solubility at various degree of mutual diffusion in a solid state. Study of Co-Ni powders at various rates of sintering showed a non-ideal blending and porosity leading to retardation of the homogenation process, contrary to theoretical expectations. (P12e, H15; Co, Ni)

170-P.* (Ukrainian.) Magnetic Susceptibility of Solid Solutions of Some Metal-Like Compounds. G. V. Samsonov, V. S. Neshor and N. S. Strel'nikova. *Dopovidi Akademii Nauk Ukrain'skoi RSR*, no. 8, 1958, p. 838-840.

Magnetic susceptibility of solid solutions CbC-ZrC, AgC-CbC, TaB_2-ZnB_2 and Ti, C-T and N. (P16; C, B, N, Cb, Ag, Ta, Ti, Zn, Zr, 14-67)

171-P.* (Ukrainian.) Viscosity of a Tin-Bismuth System. A. Z. Golik, N. A. Runoich and S. A. Babenko. *Ukrainskii Phizichnii Zhurnal Akademii Nauk, Ukrainskoi RSR*, v. 3, no. 3, 1958, p. 365-369.

Coefficient of dynamic viscosity investigated for solutions containing 25, 42 and 69% by weight of Sn in Bi, at a temperature ranging from melting point to 350° C. (P10f; Bi-a, *Sn*)

172-P.* Exchange Between Metals and Their Ions in Solution. Cecil V. King and Nancy E. McKinney. *Canadian Journal of Chemistry*, v. 37, 1959, p. 205-212.

Mechanisms by which a metal specimen can acquire radioactivity when immersed in a tracer solution of its own ions. Influence of exchange current, adsorption, local cell electrolysis, corrosion and self-diffusion within the metal. 14 ref. (P15, N1, 1-59; Ag)

173-P.* Cathodic Polarization of Silver in Sulphuric Acid. A. A. Antoniou and F. E. W. Wetmore. *Canadian Journal of Chemistry*, v. 37, 1959, p. 222-227.

H overpotential on fine Ag cathodes determined from 2 to 35°. Two distinct Tafel slopes were observed. A rise exists in the low current slope as the electrode is worked and this change may be related to the surface condition. 5 ref. (P15; Ag)

174-P.* Effects of Certain Chemical Treatments and Ambient Atmospheres on Surface Properties of Silicon. T. M. Buck and F. S. McKim. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 709-722.

Measurements of surface conductance, recombination velocity and field effect on n and p-type Si specimens. Low recombination velocity occurred when the surface was strongly p-type, after treatments in boiling de-ionized water and sodium dichromate solution, or when the surface was strongly n-type, after treatment in concentrated hydrofluoric acid. Chemical treatments have stronger effects than atmosphere in determining surface potential. 21 ref. (P15g; Si)

175-P.* Some Semiconducting Properties of HgTe. J. Black, A. M. Ku and M. T. Minden. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 723-728.

HgTe synthesized and single crystals prepared both in horizontal capsule and by the Bridgman technique. Hall coefficient and resistivity measured as a function of temperature and magnetic field. HgTe has high carrier mobilities characteristic of low energy gap compared semiconductors. All HgTe synthesized was p-type. 12 ref. (P15g; Hg, Te, 14-68, 14-61)

176-P.* Electron Mobility in InP. M. Glisksman and K. Weiser. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 728-731.

Hall mobility of electrons in InP observed as a function of temperature and carrier concentration. Electrons in InP have a small effective mass, while the lowest conduction band is spherically symmetric. 12 ref. (P15; In, P, NM-a37, 14-61)

177-P.* Vapor Pressure of Niobium. Rudolph Speiser, P. Blackburn and H. L. Johnston. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 52-53.

Langmuir method used with an accomodation coefficient of unity assumed. Measurements of rate at which a Cb surface sublimed into a high vacuum. Equation for the heat of sublimation at absolute zero. (P12c; Cb)

178-P.* (Russian.) Temperature Dependence of Magnetic Properties in Highly Coercive Alloys. I. A. Baranova and Ya. S. Shur. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya,* v. 22, no. 10, 1958, p. 1273-1275.

Temperature effect on basic magnetic characteristics of magneto-anisotropic highly coercive alloys-Alnico and Vicalloy. (P16, 2-61; Fe, Co, SGA-n)

179-P.* (French.) Geometric Study of Adsorption on Some Crystallographic Faces. Interpretation of the Two Adsorptions of Hydrogen on Bare Metal Surfaces. J. C. P. Mignolet. *Sociétés Chimiques Belges, Bulletin,* July-Aug. 1958, p. 358-372.

It is suggested that on base metal surfaces H atoms are adsorbed over deepest regions of periodic surface (sites b or d). Negative adsorption is adsorption of one H atom per metal atom. For some faces there are two sites per metal atom. A second H atom may then be adsorbed, but it inevitably interacts with pre-absorbed neighbors. This interaction involves partial lateral bonding between H atoms, together with a loosening of ions holding pre-adsorbed atoms to the surface. Application of these ideas in field of adsorption and catalysis briefly analyzed. 17 ref. (P13d, P13c, *H*)

180-P.* (Russian.) Clarification of Transverse Electric Thermomagnetic Phenomenon in Ferromagnetics by Means of Metal Exchange Force Data. N. P. Patrakhin. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 15-22.

A mathematical attempt to explain Nernst's thermomagnetic phenomenon on the basis of (s - d) exchange force lattice in ferromagnetic metals. 6 ref. (P16; SGA-n)

181-P.* (Russian.) Some Problems in the Theory of Semiconductors With Narrow Zones of Admixture. V. M. Nitzovich. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 23-39.

The properties of electron gases in narrow zones of admixture and those of semiconductors with narrow zones of admixture are examined. By calculating chemical potentials the limit of application for the method of effective determination is established. The density of distribution in cubic and body-centered lattices is calculated and a method is derived for calculating the dependence of conductivity on temperature in zones of various degrees of admixture. 14 ref. (P15g; EG-j)

182-P.* (Russian.) Influence of Scale on Magnetic Properties of Hot Rolled Transformer Steels. V. V. Druzhinin and L. K. Kurennikh. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 40-45.

Scale deteriorates magnetic properties of transformer steels by lowering their permeability and by increasing specific losses. Decrease in total loss of 10,000 gauss due to pickling by means of induction does not appear to be significant, but decrease of 15,000 gauss does. Lowering of specific loss is at the expense of those caused by hysterisis and eddy currents. Decrease of losses by hysterisis resulting from pickling is not due to decrease in coercive forces, but to decrease of maximum magnetizing pole. 6 ref. (P16, 9-62; ST, SGA-n)

183-P.* (Russian.) Magnetic Properties of Manganese-Bismuth Permanent Magnets. A. B. Al'tman. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 46-51.

Simplified method of preparing Mn-Bi permanent magnets by powder metallurgy. The maximum magnetic energy developed is 150,000 ergs per sq. cm. However, irreversible dip in magnetic properties below room temperature limits their broad industrial application. Further research may lower their temperature coefficient to make them as effective at lower temperature as at 20° C. 13 ref. (P16, H-general, 2-61; Mn-b, *Bi,* SGA-n)

184-P.* (Russian.) Electromagnetic Effect in Platinum at Low Temperatures. E. S. Borovik and V. G. Volotskaya. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 60-66.

Dependence of resistance on temperature was investigated from 4.2 to 20° and divergence from Matissen's rule indicated. Hall effect studied in fields up to 27,000 oersteds. Results used to calculate electron movement and concentration in Pt which showed less tendency to order than those of nontransition metals. 13 ref. (P16, 2-63; Pt)

185-P.* (Russian.) Investigation of Physical Properties of Chromium-Germanium Alloys. Pt. 1. I. G. Fakidov and N. P. Grazhdankina. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 67-73.

Series of ferromagnetic Cr-Ge alloys with Curie temperature at 98°. Specific electric resistance, temperature coefficient and change of resistance in magnetic field investigated from 50 to 98 atm. Ferromagnetism of these alloys is conditioned by

a magnetic phase of $CrGe_3$ 8 ref. (P16, P15; Ge-b, *Cr*)

186-P.* (Russian.) Cold Rolled Transformer Steel. A. I. Belyakov, A. A. Nefedov and M. S. Simakova. *Stal'*, Dec. 1958, p. 1128-1129.

Cold rolled steel, 1 mm. thick, with 3% Si, after annealing at 850° is isotropic with sufficiently good electric and magnetic properties. After annealing at 1150° the steel is characterized by considerable anisotropy, because of a recrystallization texture. After final annealing the steel possesses durability and good ductility. (P15, P16, Q-general; ST, *Si*, SGA-n)

187-P. (Russian.) Potential of Titanium in Chlorine Solutions. M. V. Smirnov, L. E. Ivanovski and N. A. Loginov. *Doklady Akademii Nauk SSSR*, v. 121, no. 4, 1958, p. 685-688.

(P15, R6g; Ti)

188-P.* A Bitter Figure Examination of Some Polycrystalline Nickel-Cobalt Alloys. L. F. Bates and E. D. Isaac. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 14-16.

Wall movements; the field limits agree with heat changes accompanying magnetization processes. 4 ref. (P16c; Ni, *Co*)

189-P.* Eddy Current Losses in 65/35 Nickel Iron. E. W. Lee, A. G. H. Troughton and D. R. Callaby. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 133-136.

Loss ratio in relation to thickness of domain walls. 5 ref. (P16s, P16c; Ni-b, Fe)

190-P.* Contraction in a Welded Propeller Shaft. D. Birchon. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 17-21.

Contraction of 1.25 in. observed along a propeller shaft following reinforcement by welding. Effect was due to the combination of high heat input and low wall thickness. Stresses at the outer surface were compressive rather than tensile as normally observed in weld reinforcement of this type. 5 ref. (P10d, T22h, 3-66, 7-51)

191-P.* Gold in Silicon. G. Bems and J. D. Struthers. *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 588-591.

Heat treatment of Si, both p-type and n-type, to temperatures in excess of 900° C. frequently results in a decrease of lifetime and is sometimes accompanied by an increase in resistivity. Au concentrations introduced during heat treatment are sufficient to account for changes in electrical characteristics. 9 ref. (P15, 2-64, N1; Si, *Au*)

192-P.* Technique for Preserving Lifetime in Diffused Silicon. S. J. Silverman and J. B. Singleton. *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 591-594.

A metal-Si liquid phase established on the Si surface getters recombination centers from within the bulk of the material, thereby preserving the lifetime. Comparative results are given for Ni, Ag, and Bi. 16 ref. (P15, N1, Si, *Ni, Ag, Bi*)

193-P. Effect of Temperature on the Magnetic Properties of Nickel-Iron Alloys. J. J. Clark and J. F. Fritz. Westinghouse Electric Corp. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131799, Dec. 1957, 36 p. $1.

Normal permeability of Hipernik, Mo-Permalloy, Supermalloy, and Hymu 80 alloys is relatively independent of temperature at one induction—6 kilogausses for the Hipernik alloy and between 4.5 and 5.5 kilogausses for Mo-Permalloy, Supermalloy, and Hymu 80 alloys. (P16, 2-61; Ni-b)

194-P. Energy Loss Processes in Ferro-Electric Ceramics. B. Lewis. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 17-24.

By study of aging effects of barium titanates process identified as microhysteresis associated with small amplitude domain boundary movement. 8 ref. (P15, P16c, P16a, 2-65; Ba, *Ti, Ni, Zr*, NM-a)

195-P. Complete Absorption of Light by Thin Metal Films. T. Turbadar. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 40-44.

4 ref. (P17c; Al, 14-62)

196-P. Thermoelectric Measurements on Natural Galena at Low Temperatures. D. M. Finlayson and D. Greig. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 49-53.

11 ref. (P11, 1-67; Pb, *S*, NM-a37)

197-P. The Gamma-Neutron and Gamma-2 Neutron Reactions in ^{141}Pr. J. H. Carver and W. Turchinetz. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 110-112.

11 ref. (P18k, P18h; Pr)

198-P. Mechanism of Anodic Evolution of Oxygen on Platinum Electrode. Pt. 1. In Dilute Sulphuric Acid. Chu Yung-chao, Shu Tsen-yen, Huang Tzy-bao and Lin Tzao-chin. *Science Record*, v. 2, Nov. 1958, p. 373-383.
24 ref. (P15; Pt)

199-P. Mechanism of Anodic Evolution of Oxygen on Platinum Electrode. Pt. 2. In Concentrated Sulphuric Acid. Chu Yung-chao, Shu Tsen-yen, King Chi-hsung and Wang Tsen-woo. *Science Record*, v. 2, Nov. 1958, p. 384-393.
14 ref. (P15; Pt)

200-P. (German.) Automatic Recording of Thermodynamic Curves. Willy Oelsen, Peter Zuhlke and Olaf Oelsen. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 799-805.
Simple electrical apparatus for automatic recording. Curves obtained from Al-Sn alloys of different composition. 14 ref. (P12; Al-b, *Sn*)

201-P. (Russian.) New Method for Determining Monocrystalline Constants for Magnetostriction. G. P. D'yakov. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 168-170.
4 ref. (P16; 14-61)

202-P. (Russian.) Possible Influence of Electromagnetic Radiation on Electrical Conductivity of Conductors. V. M. Eleonskii and P. S. Zyryaov. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 171-172.
(P15g)

203-P. (Russian.) Electrical Conductivity of Antiferromagnetic Chromium-Antimony Alloy. I. G. Fakidov and A. Ya. Afanas'ev. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 176-177.
11 ref. (P15g; Cr-b, *Sb*, SGA-n)

204-P. (Russian.) Electrical Conductivity of Anti-Ferromagnetic Metals. Yu. P. Irkhin. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 586-589.
Relation of conductivity to temperature. 4 ref. (P15g, 2-61; SGA-n)

205-P. (Russian.) Nuclear Polarization in Metallic Lithium. N. A. Bekeshko and E. I. Kondorskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 609-613.
21 ref. (P18m; Li)

206-P. Indium Mono-Telluride. H. C. Wright and J. C. Brice. *Nature*, v. 183, Jan. 3, 1959, p. 27-28.
Resistivity, Hall coefficient, thermal emf., thermal conductivity, photovolaic effects. (P15; In, Te, 14-68)

207-P.* (Russian.) Magnetic Structure Changes of Residually Magnetized Silicon-Iron Crystals During Demagnetization. Ya. S. Shur and I. E. Startseva. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 614-620.
Supplementary and reversed magnetic regions lower the stability of its magnetic structure against demagnetization effect. 5 ref. (P16; Fe-b, *Si*)

208-P.* (Russian.) Hall Effect in Alloys in the Region of Ferromagnetic Conversion. K. P. Belov, E. P. Svirina and Yu. V. Belous. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 621-627.
For iron-nickel alloys in region of Curie point, Hall constant varies linerally with the square of spontaneous magnetization. 11 ref. (P15p, P16d, 2-63; Fe-b, *Ni*)

209-P.* (Russian.) Electronographic Investigation of the Structure of Liquid Alloys of Aluminum-Tin System. A. I. Bublik and A. G. Buntar. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 692-699.
Atom density distributions of alloys at 470-580° C. Sn content from 20 to 60%. 9 ref. (P10a, M24b; Al-b, *Sn*, Sn-b, Al, 14-60)

210-P.* (Russian.) Changes of Heat Capacities in Iron and Copper During Plastic Deformation. B. V. Belogurov and L. M. Shestopalov. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 734-738.
In axial elongation and contraction, the heat capacity of Fe and Cu is increased. 14 ref. (P12r, Q24, 3-68; Fe, ST, Cu)

211-P.* (Russian.) Cold Rolled Steel Used in Dynamos. N. I. Lapkin and N. F. Dubrov. *Fizika Metallov i Metallovedenie*, v. 6, no. 4, 1958, p. 739-744.
Magnetic induction and specific losses compared with hot rolled steel. 4 ref. (P16; AY, SGA-n)

212-P. (Translation.) On the Periodic Relationship of Electrode Potentials of Metals in Fused Salts. Yu. K. Delimarsky. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 201-204.
Electrode potentials of metals in fused fluorides, chlorides, bromides or

iodides as periodic function of atomic numbers. Values for Li, Be, Na, Mg, Al, K, Ca, Cr, Mn, Co, Ni, Cu, Zn, Sr, Zr, Ag, Cd, Sn, Sb, Ba, Hg, Tl, Tb and Bi. (P15m)

213-P. (Translation.) Electrical Conductivity of Titanate Slags. B. M. Lepinskikh, O. A. Esin and S. V. Shavrin. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 211-219.

Determination on liquid titanate of sodium, manganese or iron at various temperatures and TiO_2 contents. 11 ref. (P15g; Ti, RM-q)

214-P. (Translation.) Measurement of the Density of Fused Silicates. S. I. Popel and O. A. Esin. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 255-259.

Method for the calculation of density from variation of pressure in the formation of a bubble at the end of a tube immersed in the melt to various depths. Determination for $FeO-SiO_2$, $FeO-CaO-SiO_2$ and $CaO-SiO_2-Al_2O_3$ systems at 1400° C. 15 ref. (P10a, 2-60; Si, RM-q)

215-P. (Translation—AIP.) Spontaneous Fission of Th^{232} and the Stability of Nucleons. G. N. Flerov, D. S. Klochkov, V. S. Skobkin and V. V. Terentev. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 79-80.

Method of recording rare acts of fission determine that the lifetime of a bound nucleon against decay to lighter particles is more than 2×10^{23} years. 5 ref. (P18h; Th, 14-63)

216-P. (Translation—AIP.) Theory of the Anisotropy of Ferromagnetic Single Crystals. N. A. Potapkov. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 89-92.

Dyson's method that spin-wave states in which the Heisenberg Hamiltonian is diagonal and correction of dynamical interaction do not exceed few percent is applied to crystal with hexagonal symmetry. 5 ref. (P16, P12a; SGA-n, 3-72, 14-61)

217-P. (Translation—AIP.) Thermionic Emission From Carbon Particles. A. A. Arshinov and A. K. Musin. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 99-101.

Considers electron recombination with positively charged C arriving at final equilibrium electron concentration. 5 ref. (P15k; C)

218-P. (Translation—AIP.) Masses of the Isotopes of Lead. R. A. Demvikhanov, T. I. Gutkin and V. V. Dorokhov. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 141-142.

Measurements of Pb^{204}, Pb^{206}, Pb^{207} and Pb^{208} by mass spectrographic apparatus in connection with nucleon binding energies. 4 ref. (P10; Pb, 14-63)

219-P. (Translation—AIP.) Effect of a Surface on the Sign of the Conductivity of AlSb and InSb. V. F. Synorov. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 161-162.

Thermo-emf. sign determined at stages of grinding, and magnitude reduced then changed sign. 5 ref. (P15g, 2-59; Al, In, Sb, 14-68)

220-P. (Translation—AIP.) Structure of the Absorption and Photoconduction Spectra of CdS Crystals at 20° K. V. L. Broude, V. V. Eremenko and N. N. Chikovani. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 351-353.

No relation between stationary photocurrent and absorption coefficient. Dependence of photoconductivity on absorption coefficient complicated by dependence of photocurrent on wavelength of absorbed light. 4 ref. (P17e, P17c, 1-67; Cd, S)

221-P. (Translation—AIP.) Emission From Tb^{160}. M. P. Avotina, E. P. Grigor'ev, A. V. Zolotavin and B. Kratsik. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 368-371.

The 967-kev. line separated into its two components using a Th target. Ratio between conversion line intensity and corresponding gamma transitions. (P17d; Tb, 14-63)

222-P. (Translation—AIP.) Coefficients of Linear Expansion of Dilute Alpha-Solid Solutions of Fe With Cr, Mo and W. Iu. G. Miller. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 409-410.

Compared with results in investigation of diffusion constants. Temperature dependence of expansion of specimens. 4 ref. (P11g; Fe-b, *Cr, Mo, W*, 14-67)

223-P. (Translation—AIP.) Theory of Superconductivity of Metals. S. V. Vonsovskii and M. S. Svirskii. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 549-552.

10 ref. (P15g)

224-P. (Translation—AIP.) Temperature Dependence of the Coercive Force in Thin Specimens of Nickel and Ferronickel Alloys. E. Kondorskii and M. Rosenberg. *Soviet*

Physics Doklady, v. 3, no. 3, 1958, p. 595-598.

Measurements were performed with ballistic apparatus using a coil and open circuit at -196 to +300° C. 9 ref. (P16a, 2-61; Ni-b, *Fe*)

225-P. (Translation—AIP.) Temperature Stabilization of the Magnetic Properties of Permalloy. I. M. Puzeĭ. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 649-651.

Temperature dependence of energy of magnetic anisotropy of Ni-Fe single crystal grown from melt at -196 to +600° C. 5 ref. (P16, 3-72, 2-61; Ni-b, *Fe, Mo*)

226-P. (Translation—AIP.) Surface Impedence of Superconducting Cadmium. M. S. Khaikin. *Soviet Physics JETP*, v. 7, Dec. 1958, p. 961-967.

See item 661-P, 1958. (P15g; Cd)

227-P. (Translation—AIP.) Multimagnon Processes in the Scattering of Slow Neutrons in Ferromagnetics. S. V. Maleev. *Soviet Physics JETP*, v. 7, Dec. 1958, p. 1048-1052.

Calculates cross section for inelastic scattering of neutrons with absorption of one magnon and emission of another. 6 ref. (P18j; SGA-n)

228-P. (Translation—AIP.) Investigation of Photoelectric Properties of Semiconductors of the PbS Group by the Capacitor Method. B. T. Kolomiets and V. N. Larichev. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 859-861.

6 ref. (P15k; Pb, *S*)

229-P. (Translation—AIP.) Effect of the Surface Treatment of Semiconductors on the Magnitude and the Spectral Distribution of Photoconductivity. S. M. Ryvkin and R. Iu Khansevarov. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 862-867.

Using high-intensity electron bombardment heating in vacuum and in air, and short duration exposure of CdS single crystals to gaseous discharge. 7 ref. (P15k; Cd, S, NM-a)

230-P. (Translation—AIP.) Current Voltage Characteristic of Metal-AlSb Point Contact. Iu. V. Ilisavskii. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 898-904.

Preparation, measuring, forming, temperature dependence, effect of strong field. 20 ref. (P15; Al-b, *Sb*, 14-68)

231-P. (Translation—AIP.) Effect of Heat Treatment on Electric Properties of Silicon. E. I. Givargizov and Ia. E. Pokdovskii. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 905-907.

Single crystals heated in vacuum in a resistance furnace and quenched in vaseline oil. No change in resistivity during treatment. 10 ref. (P15, 2-64; Si, 14-61)

232-P. (Translation—AIP.) Thermoelectric Properties of Bismuth Telluride With Alloying Elements. G. N. Gordiakova and S. S. Sinani. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 908-911.

Effect of I, Pb, Cu and CuBr on electrical conductivity and thermal emf. (P15g, P15j, 3-69; Bi-b, *Te, I, Pb, Cu*, 14-67, 14-68)

233-P. (Translation—AIP.) Investigation of the Nernst-Ettingshausen Effect in Bismuth Telluride. R. I. Bashirov. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 917-920.

Measurements on cast and pressed specimens of electrical conductivity, Hall effect and N-E effect at 120-600° K. 6 ref. (P16, P15g; Bi, *Te*, 5-60, 14-68)

234-P. (Translation—AIP.) Electrical Properties of Thin Films of Fe, Ni and Co. N. I. Ginzburg and A. M. Poliakov. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 957-959.

Resistance of films of various thickness at 1.65-300° K. 5 ref. (P15g; Fe, Ni, Co, 14-62)

235-P. (Translation—AIP.) Investigation of a Coated W-Co Cathode. A. E. Dol'nikov. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 960-963.

Coating Ca on W cathode increases emission current. (P15k, T1j; W, *Ca*)

236-P. (Translation—Brutcher, no. 4447.) Distortion of Surface Hardened Steel. Yu. M. Bogatyrev and V. P. Eremina. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 35-41.

Distortion resulting from hardening temperature, cooling rate, the initial structure state and method of tempering. Elevated hardening temperature brings about increase of deformation but has no effect on its nature. (P10d, 2-64; ST, 9-74)

237-P. (Russian.) Thermodynamic Properties of Alloys Containing Alkali Metals.

A. F. Alabyshev and M. F. Lantratov. *Uspekhi Khimii*, v. 27, no. 8, 1958, p. 921-942. 79 ref. (P12; EG-e)

238-P.* (German.) Manufacture of Ni-Free Nonmagnetic Cast Iron. Ludwig Kolb. *Freiberger Forschungshefte*, no. B31, 1958, p. 217-240.

Production of nonmagnetic gray iron with pure Mn. Materials high in carbon and of high graphite given preference because of their good machinability and good magnetic properties. Machinability improved by Ti. 10 ref. (P16, G17k, 2-60; CI-q, *Mn, Ti*)

239-P.* (German.) Limits and Variations of Activation Energy Related to Creep and Other Phenomena Occurring in Solid Metals. K. A. Ossipow. *Neue Hutte*, v. 3, Oct. 1958, p. 619-622.

Analyzing the thermodynamic properties of crystals, actual values compiled relating to activation energies of Al, Cu and Ag with respect to creep and recovery of electric conductivity after heating. (P13a, P15g, Q3; Al, Ag, Cu)

240-P.* (Russian.) Thermodynamic Properties of Alkaline Earth Metals and of Their Oxides and Monohydrides in Gaseous States. I. V. Veits, L. V. Gurvich and N. I. Rtishcheva. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 11, 1958, p. 2532-2542.

Thermodynamic functions of Mg, Ca, Sr, Ba, their oxides and monohydrides computed for the ideal gaseous state. 29 ref. (P12; Mg, Ca, Sr, Ba)

241-P.* (Russian.) Correlations in the Discharge of Zinc and Hydrogen Ions in Sulphuric Acid Solutions in Presence of Metal Impurities More Electropositive Than Zinc. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 11, 1958, p. 2561-2564.

On models of galvanic pair of Zn and associated metals (Co, Sb, Pb, Cu) the current distribution over the components of the pair was studied and potentials measured. At high current densities, the locations of the cathode occupied by the impurity metals serve as active centers of the H_2 ions discharge, as a result of which the current efficiency with respect to Zn is lowered. These locations also serve as centers of dendrite growth, after they have been covered with Zn. 4 ref. (P15m, 3-69; Co, Cu, H, Pb, Sb, Zn)

242-P.* (Japanese.) Curvature Distortion of Plate Castings. Toshiro Owadano. *Japan Foundrymen's Society, Journal*, v. 30, Dec. 1958, p. 953-958.

Casting strain in Pb, Zn, Sn and Pb-Sn alloys in horizontal green sand open molds; distortion measured by an optical lever during cooling; effects of casting temperature, chill plate and the types of molds on distortion. (P10d, 2-61, 3-73; Zn, Pb-b, Sn, 5-60)

243-P. Mass Spectrometric Study of Heats of Sublimation of Dysprosium, Samarium, Thulium, and Ytterbium. William R. Savage, Donald E. Hudson and Frank H. Spedding. *Journal of Chemical Physics*, v. 30, Jan. 1959, p. 221-227.

(P12q; Dy, Sm, Tm, Yb, EG-g)

244-P. Experimental Determination of the Electrical Resistivity of the Liquid Alloys HgIn, HgT1, GaIn, GaSn and of Liquid Gallium. L.G. Schulz and P. Spiegler. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 87-90.

19 ref. (P15g; Hg-b, Ga-b, *In, Tl, Sn*, 14-68, 14-60)

245-P. Inelastic Scattering of Neutrons by Thorium. R. Batchelor and J.H. Towle. *Physical Society, Proceedings*, v. 73, Pt. 2, Feb. 1, 1959, p. 193-200.

12 ref. (P18; Th, U)

246-P. Electrical Conduction in n-Type InSb Between 2 and 300° K. E.H. Putley. *Physical Society, Proceedings*, v. 73, Pt. 2, Feb. 1, 1959, p. 280-290.

13 ref. (P15g, P15p, 2-63; In, Sb, 14-68)

247-P. Decay Scheme of Mo^{99}. V. Estulin, G.M. Chernov and Z.V. Pastukhova. *Soviet Physics—JETP*, v. 8, Jan. 1959, p. 51-56.

Angular correlation of gamma rays emitted. 17 ref. (P18h; Mo, 14-63)

248-P. (English.) Differential Capacity of the Electrical Double Layer Between Mercury and Methanol-Water Mixtures. A.A. Moussa, H.M. Sammour and H.A. Ghaly. *Egyptian Journal of Chemistry*, v. 1, no. 2, 1958, p. 165-174.

12 ref. (P15m; Hg, NM-a31)

249-P. (German.) Ferromagnetism in Welded Austenitic Steel. F. Erdmann-Jesnitzer and M. Gerlach. *Werkstatt und Betrieb*, v. 91, Dec. 1958, p. 709-713.

Appearance of ferromagnetism is explained by limited formation of martensite due to shrinkage stresses. Amount of

ferromagnetism is related to several types of welds. (P16; SS-e, 7-51)

250-P.* Physical Damage Brought About by Thermally Cycling Uranium Through Its Phase Changes. S.N. Buckley, A.G. Harding and M.G. Waldron. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 150-154.

Thermally cycling U through alpha-beta and beta-gamma transformations. Influence of prior history, thermal conditions during testing and alloying on changes in volume and density. 11 ref. (P10d, N6p, 2-60, 2-61, 3-70; U-a)

251-P.* Surface Tension and Contact Angles in Some Liquid Metal Solid Ceramic Systems at Elevated Temperatures. B.C. Allen and W.D. Kingery. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 30-37.

Sessile drop method applied to pure Fe, Cu, Co, Ni and Sn and Fe-C, Co-C and Ni-C alloys; wetting behavior of Sn, Ni-Ti alloys, and Sn-Ti alloys on Al_2O_3, Si_3N_4, Mo-Si_2 and Si-C. Ti additions lower contact angles. 38 ref. (P13h; Fe-b, Cu-b, Co-b, Ni-b, Sn-b, *C, Ti*, 14-60)

252-P.* Enhanced Surface Reactions. Pt. 3. Adsorption of Gases on Prepared Ruthenium Surfaces. Manfred J. D. Low and H. Austin Taylor. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 138-142.

Rates of adsorption of H_2, CO and O_2 on $Ru{\cdot}Al_2O_3$ catalyst surfaces prepared by pre-adsorption of gases. Results are discussed in terms of a site-creation mechanism. Pre-adsorption of gas may influence both the initial and the ambient rates of adsorption to various and, at times, opposite extents, resulting in several types of "poisoning". 14 ref. (P13d, P13c; Ru, *Al, O*, NM-a34)

253-P.* Effect of Trace Elements on the Tensile, Electrical Resistance and Recrystallization Properties of High-Purity Nickel. K.M. Olsen. *American Society for Metals, Transactions*, v. 52, Preprint no. 130, 1958, 27 p.

Effects of small quantities of Mg, Al, Mn, Si, C, Zr, Co, W and Ti. 13 ref. (P15g, Q27a, N5h, 3-69; Ni-a, *Mg, Al. Mn, Si, C, Zr, Co, W, Ti*)

254-P.* Strain Electrometry and Corrosion. Pt. 4. Film Properties and Strain Potential. J. Calvin Giddings, Albert G. Funk, Carl J. Christensen and Henry Eyring. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 91-95.

Measurements of strain transients for several metal electrodes; Cu, Al, Zn, Ag, and Fe. Shows magnitude of transients as function of percentage strain, with transients depending on position of electrode in emf.series and on protective nature of film. Effects of corrosion inhibitors and organic coatings on strain transients shown. 11 ref. (P15, 3-68, R10b; Cu, Ag, Al, Zn, Ni, Fe)

255-P.* Heat Capacity of Dilute Solutions of Chromium in Nickel. R. Hultgren and C. Land. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 165-166.

Heat content determined by diphenyl ether calorimeter. Kopp's law of additivity of heat capacities followed. 6 ref. (P12r; Ni-b, *Cr*, 14-60)

256-P.* (German.) Characteristics of Sintered Al-Ni-Cu-Fe Materials for Permanent Magnets as Influenced by the Constituent Elements. Gunter Ritzow and Werner Ebert. *Neue Hutte*, v. 4, Jan. 1959, p. 35-40.

Influence of Al, Ni, Cu in Alnico alloys; effect of cooling velocity on the magnetic properties. (P16; 6-72, Fe-b, *Al, Ni, Cu*, SGA-n)

257-P.* (Russian.) Phosphide Porosity in Cast Iron. A.A. Timofeev. *Liteinoe Proizvodstvo*, Dec. 1958, p. 17-18.

Varies with different carbon equivalents in metal. The greater the P content, the greater the number of phosphide eutectoids and development of porosity. (P10m, 2-60; CI, *C, P*)

258-P.* Mechanism of Growth of Uranium on Thermal Cycling in the Alpha Range. S. F. Pugh. *British Nuclear Energy Conference, Journal*, v. 4, Jan. 1959, p. 27-33.

Kinetics of the creep process. Determination of internal stress cycle and modes of deformation during a typical cycle; quantitative account of internal strains and resulting external growth. Processes leading to a change in growth per cycle when the heating and cooling rates are changed. 7 ref. (P10d, Q3, Q25; U)

259-P.* Chemisorption of Nitrogen on Tungsten. P. Kisluk. *Journal of Chemical Physics*, v. 30, Jan. 1959, p. 174-181.

The amount of N chemisorbed on a polycrystalline W ribbon measured as a function of the temperature of the ribbon and the pressure in the region of less than one monolayer. 33 ref. (P13d, 2-61, 3-74; W, *N*)

260-P.* Effects of Heat and Pressure on the Swelling of Irradiated Uranium. A. T. Churchman, R. S. Barnes and A H. Cottrell. *Journal of Nuclear Energy*, v. 7, Aug. 1958, p. 88-95.

Small pieces of a natural U fuel bar, after irradiation at below 300° C., heated to higher temperatures under various pressures. Heat treatment produced changes in both density and microstructure. 13 ref. (P10d, 2-64, 2-67, 3-74; U)

261-P.* Determination of the Solubility of Oxygen Bearing Impurities in Sodium, Potassium and Their Alloys. D. D. Williams, J. A. Grand and R. R. Miller. *Journal of Physical Chemistry*, v. 63, Jan. 1959, p. 68-71.

Finds relatively low solubilities of the various impurities in the alkali metals. (P12e, M24c; Na, K, O, EG-e, 14-60)

262-P.* Magnetic Flux and Resistance of Circular Indium Rods at the Superconducting Transition. Yoshio Shibuya. *Tohoku University, Research Reports, (Series A)*, v. 10, no. 5, Oct. 1958, p. 326-342.

Paramagnetic effect in In. Current minimum required for the occurrence of the magnetic flux increase is represented by functions of the temperature and the external magnetic field maximum beyond which quasi-paramagnetism cannot be observed at that temperature. (P16; In, 4-55)

263-P.* (French.) Physical Properties of Ga Monocrystals Near the Fusion Point. Pt. 2. Marc Erny. *Metaux Corrosion-Industries*, v. 33, Dec. 1958, p. 493-513.

Comparative study of variations in electric resistivity and specific heat as influenced by temperature. 33 ref. (P12, P15, 2-61; Ga, 14-61)

264-P.* (Polish.) Defects in the Calculation of Equilibrium Constants. W. M. Szczedrin. *Hutnik*, v. 25, Oct. 1958, p. 377-385.

Defects shown with reference to the reaction $2\ Fe + O_2 = 2\ FeO$. Faulty calculation of heat reaction must be avoided as well as of entropy changes. 15 ref. (P12; Fe, O)

265-P. Ceramic Coatings for the Control of Radiant Heat. Edward A. Douglas. *American Ceramic Society Bulletin*, v. 38, Jan. 15, 1959, p. 20-23.

Emissivities of ceramic coatings for low-alloy steels. It was found that most dark refractories give highly emissive coatings. (P17d, T24b, 2-60; AY-n, 8-71, 17-57)

266-P. Thermodynamic Properties of Binary Alloys Exhibiting Miscibility in Solid and Liquid Phases. R. P. Rastogi and K. T. Rama Varma. *Indian Academy of Sciences, Proceedings*, v. 48A, Dec. 1958, p. 336-343.

Thermodynamic properties of Ni-Mn alloys determined from phase diagram. 16 ref. (P12, M24b; Ni-b, Mn)

267-P. Magnetic Flux Increase in Noncircular Tin Rods at the Superconducting Transition. Yoshio Shibuya. *Tohoku University, Research Reports, (Series A)*, v. 10, no. 5, Oct. 1958, p. 343-355.

Current minimum required for the occurrence of the paramagnetic effect. (P16; Sn, 4-55)

268-P. Magnetic Field Dependence of the Surface Impedance of Superconducting Tin. M. Spiewak. *University of Chicago, Institute for the Study of Metals, Quarterly Report*, no. 51, Dec. 1958, p. 381-411.

Surface impedance at 1000 mc. per sec. of super-conducting Sn investigated as a function of temperature, and of static magnetic field, both longitudinal and transverse to the r.f. current. 18 ref. (P15g, 2-61; Sn)

269-P. Effect of Uniaxial Tensile Stress on Impurity Conduction in Germanium. H. Fritzsche. *University of Chicago, Institute for the Study of Metals, Quarterly Report*, no. 51, Dec. 1958, p. 414-417.

6 ref. (P15g, 3-66, 3-69; Ge)

270-P. Transport Processes in Liquid Alloys. Pt. 1. A Transport Cell for Liquid Alloys. Paul C. Mangelsdorf, Jr. *University of Chicago, Institute for the Study of Metals, Quarterly Report*, no. 51, Dec. 1958, p. 426-444.

Study of electrolysis and diffusion. 13 ref. (P15g, N1c; 14-60)

271-P.* (French.) Magnetoscopic Control of Ferrous Parts. *Machine Moderne*, v. 53, Feb. 1959, p. 47-52.

Carbon content reduces magnetic permeability, hysteresis cycles of different alloy steels; interrelation of temperature and magnetization; influence of cold working on magnetization and hysteresis losses. (P16, S13h, S14h; AY)

272-P.* Interaction of Silver Impurity Atoms With a Copper Solvent. T. Pyle and R. Shuttleworth. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 598-608.

Radioactive isotopes used to measure the thermodynamic properties of solutions of Ag impurity in a Cu solvent in which the Ag was present at a concentration of less than 0.1 at.%. At these low concentrations it is possible to neglect the interaction between the Ag atoms and to consider only the interaction of the Ag atoms with the Cu solvent. 15 ref. (P12e, 1-59; Cu-b, *Ag*, 14-67)

273-P.* Frictional Sparking of Aluminum. J. C. Bailey. *Institution of Mining Engineers, Transactions*, v. 118, Jan. 1959, p. 11-244.

Al alloys are not especially prone to impact sparking on rusted steel, though more so than mild steel, and less so than Mg-base alloys. The susceptibility is greater with increasing hardness and Mg content of the alloys, and with increasing energy of impact. 8 ref. (P13, Q9p, 2-60, 3-74; Al-b, *Mg*)

274-P.* (German.) Thermodynamics of the Liquid Binary Systems Bi-Sn and Bi-Pb at 475° C. Franz Eberhard Wittig and Franz Huber. *Zeitschrift fur Physikalische Chemie Neue Folge*, v. 18, Dec. 1958, p. 330-347.

Free mixture enthalpies as a function of increasing Sn or Pb content. 34 ref. (P12r, M24b, 2-60; Bi, *Sn, Pb*)

275-P. (German.) Pyrophoric Alloys. H. Nowotny, Helga Auer-Welsbach and A. Wittmann. *Osterreichische Chemiker Zeitung*, v. 60, Jan. 1959, p. 12-16.

Structure of various types of mischmetal. Pyrophoric phases of Ce-free alloys on Ti and Zr-base. (P13, M26; Fe-b, Ti-b, Zr-b, *Ce, La*)

276-P. (Translation—AIP.) Secondary Nuclear Reactions Induced in Bismuth and Lead by High Energy Proton Bombardment. B. V. Kurchatov, V. N. Mekhedov, L. V. Christiakov, M. Ia. Kuznetsova, N. I. Borisova and J. G. Solv'ev. *Soviet Physics-JETP*, v. 8, Jan. 1959, p. 40-46.

Production of astatine isotope. Cross sections studied. 12 ref. (P18; Pb, Bi)

277-P. (Translation—AIP.) Hall Effect in Pure Nickel at Helium Temperature. N. V. Volkenshtein, G. V. Fedorov and S. V. Vonsovskii. *Soviet Physics-JETP*, v. 8, Jan. 1959, p. 61-63.

Ferromagnetic constant drops with temperature; minimum at 20-30° K. 17 ref. (P15p, 2-63; Ni-a)

278-P. (Translation—AIP.) Hall Constant in Semiconductors for Strong Magnetic Fields. Iu. A. Fursov. *Soviet Physics, Technical Physics*, v. 3, June 1958, p. 1051-1061.

7 ref. (P15p; EG-j)

279-P. (Translation—AIP.) Penetration of Electrons in Germanium and Silicon. B. Ia. Iurkov. *Soviet Physics, Technical Physics*, v. 3, June 1958, p. 1078-1082.

Curves of energy loss of electrons calculated on basis of Spencer's theory. 9 ref. (P15m; Ge, Si)

280-P. (Translation—AIP.) Electrical Properties of GaAs at Low Temperatures. O. V. Emel'ianenko and D. N. Nasledov. *Soviet Physics, Technical Physics*, v. 3, June 1958, p. 1094-1103.

Electrical conductivity, Hall coefficient and resistivity change in magnetic field measured at 1.5—300° K. 14 ref. (P15g, P15p, 2-63, 1-60, 1-54; Ga, *As*)

281-P. (Translation—AIP.) Electrical Properties of Tin-Antimony System. V. I. Ustianov. *Soviet Physics, Technical Physics*, v. 3, June 1958, p. 1106-1110.

Compositions included the gamma solution and beta phase. Properties with Sb composition and high temperature. 12 ref. (P15, M24b, 2-62, 2-60; Sn-b, Sb)

282-P. (Translation—Columbia.) Influence of Thermal Vibrations of Atoms on the Electron Energy Distribution in Metals and Alloys. I. B. Borovskii and G. N. Ronami. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 10, 1957, p. 1385-1388.

Determination of energy distribution of electric status in solids by investigation of frequency variation of the intensity in X-ray emission and absorption spectra. 7 ref. (P12, P15)

283-P.* (French.) Manganese Alloyed Austenitic Cast Iron Containing Nodular Graphite. N. Popescu. *Revue de Metallurgie (Bucharest)*, v. 3, no. 3, 1958, p. 73-77.

Mechanical, electrical and magnetic properties as influenced by Mn and other alloying additions. 5 ref. (P15g, P16q, Q27, 2-60; CI-r, *Mn*)

284-P.* (German.) Activation Energies, Disintegration and Evaporation Equilibrium in Pb-Cd Melts. Eberhard Schurmann. *Archiv fur das Eisenhuttenwesen*, v. 30, Jan. 1959, p. 41-49.

Both components of the melt show a definite tendency toward decomposition. In evaporation equilibrium Cd displays

much higher vapor pressure than Pb, resulting in practically pure Cd vapors, leaving a melt with 17 at.% Cd at 900° C. and 1 atm. ambient pressure. 17 ref. (P12; Pb-b, *Cd*)

285-P.* (German.) Properties of Mixed Nickel Ferrites Influenced by the Degree of Sintering. Elena Labusca, Gh. Stancu and N. Andreescu. *Revue de Metallurgie (Bucharest)*, v. 3, no. 3, 1958, p. 79-86.

Nickel ferrites and Cu-Ni ferrites were sintered at different temperatures with other conditions being kept constant. The specific gravity and magnetic permeability increase as the sintering temperature is raised, while specific electrical resistance decreases. 6 ref. (P16q, P15g; 6-72, *Ni, Cu*, NM-a34)

286-P.* (Russian.) Improved Properties of Aluminum by Small Alloying Additions. M. Protopopesku. *Revue de Metallurgie (Bucharest)*, v. 3, no. 3, 1958, p. 33-51.

Effect of Mn, Zn, Cu and Mg and influence of artificial aging on mechanical properties and electrical conductivity. 11 ref. (P15g, Q-general, 2-60, 2-65; Al-b, *Mn, Zn, Cu, Mg, Si*)

287-P.* (French.) Electrical Conductivity of Resistance Wires of Solid Solution Type Alloys. T. Dulamita, D. Drimer and E. Fokt. *Revue de Metallurgie (Bucharest)*, v. 3, no. 3, 1958. p. 53-60.

Electrical resistance of wires of various Ni-Cr, Ni-Cu and Ni-Cr-Cu alloys measured at temperatures from 273 to 1073° C. 7 ref. (P15g, 2-61, 4-61; Ni-b, *Cr, Cu*, 14-67)

288-P.* Effect of a Magnetic Field on Thermionic Emission From Molybdenum. Joel Greenburg. *Physical Review*, v. 112, Dec. 15, 1958, p. 1898-1900.

Applied field of 6000 gauss or less has no effect on the saturation current density. 6 ref. (P15k, P16; Mo, 4-61)

289-P.* (German.) Effect of Tensile Stress on the Remanence of Alpha Iron at High Temperatures. B. J. Shepstane and L. Alberts. *Zeitschrift fur Naturforschung*, v. 13a, Dec. 1958, p. 1096-1097.

Effects emphasize that magnetization by domain growth is taken over by rotation at higher temperatures. Experimental and theoretical results agree except near the Curie temperatures. (P16c, 3-66, 2-62; Fe-a)

290-P. Unit Cell and Thermal Expansion of Beta-Plutonium Metal. W. H. Zachariosen. Acta Crystallographica, v. 12, pt. 3, Mar. 10, 1959, p. 175-176.

Data show anisotropy in expansion of this monoclinic element with 34 atoms per unit cell. (P11g; Pu)

291-P.* (French.) Results of Research on Nonmagnetic Ni-Cu-Mn Cast Irons. A De Sy and J. Van Eeghem. *Fonderie Belge*, v. 29, Jan. 1959, p. 7-11.

Study of domain stability of austenite in Ni-Cu-Mn cast irons has led to development of a group of cast irons with magnetic permeability under 1.05 for a field of 200 oersteds. Physical and mechanical properties of these new irons are comparable to those of "Nomag" iron. (To be continued.) (P16; SGA-n, CI, *Ni, Cu, Mn*)

292-P.* (Dutch.) Copper and Copper Alloys. Pt. 18. Effect of Hydrogen. W. G. R. de Jager. *Metalen*, v. 14, Feb. 14, 1959, p. 34-40.

Copper samples of various compositions heated to 800° C. in a hydrogen or nitrogen atmosphere. An increase of electrical resistance caused by hydrogen contamination takes place in samples containing chemically combined oxygen or As and in phosphorus deoxidized Cu. Formation of coarse grain is influenced by composition and temperature. (P15g, 2-60, N3; Cu-b, *H*)

293-P. Spin-Disorder Effects in the Electrical Resistivities of Metals and Alloys. B. R. Coles. *Philosophical Magazine Supplement—Advances in Physics*, v. 7, Jan. 1958, p. 40-71.

60 ref. (P15g, N10, 3-71)

294-P. The Solubility of Nickel in Lithium. K. Q. Bagley and K. R. Montgomery. *United Kingdom Atomic Energy Authority*, IGR-TN/C-250, Sept. 1958, 4 p.

Results indicate that the solubility of Ni rises slowly from 60 ppm. at 200° C. to 220 ppm. at 500° C., then more rapidly to 0.2% at 675° C. (P12e; *Ni*, Li)

295-P. (German.) Magnetic Investigations of Solid Solutions of Transition Elements in Pd. D. Gerstenberg. *Annalen der Physik*, v. 2, Nov. 1958, p. 236-262.

Magnetic susceptibility of solid solutions of Ti, V, Cr, Mn, Fe, Co, Ni, Zr, Cb, Mo, Ta, W and Re in Pd measured from 90-1100° K. Results discussed in terms of Pauli's and Staner's equations

for spin paramagnetism. 41 ref. (P16q; Pd-b, *Ti, V, Cr, Mn, Fe, Co, W, Re, Ni, Zr, Cb, Mo, Ta,* 14-67)

296-P. (German.) Magnetic Properties of Electrolytically Produced Nickel Layers. W. Ruske. *Annalen der Physik,* v. 2, Nov. 1958, p. 274-286.

Hysteresis loops of single and multiple layers of 20 to 2.10^4 Å thickness. Elimination on separation of the various magnetic effects permitted the influence of the layer thickness on the magnetic properties to be determined. 35 ref. (P16a; 14-62, Ni-a)

297-P.* (Polish.) Thermodynamic Properties of Liquid Metallic Solutions. Pt. 3. Semiregular Two-Consistent Solutions. Janusz Terpilowski and Emilia Przezdziecka. *Archiwum Hutnictwa,* v. 3, no. 4, 1958, p. 315-327.

Enthalpy and entropy of liquid solutions of Au-Tl, Bi-Cd, Bi-Sn, Cd-Pb, Cd-Sn, In-Zn, Pb-Sb, Sn-Tl and Sn-In. 38 ref. (P12r, P12s; 14-60, Au, Tl, Bi, Cd, Sn, Pb, In, Zn, Sb)

298-P.* Hysteresis Torque Limits Lifted With New Magnetic Alloy. Joseph C. Betts. *Electrical Manufacturing,* v. 63, Mar. 1959, p. 101-104.

Magnetic and electric properties of iron-cobalt alloy P-6. (P16, P15; Co-b, *Fe*)

299-P.* (Czech.) Effect of Composition on the Magnetic Properties of Low-Coercivity Steels. Jiri Wozniak, Ludek Kodrle, Vaclav Foldyna and Tasilo Prnka. *Hutnicke Listy,* v. 14, Feb. 1959, p. 93-98.

The absolute coercivity is increased by carbon, Mn and oxygen. Increase of coercivity in aging is promoted by oxygen, nitrogen and sulphur and retarded by Mn and Cr. 16 ref. (P16a, 2-60; CN-g, *C, Mn, O, Cr, S*)

300-P.* (Czech.) Changes Observed on Metallic Surfaces in Air. Antonin Hrbek. *Hutnicke Listy,* v. 14, Feb. 1959, p. 111-117.

Influence of atmospheric corrosion on the emission of electrons when exposed to light. 24 ref. (P17d, R3; Zn, Al)

301-P. Influence of the Demagnetizing Field on Domain Structure. J. Kocinski. *Acta Physica Polonica,* v. 17, no. 5, 1958, p. 283-294.

6 ref. (P16c)

302-P. (Engligh.) Influence of Hydrogen Permeation on the Potential of Iron Cathodes Polarized in Sulphuric Acid Solutions. H. Angerstein-Kozlowska. *L'Academie Polonaise des Sciences, Bulletin, Serie des Sciences,* v. 6, no. 12, 1958, p. 739-746.

18 ref. (P15, P13d; Fe, H)

303-P.* (French.) New Experimental Results on the Conductivity of Very Thin Films of Nickel. A. Colombani and G. Goureaux. *Comptes Rendus,* v. 248, Jan. 19, 1959, p. 380-383.

Under 130 Å, resistivity of films increases rapidly with decreasing thickness. (P15g, P15p; Ni, 14-62)

304-P.* (French.) Magnetic Resonance of Polycrystalline Cobalt at 35,500 Megacycles Per Second as a Function of Temperature. Georges Asch. *Comptes Rendus,* v. 248, Feb. 9, 1959, p. 781-784.

Measurement in -80 to +400° C. range, in which energy of magnetocrystalline anisotropy varies greatly. Decrease of this energy brings about increase of field of resonance and decrease of line width; field of resonance is maximum and line width minimum around 260° C., at which temperature energy of anisotropy is itself minimum. 6 ref. (P16f, 2-61; Co)

305-P.* (French.) Solubility of Hydrogen in Stainless Steels. Rene Blanchard. *Comptes Rendus,* v. 248, Feb. 16, 1959, p. 966-968.

Solubility of hydrogen varies from 5.3 to 7.25 cc. per 100 g. between 700 and 1000° C.; addition elements (Mo, Cb) cause slight decrease in solubility. 4 ref. (P12e, 2-60; SS, *H, Mo, Cb*)

306-P.* (German.) Electroconductivity of Aluminum Casting Alloys Conforming to DIN 1725. A. Buckeley. *Aluminium,* v. 35, Mar. 1959, p. 135-139.

Effect of composition, thickness and cooling conditions, heat treatment, quenching and type of mold on electrical conductivity. 17 ref. (P15g, 2-60, 2-64, E-general; Al-b, 15-56, 5)

307-P.* (French.) Magnetic Properties of Very Thin Films of Nickel. G. Goureaux and A. Colombani. *Comptes Rendus,* v. 248, Jan. 26, 1959, p. 543-546.

Hall effect in films up to 1000° Å thick. 4 ref. (P15p; 14-62, Ni)

308-P.* (German.) Conductivity of Pure Copper Influenced by Admixtures. Ernst

Gunter Hess and Franz Pawlek. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 57-70.
Presence of oxygen, sulphur, Se and Te slightly increases electrical resistance. 67 ref. (P16g, 2-60; Cu, *O, Se, S, Te*)

309-P.* (Russian.) Measurement of the Radioactivity of Metal and Slag. B. I. Bruk. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 184-185.
To melts of low-carbon steel and austenitic stainless steel and various slags, ferrous sulphide containing the isotopes S^{35} and S^{16} was added and the radioactivity measured. With the same S isotope content, metal showed a higher irradiation than slag, which is explained by differing absorption properties. (P18, 1-59; CN-g, SS-e, RM-q, *Si, O, Ca*)

310-P.* Changes of Electric Resistance of Nickel Films With Absorption of Hydrogen. Zenjiro Oda and Hikaru Arata. *Journal of Physical Chemistry*, v. 62, Dec. 1958, p. 1471-1474.
Resistance increases on very clean films, decreases on contaminated films. Experiments show that this decrease is due not to the oxygen absorbed on the surface but to that which has diffused into Ni lattice. 15 ref. (P15g; Ni, 14-62)

311-P.* (French.) Influence of Purity and Structure of Iron in Hydrogen Pickup Under Cathodic Conditions. Simone Besnard and Jean Talbot. *Revue de Metallurgie*, v. 56, Feb. 1959, p. 163-170.
Polycrystalline Fe heated at 930° C. for three days absorbs 50 cc. of hydrogen per 100 g. while the same Fe absorbs less than 10 cc. per 100 g. after polygonization. Addition of 0.1 g. of Na_2S to the electrolyte increases absorption. 6 ref. (P13d; Fe, *H*)

312-P.* (German.) Solubility of Nitrogen in Solid Iron in Presence of Vanadium and Chromium. Martin G. Frohberg and Hans Graf. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 304-306.
Solubility in alpha iron in the presence of 0.016 and 0.051% V at 500 and 600° C. (P13d; Fe, *N, V, Cr*)

313-P. Adsorption of Oxygen on Tungsten. Joseph Eisinger. *Journal of Chemical Physics*, v. 30, Feb. 1959, p. 412-416.
13 ref. (P13d; W, *O*)

314-P. Specific Heats of Some Copper-Rich Copper-Nickel Alloys at Liquid Helium Temperatures. G. L. Guthrie, S. A. Friedberg and J. E. Goldman. *Physical Review*, v. 113, Jan. 1, 1959, p. 45-48.
25 ref. (P12r, 2-63; Cu-b, *Ni*)

315-P. Low-Temperature Electrical and Magnetic Behavior of Dilute Alloys: Mn in Cu and Co in Cu. I. S. Jacobs and R. W. Schmitt. *Physical Review*, v. 113, Jan. 15, 1959, p. 459-463.
26 ref. (P15, P16, 2-63; Cu-b, *Co, Mn*)

316-P. (German.) Electrical Conductivity of Treated and Untreated Aluminum-Silicon Alloys. W. Patterson and D. Ammann. *Aluminium*, v. 35, Mar. 1959, p. 139-140.
Electrical conductivity of the Al-Si eutectic can be increased 30% by sodium treatment. (P15g, 2-60; Al-b, *Si, Na*)

317-P.* Thermal Conductivity of Some Non-Superconducting Alloys at Low Temperatures. M. S. R. Chari and J. De Nobel. *Physica*, v. 25, Jan. 1959, p. 84-96.
Thermal conductivity of dilute alloys of Ag-Mn and Ag-In and of some steels at low temperatures. 32 ref. (P11h, 2-63; Ag-b, *In, Mn*)

318-P.* (English.) Magnetic Properties of Spheroidal Graphite Cast Iron. Yuki Shirakawa and Takeshi Miyazaki. *Tohoku University, Science Reports of the Research Institutes*, v. 10A, no. 6, 1958, p. 399-404.
Under the same degree of graphitization, the maximum induction, the coercive force and the hysteresis loss of spheroidal graphite cast iron were lower than those of flake graphite cast iron, and so the maximum permeability and the residual induction were higher. With increasing degree of graphitization, the maximum permeability increased, whereas the other four quantities decreased. (P16, N8s; CI, CI-r)

319-P.* Malleable Iron: A Magnetic Alloy. W. K. Bock. *Modern Castings*, v. 36, Apr. 1959, p. 61-68.
Magnetic variation, saturation value, permeability, hysteresis, coercive force and retentivity of malleable iron. Comparison with other magnetic alloys. Mechanical properties, foundry characteristics and machinability. (P16; CI-s, SGA-n)

320-P.* Electrical Conductivity of Sand-Cast Copper-Base Alloys. D. G. Schmidt and F. L. Riddell. *Modern Castings*, v. 35, Apr. 1959, p. 69-76.
Electrical conductivities of over 100 sand-cast Cu-base alloys including tin

bronzes, leaded tin bronzes, leaded red and semi-red brasses, leaded yellow brasses, high-strength yellow brasses, aluminum bronzes, leaded nickel bronzes, silicon bronzes, silicon brasses and nickel silvers. Effect of alloy elements on conductivity. 5 ref. (P15g, 2-60; Cu-b, Cu-n, Cu-s, *Al, Sn, Ni, Si,* Pb, 5-60)

321-P.* Electrochemical Properties of the Platinum Metals. M. J. N. Pourbaix, J. Van Muylder and N. de Zoubov. *Platinum Metals Review,* v. 3, Apr. 1959, p. 47-51.

Thermodynamic approach to corrosion and cathodic protection. 9 ref. (P15, R10d, R4; Pt, 17-57)

322-P.* Thermal Conductivity of Some Steels at Low Temperatures. M. S. R. Chari and J. De Nobel. *Physica,* v. 25, Jan. 1959, p. 73-83.

With increasing Ni and Cr content from 2-27%, the lattice conductivity decreases. The electronic thermal conductivity decreases by about 80% for the mentioned temperatures. 21 ref. (P11h, 2-60, 2-63; AY, SS)

323-P.* Electrical and Thermal Resistivity of the Transition Elements at Low Temperatures. G. K. White and S. B. Woods. *Royal Society of London, Philosophical Transactions,* v. 251A, Mar. 12, 1959, p. 273-302.

Intrinsic or ideal electrical resistivity, from 295° K. to about 10° K. and for the ideal thermal resistivity, from above 100° K. to about 20° K. 100 ref. (P11h, P15g, 2-63)

324-P. Heat Transfer Tests on Aluminum Bonded Stainless Steel Heat Exchangers. T. I. M Crofts and D. Gambles. *United Kingdom Atomic Energy Authority,* IGR-TN/W-259, 1958, 5 p.

Breakdown in the bond commenced when the control temperature was raised to 150° C., while the breakdown was aggravated by continued operation at a control temperature of 160° C. (P11k, W13b; SS, 7-58, Al)

325-P.* (English.) Ferromagnetic Phase in Manganese-Aluminum System. Hiroshi Kono. *Physical Society of Japan, Journal,* v. 13, Dec. 1958, p. 1444-1451.

Conditions necessary for formation, structure, stability and thermal and magnetic properties of the promagnetic phase. 8 ref (P16; Mn-b, *Al*)

326-P.* A Redetermination of the Volume Changes on Solidification and Fusion of Lead-Bismuth Alloys Near to the Eutectic Composition. C. T. Preston and C. H. Broomfield. *Institute of Metals, Journal,* v. 87, p. 240.

Displacement method reveals that the eutectic alloy of 55.5% Bi, remainder Pb, contracts on freezing by 1.52 + 0.1% of its solid volume. (P10c, Pb-b, *Bi*)

327-P.* How Fabrication Affects Stainless Magnetic Properties. W. S. Eberly. *Iron Age,* v. 183, Apr. 23, 1959, p. 106-108.

For best magnetically soft properties (maximum permeability, lowest residual magnetism), ferritic stainless steels, 400 series, must be heat treated to remove all cold work stresses and to minimize the amount of carbon retained in the matrix of the alloy. (P16, 2-64; SS)

328-P. High Temperature Brazing Alloy-Base Metal Wetting Reactions. W. Feduska. *Welding Journal,* v. 38, Mar. 1959, p. 122s p. 122s-131s.

Wettability of high-temperature alloys by brazing alloys decreases as the brazing temperature increases above the nominal level in atmospheres of dry hydrogen, dry helium and a vacuum. 4 ref. (P13h, K8, 2-62, 1-73, 1-54; SS-c, SS-e, Co-b, Ag-b, Ni-b, *Cr, Si, B*)

329-P.* (Russian.) X-Ray Structure Study of Ferromagnetic Alloys Fe-Mo and Fe-Mo-Co. B. Ya. Pines and I. N. Barutkin. *Fizika Metallov i Metallovedenie,* v. 6, no. 5, 1958, p. 832-837.

Coercivity changes caused by various heat treatments are investigated by radiographic methods and explained by microstress and the presence of finely dispersed phases. (P16a, 2-64; Fe-b, *Mo, Co*)

330-P. Domain Processes and Magnetic and Thermomagnetic Behavior of a Single Crystal of Silicon Iron. P. F. Davis. *British Electrical and Allied Industries Research Assoc.,* Technical Report N/T79, 1957, 9 p.

(P16; ST, *Si,* SGA-n, 14-61)

331-P. Electrochemical Behavior of Zinc in Alkaline Solutions. Pt. 2. Constant Over-Voltage Measurements. Indra Sanghi and M. Fleischmann. *Indian Academy of Sciences, Proceedings,* v. 49A, Jan. 1959, p. 6-24.

18 ref. (P15; Zn)

332-P. Time Decrease of Permeability in Transformer Steel. A. K. Smolinski and M. Zbikowski. *Institution of Electrical Engineers, Proceedings,* v. 106C, Mar. 1959, p. 23-26.

9 ref. (P16q; AY, SGA-n)

333-P. Magnetic Moments of Alloys and Compounds of Iron and Cobalt With Rare Earth Metal Additions. E. A. Nesbitt, J. H. Wernick and E. Corenzwit. *Journal of Applied Physics*, v. 30, Mar. 1959, p. 365-367.

Sharp drop of magnetization on the addition of gadolinium can be explained by antiferromagnetic exchange coupling. 5 ref. (P16; Co-b, Fe-b, *Gd*)

334-P. Effect of Oxide Impurities on the Thermoelectric Powers and Electric Resistivities of Bismuth, Antimony, Tellurium and Bismuth-Tellurium Alloys, R. A. Horne. *Journal of Applied Physics*, v. 30, Mar. 1959, p. 393-397.

18 ref. (P15, 3-69; Bi, Sb, Te)

335-P. Solubility of Plutonium in Mercury. C. F. Bowersox and J. A. Leary. *Journal of Inorganic & Nuclear Chemistry*, v. 9, Feb. 1959, p. 108-112.

(P12e; Hg, Pu)

336-P. Thermal Conductivity of Some Dilute Silver Alloys at Low Temperatures and in Magnetic Fields. M. S. R. Chari and J. De Nobel. *Physica*, v. 25, Jan. 1959, p. 60-72.

17 ref. (P11h, 2-63; Ag-b, *In, Mn*)

337-P. Principles of Electrochemistry. Fred G. Brune. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 68-72.

Basic factors involved in the passage of electric current through a solution and obtaining plate or deposit of metal. (P15, L17, C23)

338-P. Temperature Coefficients of Resistance of Metallic Films in the Temperature Range 25 to 600° C. Richard B. Belser and Walter H. Hicklin. *Journal of Applied Physics*, v. 30, Mar. 1959, p. 313-322.

Values of thin metal films depart from those of bulk metal because of the imperfections of films intrinsic in their method of deposition and growth. 18 ref. (P11h, 3-71; 14-62)

339-P.* The Heat Capacity of Solid Solutions of Cadmium in Silver. Ralph Hultgren and K. N. Rao. *Indian Institute of Metals, Transactions*, v. 11, Dec. 1958, p. 55-58.

Heat capacities of Ag-Cd alloys containing 20 or 42 at .% Cd determined at 350 to 600° K. (P12r; Ag-b, Cd, 14-67)

340-P.* Atomic Heats of Gold, Platinum and Antimony at Liquid Helium Temperatures. K. G. Ramanathan and T. M. Srinivasan. *Indian Academy of Sciences, Proceedings*, v. 49A, Feb. 1959, p. 55-60.

New investigation with vacuum calorimeter. 9 ref. (P12r, 2-63; Au, Pt, Sb)

341-P.* Lattice and Electronic Specific Heats of Zinc and Cadmium. T. M. Srinivasan. *Indian Academy of Sciences, Proceedings*, v. 49A, Feb. 1959, p. 61-65.

Results of investigation with vacuum calorimeter. 12 ref. (P12r, 2-63; Cd, Zn)

342-P.* Internal Ferromagnetic Resonance in Nickel. J. C. Anderson and B. Donovan. *Physical Society, Proceedings*, v. 73, Apr. 1, 1959, p. 593-599.

Investigated over 5 to 100° C. range. Resonant frequency is a decreasing function of temperature. Resonance is due to the internal magnetic field associated with the anisotropy energy. 14 ref. (P16f, P16q, 2-61; Ni)

343-P.* (French.) Nonmagnetic Ni-Cu-Mn Cast Iron. Albert de Sy and J. van Eeghem. *Fonderie Belge*, v. 29, Feb. 1959, p. 41-49.

Tests on magnetic, thermal and mechanical properties as influenced by composition. 4 ref. (P16q, P11g, Q-general, 2-60; CI-q, *Ni, Cu, Mn*)

344-P.* (Italian.) Chemical Properties of Zirconium. *Aluminio*, v. 28, Mar. 1959, p. 125-132.

Effect of impurities and alloying additions on corrosion behavior and physical and mechanical properties of Zr. 6 ref. (P-general, Q-general, R-general, 2-60; Zr, *Hf, C, H, Fe, Ni, Cr, Sn, N*)

345-P. Fermi-Thomas Angular-Dependent Potential for Iron. D. M. Hum. *Physical Society, Proceedings*, v. 73, Apr. 1, 1959, p. 650-660.

Method for calculating angular-dependent potential field, which is suitable for body-centered and face-centered cubic structures; calculations performed for Fe. Total energy per atom of any metal, in the angular-dependent case, is reduced to a sum of integrals over the surface of the atomic polyhedron. 11 ref. (P18n, M25n; Fe)

346-P. (French.) Nomograms for Calculation of Thermal Processes Occurring in Arc Welding. Traian Salagean. *Metalurgia si Constructia de Masini*, 1958, p. 43-50.

10 ref. (P11k, K1)

347-P.* Determining the Specific Resistance of Solid and Molten Aluminum and Its Alloys. W. Marty. *Brown Boveri Review*, v. 45, Nov-Dec. 1959, p. 549-552.

During melting, the resistance increases to double or triple the normal value. The temperature coefficient of electric resistance is positive in both solid and molten states. (P15g, 2-61; Al, 14-60)

348-P.* (German.) Correlations Between Magnetic Induction of Unalloyed Cast Steel, Composition and Brinell Hardness. Alfred Kolorz and Karl Lohberg. *Giesserei*, v. 46, Apr. 9, 1959, p. 187-190.

A decrease in carbon causes an increase of the induction value. With normalized steel castings, the Brinell hardness, since it is influenced by carbon, allows conclusions to be made as to magnetic induction. (P16, Q29b; ST, 5-60)

349-P. The Thermodynamics of the Liquidus-Solidus Gap in Binary Alloys: the Silver-Gold System. J. L. White. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 178-181.

The liquidus-solidus gap of the Ag-Au system was investigated by thermal analysis to resolve the discrepancy between the phase diagram and the measured thermodynamic properties of the solid and liquid alloys. The results confirm the gap calculated from the thermodynamic properties. 9 ref. (P12, M24b, N12; Ag, Au)

350-P. Effects of Heat and Pressure on the Swelling of Irradiated Uranium. A. T. Churchman, R. S. Barnes and A. H. Cottrell. *United Kingdom Atomic Energy Authority*, AERE M/R 2510, Mar. 1958, 14 p.

Heating in vacuum produced an increase in volume (swelling) of about 2% at 575° C., and over 20% above 1000° C. Repeated thermal cycling, and reheating at low pressure after first heating at high pressure, produced swelling of 10 to 20% at 810-835° C. Swelling appears to be caused by the separation of the fission gases, krypton and xenon, to form gas pockets in the metal. 13 ref. (P10d, 3-74, 2-62; U)

351-P. Conductivity Testing of Zinc Dust Pigmented Coatings. D. S. Nantz. Wright Air Development Center. *U. S. Office of Technical Services*, PB 131435, Sept. 1957, 27 p. $.75.

Zinc-rich coatings can provide excellent galvanic protection if the coating is properly pigmented with Zn and is sprayed at the proper thickness. (P15g, 1-54; Zn, NM-g30)

352-P.* (French.) Testing of Thermomagnetic Ni-Cu Alloys. David. *Revue du Nickel*, v. 25, Jan-Feb. 1959, p. 3-7.

Magnetic induction of Ni-Cu alloys in the -20 to +60° C. range. Magnetic induction is affected by alloying additions of Fe, Co, Mn and Si and reheating at 800 to 1200° C., followed by cooling affects. (P16, 2-60; Ni-b, *Cu, Fe, Co, Mn, Si*)

353-P.* (German.) Changes of Thin Lead Layers Due to Annealing. R. Grigorovici, N. Croitonu, A. Devengi and Ath. Trutia. *Zeitschrift fur Physik*, v. 154, no. 2, 1959, p. 160-171.

Electrical resistance as a function of temperature and thickness. Changes in grain structure by annealing. 11 ref. (P15g, J23; Pb, 14-62)

354-P.* Effects of High Temperature on Magnetic Properties of Core Materials. Michael Pasnak and R. H. Lundsten. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 107S-108S.

Increase in temperature decreases the coercive force and maximum and residual inductions. Maximum and initial permeabilities increase with increasing temperature until the Curie temperature is approached, then they decrease. (P16, 2-62; Fe-b, Ni-b, SGA-n)

355-P.* Ferromagnetic Resonance of Iron Whisker Crystals. D. S. Rodbell. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 187S-188S.

Two resonance modes may be excited and identified. The mode driven by the curl component of the microwave magnetic field exhibits a line width for some whisker crystals of Fe that at 9 kmc. per sec. is about an order of magnitude smaller than previously observed with other crystals of Fe. 29 ref. (P16; Fe, 14-61)

356-P.* Development of Metallurgical Structures and Magnetic Properties in Iron Silicon Alloys. R. H. Pry. *Journal of Applied Physics*, v. 30S, Apr. 1959, Apr. 1959, p. 189S-193S.

Processes which lead to the development of strong textures of both the cube and cube-on-edge type and a comparison of some of the magnetic properties of textured silicon iron. 29 ref. (P16, M26c, 3-71; Fe-b, *Si*, SGA-n)

357-P.* Solubility of Carbon in Iron as Determined by the Magnetic Aftereffect. Joseph Singer and Eugene S. Anolick. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 193S-194S.

Time decay of permeability is proportional to dissolved carbon. 6 ref. (P12e, P16, 2-60; Fe, C)

358-P. The Activities of Iron and Nickel in Liquid Fe-Ni Alloys. G. R. Zellars, S. L. Payne, J. P. Morris and R. L. Kipp. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 181-185.

Activities determined by measuring vapor pressures of Fe and Ni above the alloys and comparing with vapor pressures of pure metals. Ni deviates negatively from Raoult's law over the entire composition range. Fe behaves ideally down to 0.7 mole fraction but shows negative deviations at lower concentrations. 8 ref. (P12; Fe-b, Ni)

359-P. Activities of Iron and Nickel in Liquid Iron-Nickel Solutions. R. Speiser, A. J. Jacobs and J. W. Spretnak. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 185-192.

Activities of Ni in liquid Fe-Ni solutions containing from 10 to 90% Ni measured over the 1510 to 1600° C. range. A sepcial function was devised whereby activities can be computed by a graphican computation integration using the results of chemical analyses on the vapor phase alone. The liquid solutions studied exhibit negative deviation from Raoult's law but approach ideality as the temperature is raised from 1510 to 1600° C. 11 ref. (P12; Ni, Fe)

360-P.* (German.) Boiling Point in Silver-Phosphorus and Gold-Phosphorus Systems. Rudolf Vogel, Raymund Dobbener and Ortrud Strathmann. *Zeitschrift fur Metallkunde,* v. 50, Mar. 1959, p. 130-135.

In the system Au-P the boiling point is at 935° C., at a maximum solubility of 2.4% P. The boiling point for the system Ag-P is at 995° C., at a maximum solubility of 1.6% P. (P12p; Ag, Au, *P*)

361-P.* Temperature Dependence of the Magnetic Properties of Nickel-Iron Alloys. J. J. Clark and J. F. Fritz. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 105S-107S.

Trade names of the alloys tested are: Hipernik Deltamax, Hipernik V, Supermalloy, 4-79 Mo-Permalloy and Hymu 80. (P16, 2-61; Fe-b, Ni-b, SGA-n)

362-P.* Effect of Composition and Processing on the Activity of Some Magnetostrictive Materials. C. M. Davis, Jr., and S. F. Ferebee. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 113S-115S.

Strain sensitivity due to magnetostriction was found to be a maximum in the neighborhood of 8 oersteds for alloys, 16 oersteds for ferrites. The strain sensitivity of both the ferrites and the Alfenols decreased when the samples were quenched. 6 ref. (P16b, Q21a, 2-60, 3-66; Ni-b, Co-b, Fe-b, *Al,* SGA-n)

363-P.* Influence of Plastic Deformation on the Time Decrease of Permeability in Transformer Steel. A. K. Smolinski, Z. Kaczkowski and M. Zbikowski. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 195S-199S.

Measurements show a drop of time decrease of permeability at large elongations and a maximum at small elongations. 11 ref. (P16q, 3-68; AY, SGA-n)

364-P.* Variation in Orientation Texture of Ultrathin Molybdenum Permalloy Tape. P. K. Koh, H. A. Lewis and H. F. Graff. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 208S-210S.

Evaluation of magnetic properties of tapes for computor applications. 5 ref. (P16, M26c; Ni-b, *Fe, Mo*)

365-P.* Progress in Ultrathin Mo-Permalloy Tapes With Square Hysteresis Loops. Martin F. Littmann and Chester E. Ward. *Journal of Applied Physics,* v. 30S, Apr. 1959, p. 213S-214S.

Effects of thickness, temperature of the final anneal, crystal structure. (P16, 2-64; Ni-b, *Fe, Mo,* SGA-n)

366-P.* Controlled Potential Reactions of Cadmium and Silver in Alkaline Solution. George T. Croft. *Electrochemical Society, Journal,* v. 106, Apr. 1959, p. 278-284.

Data from electrochemical oxidation and reduction of electrodes in potassium hydroxide electrolyte, with overpotential independent and current dependent variables. 6 ref. (P15; Cd, Ag)

367-P.* (French.) Reflection of Solid Silicon and Germanium Between 1000 and 3000 Å. Sonja Robin-Kandare and Boris Vodar. *Comptes Rendus,* v. 248, Apr. 1, 1959, p. 1965-1967.

Reflection of solid moncrystalline Si and Ge in the spectral range from 1000-3000 Å; effect of surface structure on reflectivity. 5 ref. (P17a; Si, Ge)

368-P.* (French.) Dilatometric Testing of Chromium-Hydrogen System Between 20 and 550° C. Lucien Espagno, Pierre Azou

and Paul Bastien. *Comptes Rendus*, v. 248, Apr. 1, 1959, p. 2003-2005.

Application of a differential dilatometer of high sensitivity allows direct determination of the solubility limit of hydrogen in alpha Zr and the solubility of delta hydride. 10 ref. (P12e, M24b; Zr, H)

369-P.* (French.) Properties of Austenitic Cast Iron With a 5-10% Nickel Content. Andre Meallier. *Fonderie*, no. 158, Mar. 1959, p. 107-124.

Testing of magnetic properties, elongation, tensile strength, hardness, Young's modulus, density, coefficient of expansion, electrical resistivity. 11 ref. (P16, P15, P11, Q-general; CI, *Ni*)

370-P. Effect of Magnetic Annealing on the Properties of (110) [001] Oriented 3¼% Silicon-Iron Strip. H. C. Fiedler and R. H. Pry. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 109S-110S.

6 ref. (P16, 2-64; Fe-b, *Si*, SGA-n)

371-P. Heat Capacity of Pseudo-Copper Below 4.2° K. G. L. Guthrie. *Physical Review*, v. 113, Feb. 1, 1959, p. 793-795.

Results of measurements on fcc. Cu-Zn-Ni alloys. 15 ref. (P12, 2-63; Cu-b, Ni, Zn)

372-P. (German.) Results of Low-Temperature Research. Pt. 23. Atomic and Electronic Heat of Molybdenum and Tungsten Between 10 and 273° K. K. Clusius and P. Franzosini. *Zeitschrift fuer Naturforschung*, v. 14A, Feb. 1959, p. 99-105.

19 ref. (P12, 2-63; Mo, W)

373-P. (Italian.) Potential of a Platinum Electrode in a Gas-Solid Solution System. G. Bombara. *Metallurgia Italiana*, v. 51, Mar. 1959, p. 101-108.

Considerations on the determination of pH values and air in solution by the electrode potential. 14 ref. (P15m, T1f; Pt)

374-P.* (Russian.) Electrical Resistance of Metallic Ferromagnetics Under Influence of High-Frequency Magnetic Field. P. A. Dautov. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 999-1005.

Effect of relatively strong radiofrequency magnetic field on Goldhammer effect in 4% Si transformer steel and Mo Permalloy. 14 ref. (P15g; AY, SGA-n, Fe-b, *Ni*, *Mo*)

375-P.* (Russian.) Abnormality of Electric Resistance of Nickel-Chromium Alloys. N. V. Semenova. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1017-1026.

Abnormal electrical resistance changes in Nichrome alloys related to physical properties, microstructure, crystal lattice, hardness of Ni_3Cr at various heat treating stages and thermo-electromotive force. (P15g, M27; Ni-b, *Cr*)

376-P.* Heating and Cooling of Flat Strip. Pt. 5. A. H. Vaughan. *Industrial Heating*. v. 26, Apr. 1959, p. 672-680.

Curves for heating and cooling by radiation or convection for a constant specific heat. Correction for thickness, thermal properties of Fe, stainless steel, Ni, Al, Cu and brass. (Concluded.) 9 ref. (P11, P12r; SS, ST, Fe, Cu-a, Cu-n, Ni, Al, 4-53)

377-P.* (German.) Effects of Impurities and of Previous Cold Deformation in the Residual Resistance of Sintered Tungsten. Erich Krautz and Hermann Schultz. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1958, p. 399-403.

Measurements performed at liquid hydrogen temperatures. Additions of elements far removed from tungsten in the periodic table remarkable increase the residual resistance. Additions of alumina have the same effect. 8 ref. (P15g, 3-69, W, *Ti*, *Ta*, *Cb*, *Mo*, *Re*)

378-P.* Capacities of Solid Metal-Solution Interfaces. J. J. McMullen and Norman Hackerman. *Electrochemical Society, Journal*, v. 106, Apr. 1959, p. 341-346.

Simulated conditions with electrical circuit; application of square-wave voltage. Verifies capacity measurement analysis by applying the following systems: Hg in 0.1 Na_2SO_4, Pt, Ag, Cu, Al and Ti in 1.oN Na_2SO_4. 19 ref. (P15; Pt, Ag, Cu, Al, Ta)

379-P. (German.) Measurement of the Specific Heat of Metals at High Temperatures. Friedrich Krauss. *Zeitschrift fur Metallkunde*, v. 49, July 1958, p. 386-392.

Measurements with a Cr sample; equipment. (P12, 2-62; Cr)

380-P. (German.) Magnetic Properties and Ordered Structure of Nickel-Manganese Alloys. Pt. 1. Rolf Hahn and Eckart Kneller. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1958, p. 426-441.

Magnetical and electrical properties as functions of the composition, temperature and holding time. (P16, P15, N10; Ni-b, *Mn*)

381-P. (Russian.) Magnetostriction and Magnetization Abnormality of Ternary Iron-Nickel-Cobalt Alloys. S. I. Voskoboinikov. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1011-1016.

5 ref. (P16b; Fe-b, *Ni, Co*)

382-P.* (German.) Properties of Metallic Melts. Pt. 15. Viscosity. Erich Gebhardt and Konrad Kostlin. *Zeitschrift fur Metallkunde*, v. 49, Dec. 1958, p. 605-613.

Factors influencing the viscosity of pure metal melts and molten-binary alloys include atomic volume, atomic number, temperature, concentration and constitution. 46 ref. (P10f; 14-60, Ag-b, Al-b, Pb-b, Cu-b, Mg-b)

383-P.* (German.) Differences in the Thermal Expansion in Rolling Direction and in Transverse Direction in Iron-Nickel Alloys. Gerhard Pupke and Hans-Joachim Bunge. *Zeitschrift fur Metallkunde*, v. 49, Dec. 1958, p. 626-629.

Expansion coefficients vary with the angle of measurement to the rolling direction. The cause is to be found in the perturbation of short range ordering in rolling. 8 ref. (P11g, F23, 3-68; Fe-b, *Ni*)

384-P. The Thermal Conductivity of a Molten Pu-Fe Eutectic (9.5 a/o Fe). John E. Deverall. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission, LA-2269*, Mar. 12, 1959, 62 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Thermal conductivity values varied from 0.034 at 220° C. to 0.042 at 400° C. in the solid state, and from 0.043 at 420° C. to 0.046 at 520° C. in the molten state, with the units of cal/cm sec C. The curves appear to be linear with positive temperature coefficients for both phases. 6 ref. (P11h; Pu-b, *Fe*, 14-60)

385-P.* (German.) Effect of Admixtures, Structure and Temperature of the Magnetic Properties of Cast Iron. Anton Koniger. *Giesserei*, v. 46, Apr. 23, 1959, p. 216-228.

Coercivity, magnetization, permeability, remanence and hysteresis, influenced by carbon, graphite, Si, Mn and P, austenite transformation; testing temperature. 22 ref. (P16, 2-60, 2-61, N8; CI, *Si, Mn, P*)

386-P.* (German.) Susceptibility Measurements on the Silver-Manganese System. Erich Scheitl, Ernst Wachtel and Arno Kalkuhl. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 464-466.

At moderate temperatures, a range of ordering with a maximum at 25 at.% Mn is assumed. The susceptibility maximum appearing after quenching from 900° C. is promoted by artificial aging and lowered by deformation. (P16, N10-b, 2-61, 3-68; Ag-b, *Mn*)

387-P.* (German.) Magnetic Properties and Ordering in Nickel-Manganese Alloys. Rolf Hahn and Eckhart Kneller. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 480-488.

Changes of magnetic properties after deformation were observed in Ni-Mn monocrystals. Recovery after deformation is thought to be connected with long-range ordering processes. 29 ref. (P16, N10b, 3-68; Ni-b, *Mn*, 14-61)

388-P. The Irradiation Stability of Low Wt. Pct. Uranium-Zirconium Alloys. A. H. Willis. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 245-251.

Specimens were irradiated in both static and power cycling tests below the phase transformation temperature; cycled to temperatures above the transformation temperature; and irradiated above 600° C. without cycling. (P10d, 2-67; U-b, *Zr*)

389-P. Solubility of Oxygen in Alpha Iron: Revision. A. U. Seybolt. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 298-301.

True oxygen solubility is very low, probably about 0.002% or less. Upon repeating oxygen saturation experiments with zone-refined Fe, it was found that the oxygen solid solubility was at least an order of magnitude less than previously observed. 6 ref. (P12e; Fe-a, *O*)

390-P. Porosity in Formed Titanium. R. A. Wood, D. N. Williams, H. R. Ogden and R. I. Jaffee. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 308-315.

Strain-induced porosity occurs in Ti and other materials at tensile strains greater than the uniform elongation of the material. Porosity in Ti increases with increasing strain and temperature, being most severe at 300 to 800° F. Strain-induced porosity is believed to be a normal part of the mechanism of deformation in ductile materials. 11 ref. (P10m, 3-68, 2-61; Ti)

391-P. The Immiscibility Limits of Uranium With the Rare-Earth Metals. J. F. Haefling and A. H. Daane. *Metallurgical Society of AIME, Transactions*, Apr. 1959, p. 336-338.

Solubilities of La and Ce in uranium are greater than those of the remaining

rare earths by a factor of more than two. The solubility of uranium is greater in Ce, Pr and Ne than in the other rare earth metals studied. 8 ref. (P13d; *La, Ce, Pr, Ne, EG-g,* U)

392-P. (English.) Contributions From Thermal Lattice Defects to the Energy Content of Au, Ag, Cu and Al. G. Borelius. *Arkiv for Fysik,* v. 15, no. 1, 1959, p. 65-80.
20 ref. (P12; M26s, Al, Au, Ag, Cu)

393-P. (German.) Magnetic Tests With Manganese-Tin Alloys. Robert Ochsenfeld. *Zeitschrift fur Metallkunde,* v. 49, Sept. 1958, p. 474-476.
Samples of modified composition tested for magnetic susceptibility and Curie-point at various temperatures. 13 ref. (P16n, P16d; Mn-b, *Sn*)

394-P. (German.) Instrument for Specific Heat Measurement. Heinrich Wollenberger. *Zeitschrift fur Metallkunde,* v. 49, Dec. 1958, p. 629-633.
13 ref. (P12r, 1-53)

395-P. (Book.) Permanent Magnet Handbook. Earl M. Underhill, Editor. 200 p. 1959. Crucible Steel Co. of America, Oliver Bldg., Mellon Square, Pittsburgh 22, Pa. $10.
Permanent magnet steels, Ferrimag, cast Alnico and other permanent magnet alloys; magnetization, demagnetization and ferromagnetism. (P16; SGA-n)

396-P. (Translation—AIP) Structure of the Energy Spectrum of Electrons in Iron-Chromium Alloys. N. D. Borisov, V. V. Nemoshkalenko and A. M Fefer. *Soviet Physics Doklady,* v. 3, July-Aug. 1958. p. 826-829.
See item 23-P, 1959. (P15k; Fe-b, *Cr*)

397-P. (Translation—AIP) Bulk Recombination in Aluminum-Doped Germanium. S. G. Kalashnikov and K. P. Tissen. *Soviet Physics—Technical Physics,* v. 3, Sept. 1958, p. 1739-1743.
See item 148-P, 1959. (P15g; Ge-b, *Al,* EG-j)

398-P.* Reactor Fuel Life—the Metallurgical Limits. M. D. Jepson. *Atomic World,* v. 10, Apr. 1959, p. 136-139.
Changes in natural uranium metal, brought about by irradiation, cause the elements to fail before the limit set by reactivity considerations. (P10d, T11g, 2-67; U)

399-P.* (French.) Electrical Properties of Thin Films of Cobalt. F. Savorin. *Journal de Physique et le Radium,* v. 19, Dec. 1959, p. 90S-92S.
Effect of time, temperature and thickness of film on resistivity and thermoelectric power. (P15, 3-67, 2-61; 14-62, Co)

400-P.* (German.) Reasons for Ferromagnetic Anisotropy. F. W. Ackermann and H. Stablein. *Metall,* v. 13, May 1959, p. 411-419.
Anisotropy caused by preferred orientation or the geometric shape of a part. Characteristics of various anisotropic materials, such as Fe-Si sheets, transformer steel, 50% Ni-Fe, 50% Co-Fe, Al-Ni-Co-Fe for permanent magnets and Fe-Co-V-Cr alloys. 17 ref. (P16, 3-72; Fe-b, *Si, Ni, Co, Al, V,* AY, SGA-n)

401-P. The Swelling of Beryllium From Neutron-Induced Gasses. C. E. Ellis. Chalk River, Ont. *Atomic Energy of Canada Ltd.,* CR-MET-809, Nov. 1958, 21 p.
Quantity of neutron induced gases in Be following irradiation in the Materials Testing Reactor was determined. The gas consists mainly of He_4. Neutron induced gases do not constitute a serious deterrent to the use of Be in reactor applications up to 600° C. 8 ref. (P10d, 2-67; Be)

402-P.* Radiation Damage Effects on Reactor Control Materials. W. E. Ray, W. K. Anderson and D. N. Dunning. Paper from "Symposium on Radiation Effects on Materials", v. 3. American Society for Testing Materials, STP no. 233, 1958, p. 103-126.
Damage to boron alloys, cermets and Cd-In-Ag alloys. 12 ref. (P10d, 2-67; B-b, Cd-b, *Ag, In,* 6-70)

403-P.* Irradiation of Uranium-Fissium Alloys and Related Compositions. Karl F. Smith. Paper from "Symposium on Radiation Effects on Materials", v. 3. American Society for Testing Materials, STP no. 233, 1958, p. 136-144.
Fissium is superior to Mo in resistance to radiation. (P10d, 2-67; Mo, U-b)

404-P.* (Russian.) Equilibrium of Carbon With Liquid Iron, Manganese and Silicon. M. S. Petrushevskii. *Zhurnal Prikladnoi Khimii,* v. 32, Jan. 1959, p. 86-94.
At 1460° C. with increased Si concentration the coefficient of carbon activity is increased. In Mn-Fe alloy increased Mn concentration results in a reduced gamma carbon. With increased Si content

the activation coefficient of carbon in Fe-Mn-Si alloys is increased. (P12e; Fe-b, *Mn, Si, C*)

405-P. (Russian.) Thermodynamic Properties of Copper-Palladium Alloys. A. A. Vecher and Ya. I. Gerasimov. *Doklady Akademii Nauk*, v. 123, no. 5, 1958, p. 868-869.

Free energy, heat and displacement entropy. 6 ref. (P12; Cu-b, *Pd*)

406-P. A Literature Survey on the Relationship Between Dimensional Changes Produced by Radiation and Crystal Structure. Irving B. Cadoff. New York University. *Wright Air Development Center*, Technical Report no. 58-325, June 1958, 14 p.

Dimensional instability in uranium seems to be related to a mass movement of atoms which may be a result of anisotropic diffusion or some form of anisotropic plastic deformation within the uranium. The dimensional instability of uranium is not accomplished by a change in lattice parameter or crystalline form of uranium. 26 ref. (P10d, M26, 3-68; U)

407-P.* (German.) Investigation on the "K-State." Horst-Guido Muller and Peter Muth. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 217-224.

Resistivity, differential thermo-electric voltage and Hall constant of Ni-Cr and Ni-Cr-Fe alloys measured after varying heat treatments and following varying degrees of cold deformation. A theory explaining the behavior in the "K-state" is developed. 19 ref. (P15g, P15j, P15p, 2-64, 3-68; Ni-b, *Cr, Fe*)

408-P.* (German.) Vapor Pressure of Liquid Zinc-Tin and Magnesium-Lead Alloys. Erich Scheil and Friedrich Wolf. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 229-233.

Zr and Mg vapor pressures and Zn and Mg activities determined for Zn-Sn and Mg-Pb alloys. In Zn-Sn alloys, a tendency towards decomposition was observed, while Mg-Pb alloys tend towards the formation of Mg_2Pb. 14 ref. (P12c, P12b; Zn-b, Sn, Mg-b, *Pb*, 14-60)

409-P.* Growth of Aluminum During Porcelain Enameling. A. L. Sopp, Jr. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 88-91.

Small dimensional changes in Al panels usually occur as a result of the enameling operation. Many factors such as alloy composition, temper, metal thickness and enamel processing variables affect the magnitude of these changes. (P10d, L27; ST, 8-71)

410-P.* Electrical Properties of Porcelain Enamels. C. G. Bergeron. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 105-113.

Room-temperature and elevated-temperature electrical properties of a conventional ground coat, a titania-opacified cover coat and a composite of cover coat over ground coat and comparison of the electrical properties of these enamels with those of currently used insulation materials. 12 ref. (P15, 2-62; 8-71)

411-P. (Russian.) Thermodynamics of Solid Solutions of Gold With Silver and Copper. Pt. 2. An. N. Nesmeyanov, L. A. Smakhlin and Lebedev. *Zhurnal Fizicheskoi Khimii*, v. 33, no. 3, 1959, p. 559-606.

Partial vapor pressure of Au and Ag in solid solution Au-Ag and Au and Cu in Au-Cu solid solutions were studied by employing radioactive isotopes Au^{198}, Ag^{110} and Cu^{64}. 16 ref. (P12c, 1-59; Au, Ag, Cu, 14-63)

412-P. The Swelling of 0.17% Burn-Up Uranium on Post-Irradiation Annealing. D. Rhodes and V. W. Eldred. *United Kingdom Atomic Energy Authority*, IGR-TN/W-933, Aug. 14, 1958, 17 p.

Post-irradiation annealing gave a density decrease of 0.01% on heating at 610° C. for periods up to 140 hr. On heating at 710° C. a 1% decrease was observed for periods up to 100 hr. After an initial change, no progressive change with time was detected at either temperature over these annealing periods. (P10d, J23; U)

413-P.* (French.) The Fine Structure of the X-Ray Absorption Discontinuities of Nickel and Iron in Ni-Fe Alloys. D. Bally and L. Benes. *Comptes Rendus*, v. 248, Apr. 20, 1959, p. 2327-2329.

Absorption spectra in Ni, Fe and three Ni-Fe alloys. 12 ref. (P17c; Fe-b, *Ni*)

414-P.* (German.) Wettability. Luigi Piatti, Alexander Kung and August Kaiser. *Werkstoffe und Korrosion*, v. 10, Apr. 1959, p. 239-243.

Experiments on the wettability of stainless steel, Al and glass after various surface treatments. Wettability is influenced by surface roughness, various degreasers and cleaners, by pickling and (as shown in the case of Al) by the degree of corrosion. 9 ref. (P13h; SS, Al, NM-f42)

415-P.* (Russian.) Measurement of the Magnetic Properties of Electrical Steels in Weak and Medium Fields. O. N. Al'tgausen and H. A. Semenova. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 426-428.

Effect of demagnetizing conditions following heat treatment on magnetic structure and temporary falling off of magnetic permeability. 4 ref. (P16; SGA-n, AY)

416-P.* (Russian.) Methods for the Determination of Magnetic Properties of Electrical Sheets. N. G. Chernysheva. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 437-439.

Supplementary data on the basic magnetization curve under dynamic conditions; relationship between specific losses and maximum magnetic induction at corresponding frequencies of magnetizing current; ultimate hysteresis cycles at varying frequencies; properties of the electrical sheets under complex magnetization. (P16, 1-54; SGA-n, AY)

417-P.* (Russian.) Specific Heat of Iron-Nickel-Aluminum and Iron-Cobalt-Aluminum Alloy Steels. Yu. O. Tret'yakov and Khomyakov. *Zhurnal Neorganicheskoi Khimii*, v. 4, no. 3, 1959, p. 645-649.

Two exothermic transitions were established in the temperature ranges 300-600° C. and 640-680° C. A relationship exists between high temperature and transition and the process of magnetic annealing of Fe-Ni-Al steel. In the Fe-Co-Al system magnetic annealing proceeds at a slow rate. 27 ref. (P12r, P16e, J23; *AY, Ni, Al, Co*)

418-P.* Vapor Pressure Measurements Over Calcium, Magnesium, and Their Alloys and the Thermodynamics of Formation of CaMg. J. F. Smith and R. L. Smythe. *Acta Metallurgica*, v. 7, Apr. 1959, p. 261-267.

The low values of the enthalpy and entropy of formation of the compound, $CaMg_2$, are consistent with the view that the compound forms because of atomic size considerations. Heats of combustion were measured for two samples of $CaMg_2$ and for corresponding weights of unreacted Ca and Mg. The difference between these heats of combustion was used to obtain the heat of formation. 28 ref. (P12; Mg-b, *Ca*)

419-P.* (Russian.) Structure Changes and Anti-Ferromagnetic Properties of Iron-Nickel Alloys. M. V. Dekhtyar. *Izvestiya Akademii Nauk Seriya Fizicheskaya Nauk*, v. 33, no. 3, 1959, p. 272-279.

Study of magnetic properties of Ni_3Fe and other Fe-Ni alloys showed that an antiferromagnetic orientation of magnetic exists below their transition temperature into paramagnetic state. 23 ref. (P16p; Ni-b, SGA-n)

420-P.* (Russian.) Structure of Iron-Aluminum Alloy With Abnormal Electrical Conductivity. E. I. Vlasov and L. N. Fedotov. *Izvestiya Akademii Nauk Seriya Fizicheskaya*, v. 23, no, 3, 1959, p. 403-405.

Tempering of Fe-Al alloy (3 to 10% Al) results in a "K" state. The alloy has an abnormal electrical resistance, monophased solid solution with a bcc. lattice. The electrical resistance increase is caused by scattering (dispersion) of electrons on the domain boundary. (P15g, J29, M27g; Fe-b, *Al*)

421-P.* (Russian.) New Iron-Platinum, Iron-Palladium and Nickel-Palladium-Iron Alloys With High Magnetostriction. Z. I. Alizade. *Izvestiya Akademii Nauk Seriya Fizicheskaya*, v. 23, no. 3, 1959, p. 416-417.

In these systems there is a range of alloys (Fe-Pt and Fe-Pd) with a maximum positive magnetostrictive saturation while the alloys (Ni-Pd) have a maximum negative magnetostriction saturation. (P16b; Fe-b, Ni-b)

422-P.* The Effects of Anisotropic Relaxation Times on the Hall Coefficients of Some Dilute Alloys of Silver. J. R. A. Cooper and S. Raimes. *Philosophical Magazine*, v. 4, Feb. 1959, p. 145-157.

Theoretical consideration of Hall effect taking into account effect of nonspherical energy surfaces and anisotropic relaxation times. Application to dilute alloys of Pd, Pt, Cd, Sn and Sb in Ag. 12 ref. (P15p, P15e; Ag-b, *Pd, Pt, Cd, Sn, Sb*)

423-P.* On the Knight Shift of Alloys. A. Blandin, E. Daniel and J. Friedel. *Philosophical Magazine*, v. 4, Feb. 1959, p. 180-182.

Changes of nuclear magnetic resonance shifts of Ag produced by various solute elements explained by fluctuations of electron density produced at long range by each solute atom. Values of the change in Knight shift for Cd, In, Sn, Sb, Pd and Pt solutes. 9 ref. (P16f; Ag-b, *Cd, In, Sn, Sb, Pd, Pt*)

424-P.* Measurements of the Optical Constants of Mercury and Mercury-Indium Amalgams in the Spectral Region 4000 to 17000

Cm^{-1}. J. N. Hodgson. *Philosophical Magazine*, v. 4, Feb. 1959, p. 183-193.

Reflection method used in measuring optical constants of free surface of Hg. 9 ref. (P17a, P17e; Hg-b, *In*)

425-P.* The Heat Capacity of Pure Silicon and Germanium and Properties of Their Vibrational Frequency Spectra. Pl Flubacher, A. J. Leadbetter and J. A. Morrison. *Philosophical Magazine*, v. 4, Mar. 1959, p. 273-294.

Heat capacities of Si and Ge between 2.5 and 300° K. Properties of lattice frequency spectra. Interpretation of anharmonic effect. 30 ref. (P12r, 2-63; EG-j, Ge, Si)

426-P.* Thermoelectric Power of the Alkali Metals at Low Temperatures. J. M. Ziman. *Philosophical Magazine*, v. 4, Mar. 1959, p. 371-379.

Effect of phonon drag calculated, taking into account electron-phonon Umklapp process and anisotropy of the Fermi surface. 8 ref. (P15j, 2-63; EG-e, Cs, Li, K, Rb, Na)

427-P.* Measurements of Thermoelectricity Below 1° K. Pt. 3. D. K. C. MacDonald, W. B. Pearson and I. M. Templeton. *Philosophical Magazine*, v. 4, Mar. 1959, p. 380-383.

Thermo-electric power of Ni, Pd, Fe, Pt, Co, Rb and Cs. (P15, 2-63; Ni, Pd, Fe, Pt, Co, Rb, Cs)

428-P.* Nuclear Magnetic Resonance in Silver-Cadmium. L. E. Drain. *Philosophical Magazine*, v. 4, Apr. 1959, p. 484-501.

Nuclear magnetic resonance shifts and line widths measured in alloys of Ag and Cd at 300° K. in a field of 4200 gauss. Theoretical interpretations. 31 ref. (P16f, P18m; Ag-b, Cd-b)

429-P. (Russian.) Shape of Steel Samples Used in Determining Their Magnetic Properties. V. V. Druzhinin. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 429-433.

(P16, 1-54, 3-73; AY)

430-P. (Russian.) Magnetic Properties of Cold Rolled Electrical Sheets. A. A. Roitman. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 433-434.

(P16e; SGA-n, AY)

431-P.* (Rumanian.) Cathodic Polarization of Nickel-Phosphorus Alloys in an Electrolyte. I. Atanasiu, A. Calusaru and Mira Popescu. *Studii si Cercetari de Chimie*, v. 6, no. 4, 1958, p. 585-596.

Reduction of polarization is caused in a Ni bath by addition of H_3PO_3 and is also influenced by temperature. Depolarization maximum at 90° C. As the concentration of H_3PO_3 increases the phosphorus content of the alloy decreases. 4 ref. (P15m; Ni-b, *P*)

432-P.* (German.) Thermodynamics of Liquid Alloys of B-Metals. Franz Eberhard Wittig. *Zeitschrift fur Elektrochemie Berichte der Bunsengesellschaft fur Physikalische Chemie*, v. 63, no. 2, 1959, p. 327-341.

Relationship between the thermodynamic behavior of binary systems of B-metals and their position in the periodic system. 41 ref. (P12r, M24b; Zn-b, Sn-b, Pb-b, Cd, In, Tl, Bi, 14-60)

433-P. Graphite-How It Compares With Metals, Ceramics. G. B. Engle and L. M. Liggett. *Materials in Design Engineering*, v. 49, June 1959, p. 88-90.

Electrical, tensile and thermal properties of graphite compared with other engineering materials. (P15g, P11, Q27a; NM-k36)

434-P. A Glossary of Physical Properties and Tests. Manual no.159. John B. Campbell. *Materials in Design Engineering*, v. 49, June 1959, p. 91-110.

Electrical, magnetic, thermal, density, optical and acoustic are major groups of properties covered. (P-general; 1-54)

435-P.* Development of High-Temperature Strain Gage Wire. W. H. Graft. Paper from "Symposium on Elevated Temperature Strain Gages". American Society for Testing Materials, STP no. 230, Philadelphia 3, 1958, p. 76-86.

Fe-base alloys containing Cr and Al investigated for use as electric strain gage materials. Alloys containing up to 25% Cr and 12.5% Al exhibit high values of resistivity and a range of thermal coefficients of resistivity ranging from positive to negative. (P11, X28j, 2-62; Fe-b, *Cr, Al*)

436-P. (Russian.) Aluminum Solubility in Acids and Alkalis Affected by Ultrasonic Waves. A. M. Ginberg. *Zhurnal Prikladnoi Khimii*, v. 32, Mar. 1959, p. 563-566.

Solubility rate of Al in acids and alkalis in contact with Cr can be considerably increased by the application of ultrasonic waves. The solubility of Al in contact with Cr in HCl solution may be retarded or accelerated by the frequency and wave intensity. (P12e, 1-74; *Al, Cr*)

437-P. (Ukrainian.) Viscosity and Conductivity of Zinc and Cadmium Amalgams. A. Z. Golik and I. F. Klassen. *Ukrainskii Fizicheskii Zhurnal*, v. 3, no. 5, 1958, p. 683-687.

Temperature dependence of the viscosity is subjected to an exponential law, the activation energy of the viscous curves being a linear function of the concentration. (P10f, P15g; Zn, Cd, *Hg*)

438-P. Polarisation of Nickel and Aluminum in Neutral Solutions. J. H. Greenblatt and E. M. Levy. *Journal of Applied Chemistry*, v. 9, May 1959, p. 269-273.

(P15; Ni, Al)

439-P. (Russian.) Theory of Radioactive Changes in Metals. I. M. Lifshits, M. N. Kaganov and L. M. Tamarova. *Atomnaya Energiya*, v. 6, Apr. 1959, p. 391-401.

12 ref. (P18)

440-P.* (French.) Influence of Trace Amounts of Iron on Electric Resistance of High-Purity Aluminum at Liquid Hydrogen Temperature. F. Montariol. *Comptes Rendus*, v. 248, Mar. 9, 1959, p. 1519-1520.

By measuring the electrical resistance at low temperature it is possible to observe the transformation into solution or the precipitation of traces of Fe in high-purity Al. (P15g, 2-60, 2-63; Al-a, *Fe*)

441-P.* (Japanese.) Solubility of Zirconium in Liquid Magnesium and Magnesium Alloys. Riei Ichitaka. *Nagoya Institute of Technology, Report*, no. 10, 1958, p. 197-203.

Unfavorable effect of Al, Mn, Si and Fe on grain-refining properties of Zr. Maximum solubility curves at 700 or 800° C. in the Mg corner of the ternary phase diagram are derived. (P12e, M24c, 2-60; Mg-b, *Zr, Al, Mn, Si, Fe*, AD-p35)

442-P.* (Russian.) Investigation Into the Thermodynamics of Solid Solutions of Gold, Silver and Copper. D. Ya Chopovov and V. A. Lebedev. *Zhurnal Fizicheskoi Khimii*, v. 33, no. 2, 1959, p. 342-348.

Saturated vapor pressure of solid Au, Ag and Cu were measured by Knudsen diffusion method, employing radioactive isotopes Au^{198}, Ag^{110} and Cu^{68}. 12 ref. (P12c, 1-59; Au, Ag, Cu)

443-P. (Translation—AIP.) Calculation of the Limit Values of the Activation Energy of Various Processes in Solid Metals. K. A. Osipov. *Soviet Physics Doklady*, v. 3, July-Aug. 1958, p. 848-850.

See item 162-P, 1959. (P13a)

444-P. (Translation—Brutcher no. 4505.) Some Magnetic Properties of Present-Day Permanent-Magnet Materials and Their Commercial Uses. K. Tendeloo. *Metalen*, v. 13, Aug. 15, 1958, p. 268-272.

See item 637-P, 1958. (P16, X11g; SGA-n)

445-P.* (Polish.) Effect of Plastic Deformation on the Properties of Transformer Sheet. Georg Juretzek. *Hutnik*, v. 26, Mar. 1959, p. 98-105.

Ingot specimens of four melts of steel with 2.73, 3.21, 3.87 and 4.40% Si were hot rolled, heated, cold rolled and reheated in hydrogen and in vacuum, 2-5 hr. at 800-1100° C. Magnetic properties of electrical steel sheet; effect of vacuum heat treatment and rolling. 7 ref. (P16, F23, 3-68, 2-64; SGA-n, 4-53, AY)

446-P. Effect of Molybdenum on the Overpotential of Copper Deposition. H. R. Skewes. *Australian Journal of Applied Science*, v. 10, Mar. 1959, p. 85-94.

Addition of 20 mg. per liter Mo^{VI} to an acid Cu sulphate electrolyte containing 40 g. per l. Cu and 50 g. per.l H_2SO_4 resulted in a decrease in the cathode overpotential of 40 millivolts during electrolysis at 24 milliamps. per sq. cm. and 30° C. 19 ref. (P15; Cu, *Mo*)

447-P.* Studies on Industrialization of "MT" Permanent Magnets. Tokushichi Mishima and Noboru Makino. *Tetsu-to-Hagane Abstracts*, no. 7, 1957, p. 2-12.

New magnet steel is an Fe-Al-C ternary alloy and does not contain rare metals. It has magnetic properties nearly equal to a middle-cobalt magnet steel with intermediate quality between Alnico and Cr magnet steel. Chemical composition; heat treatment; microstructure and phase diagram; magnetic properties; magnetic stability; industrial applications. (P16, X11g; Fe-b, *C, Al*, SGA-n)

448-P.* Single Crystal Anisotropy and Magnetostriction Constants of Several Ferromagnetic Materials Including Alloys of NiFe, SiFe, AlFe, CoNi and CoFe. R. C. Hall. *Journal of Applied Physics*, v. 30, June 1959, p. 816-819.

Effects of order-disorder reaction on these properties in Fe, Ni and a wide range of binary and tertiary alloys. 31 ref. (P16b, N10, 3-72, 2-60; Fe-b, Ni-b, *Si, Co, Mo, Al*, 14-61, SGA-n)

449-P. The Examination and Evaluation of Irradiated Thorium-11 w/o Uranium

Specimens. John E. Gates, Gerald E. Lamale and Ronald F. Dickerson. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1334, Apr. 16, 1959, 40 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Swelling of all specimens appeared to be a linear function of burn-up to the highest level studied (1.5 total a/o) and at temperatures below about 1100° F. Swelling increased significantly above 1100° F., even at burn-ups as low as 0.2 a/o. Fission gas losses were due to diffusion and recoil. 5 ref. (P10d, 2-67; Th-b, *U*)

450-P.* Electron Cloud Outside a Metal Surface. Ragnar Holm. *Journal of Applied Physics,* v. 30, May 1959, p. 792-793.

Estimations of attraction between parallel metal surfaces produced by electron clouds. 4 ref. (P15j)

451-P.* (Spanish.) Spoiling of F-233 Permanent Magnet Steel Alloyed With Tungsten. J. Terraza and J. M. Bermudez de Castro y Mosquera. *Instituto del Hierro y del Acero,* d. 12, Jan-Mar. 1959, p. 46-64.

Magnetic properties of steel alloyed with 5.50-6.50% W in spoiled and recovered conditions and relation of structural changes caused by heat treatment. Influence of composition of magnetic properties. 52 ref. (P16, 2-60, 2-64; AY, *W*, SGA-n)

452-P.* (Rumanian.) Semiconductor Properties of Antimony-Zinc Alloys. M. Protopopescu, D. Crimer, E. Fokt and T. Dulamita. *Studii si Cercetari de Metallurgie,* v. 4, no. 1, 1959, p. 33-57.

Thermo-electric properties are determined for various compositions and structures. Microhardness is influenced by the distribution of phases. Relationship between electromotive force and conductivity. 24 ref. (P15g, Q29q, 2-60, 3-71, M24b; Sb-b, *Zn*)

453-P.* (Ukrainian.) Electrical Resistance of Cast Iron at High Temperatures. V. K. Titov and V. S. Vanin. *Dopovidi Akademii Nauk Ukrainskoi R.S.R.,* v. 4, no. 4, 1959, p. 396-398.

Electrical resistance of white cast iron during graphitization, when heated above critical temperature, remains unchanged. At temperatures below the critical point the lower electrical resistance, as influenced by graphitization, becomes more obvious the lower the temperature at which the Rho phase of cast iron exists. (P15g, N8s, 2-61; CI)

454-P.* Nuclear Relaxation in Aluminum. John J. Spokas and Charles P. Slichter. *Physical Review,* v. 113, Mar. 15, 1959, p. 1462-1472.

Nuclear spin-lattice relaxation time and phase memory times measured in 99.99% pure Al foil from 77° K. to the melting point by the spin-echo method. Data on high-temperature resonance. The line narrowing which occurs at 330° C. is examined. 28 ref. (P16f, 2-62; Al, 4-56)

455-P.* Magnetic Field Dependence of the Surface Impedance of Superconducting Tin. M. Spiewak. *Physical Review,* v. 113, Mar. 15, 1959, p. 1479-1494.

Surface impedance at 1 kmc. per sec. of Sn investigated as a function of temperature and static magnetic field. 18 ref. (P16, 2-61; Sn, 4-61)

456-P.* Nuclear Spin Relaxation in Normal and Superconducting Aluminum. L. C. Hebel and C. P. Slichter. *Physical Review,* v. 113, Mar. 15, 1959, p. 1504-1519.

Measured in Al from 0.94° K. to 4.2° K., and as a function of static field in the normal state. 27 ref. (P16f, 2-63; Al)

457-P.* (French.) Deformation of Irradiated Fuel Elements. Ch. Allain and P. Thome. *Revue de Metallurgie,* v. 56, May 1959, p. 443-450.

Radiation induced surface deformation, growth, variations in density, expansion and swelling, bowing and cracking tendencies in uranium and uranium alloy fuel elements. 36 ref. (P10d, T11g, 2-67; U)

458-P.* (German.) Effect of Alpha-Irradiation on the Electron Structure of Aluminum. E. Schmid. *Osterreichische Akademie der Wissenschaften-Mathematisch-Naturwissenschaftliche Klasse-Anzeiger,* v. 95, no. 1-15, 1958, p. 186-189.

The decrease of conductivity following irradiation is explained by a reduced mobility of electrons and a decrease in the number of holes. 4 ref. (P15, 2-67; Al)

459-P.* (German.) The Law of Magnetic Convergence Studied in Single Crystals of Nickel and Nickel-Cobalt Following Plastic Deformation. Helmut Kronmuller. *Zeitschrift fur Physik,* v. 154, no. 5, 1959, p. 574-600.

Ferromagnetic saturation measurements after tensile deformations at room temperature and at -183° C. The increase in differential susceptibility with the degree of deformation is explained

by the magnetostrictive effect of dislocations that are produced as a result of the deformation. 25 ref. (P16, M26b, 3-68; Ni, Ni-b, *Co*, 14-61)

460-P.* (Rumanian.) Properties of Cast Iron. V. P. Ciornobrovkin. *Studii si Cercetari de Metalurgie*, v. 4, no. 1, 1959, p. 7-19.

Relationships between cooling from the liquid state, contraction and electrical resistance; data on structural changes. (P10c, P15g, N12; CI)

461-P.* (Rumanian.) Influence of Manganese on the Contraction of Solidifying Cast Iron. L. Sofroni and C. Cosneanu. *Studii si Cercetari de Metallurgie*, v. 4, no. 1, 1959, p. 21-32.

Gray cast iron with varying Mn and P content tested for contraction, structural changes, hardness, initial dilation and contraction before pearlite formation. (P10c, N12, Q29n, 2-60; CI-n, *Mn, P*)

462-P.* (German.) Mathematical Calculation of Heat Flow for the Heating and Cooling of Finite Solid Cylinders Applicable to the Heat Treatment of Large Forgings. Heinz Uhlitzsch. *Neue Hutte*, v. 4, May 1959, p. 277-287.

Theoretical calculations allowing conclusions on stresses present in ingots, castings, and forgings during heat treatment. 13 ref. (P11, Q25p, J-general; ST, 5-60, 4-51, 5-59)

463-P.* (German.) Effect of Alpha-Irradiation on the Electron Structure of Aluminum. W. Kapp and F. Stangler. *Zeitschrift fur Physik*, v. 154, no. 4, 1959, p. 486-494.

Computation of the number and mobility of electrons and holes and of their partial conductivities, based on the Hall constant and on electrical conductance. Irradiation and measurements were carried out in a liquid air bath. (P15, 2-67; Al)

464-P.* Activities of Silica and Alumina in Molten $CaO\text{-}SiO_2Al_2O_3$ Slags. K. Sanbongi and Y. Omori. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 10 p.

Activities of silica and alumina in molten slags at 1630° C. calculated from electromotive force of reversible cells. 6 ref. (P12b, D11n; RM-q)

465-P.* Measurements of the Viscosity of Undercooled Molten Metals. Gilbert Cavalier. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 12 p.

Viscosity of molten Sn, Cu, Fe, Co and Ni in pure argon. 24 ref. (P10f; Sn, Cu, Fe, Co, Ni, 14-60)

466-P.* Thermodynamic Study of Iron Sulphide-Iron Oxide Melts. Sigmund Bog and Terkel Rosenqvist. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 7 p.

Composition of iron sulfide-iron oxide melts equilibrated at 1120-1400° C. with ternary gas mixture, hydrogen, + hydrogen sulfide, + water vapor. Calculation of activities. 3 ref. (P12, M24c; Fe, *O, S*, 14-60)

467-P.* Densities of Molten Silver, Copper and Iron. G. Urbain and L. D. Lucas. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v. 2. Her Majesty's Stationery Office, London, 1959, 10 p.

Determination of densities and coefficients of volumetric expansion from difference in least pressure needed to release bubble of argon from end of a tube in each of two depths of immersion. 25 ref. (P10a, P11g; Ag, Cu, Fe, 14-60)

468-P.* High-Temperature Enthalpy of Gamma and Delta Pure Iron. Michel Olette and Albert Ferrier. Paper from "Physical Chemistry of Metallic Solutions and Intermetallic Compounds", v, 2. Her Majesty's Stationery Office, London, 1959, 11 p.

Results of measurements obtained with an adiabatic drop calorimeter on a specimen of 99.97% Fe. 21 ref. (P12r, N6p; Fe-a)

469-P.* (German.) Iron and Lead Interface Reactions. E. Pelzel. *Metall*, v. 13, June 1959, p. 552-554.

Conditions at the interface of a binary system consisting of molten Pb and solid Fe. Addition of alloying elements to the melt affects solubility of Fe in Pb. Wetting, surface tension, angle of contact and interface bond-strength discussed as a function of Sn and Sb content. 6 ref. (P13h, P12e; 14-60, Pb, Fe, Sn, Sb)

470-P.* (Russian.) Magnetic Properties of Some Copper-Nickel-Iron Alloys. D.

Balli and A. Glodyani. *Revue de Physique Academie de la Republic Populaire*, v. 3, Feb. 1959, p. 132-139.

Residual magnetism of isothermally treated Cu-Ni-Fe alloys increases proportionately to increases in tempering time, reaching 400 Gauss units, depending on the alloy composition. The magnitude of residual magnetism for any given Ni content is determined by the relative Fe-Cu concentration. 13 ref. (P16, 2-60, 2-64; Cu-b, Fe, Ni)

471-P. (Czech.) Porosity Tests on Lacquer-Coated or Tinned Surface of Sheet Metal Used in Food Preservation. Alena Hrabakova-Zvonickova. *Obaly*, no. 4, July-Aug. 1958, p. 108-109.

Colorimetric and electrolytic testing methods. 9 ref. (P10m, S13a; 4-53, 8-62, 8-65, NM-g)

472-P.* (Germaa.) Magnetic After-Effects in Fe-Si Alloys at Elevated Temperatures. H. D. Dietze. *Technische Mitteilungen Krupp*, v. 17, May 1959, p. 67-81.

Initial permeability of Fe-Si alloys decreases following demagnetization at temperatures above 300° C. This phenomenon is interpreted as the diffusion of vacancies into the Bloch wall. The higher potential in the wall leads to a drop in permeability. (P16q, 2-62; Fe-b, *Si*)

473-P.* (German.) Change of Initial Permeability With Temperature in the MnO-ZnO-FeO-$FeZnO_3$ System. W. Heister. *Technische Mitteilungen Krupp*, v. 17, May 1959, p. 82-89.

A second peak is formed in the graph of permeability versus temperature for Mn-Zn ferrites. This is due to the magnetic after-effect and largely depends on the FeO excess in the system. Sintering temperature and atmosphere are influencing factors. 8 ref. (P16q; NM-a34, Fe, *Mn, Zn, O*, 6-72)

474-P.* (German.) Magnetic Materials. H. Fahlenbrach. *Technische Mitteilungen Krupp*, v. 17, May 1959, p. 95-99.

Magnetization and demagnetization curves for an assortment of materials. Magnetization is influenced by direction in the monocrystal and is determined either by rotation of magnetization vectors or by displacement of Bloch walls. 8 ref. (P16; SGA-n)

475-P.* (German.) Effects of the Surface Structure of Electrodes on Current Density and Potential. Heinz Sudermann. *Archiv fur das Eisenhuttenwesen*, v. 30, June 1959, p. 371-380.

Mathematical considerations on the effects of surface roughness, geometrical shape and of surfaces composed of two or more phases. 20 ref. (P15m, 3-73, 3-71)

476-P. (Book-German.) Magnetic Materials (Gmelin's Handbook for Inorganic Chemistry. Iron System no. 59, Pt. D Supplementary Volume.) Gmelin Institut, Frankfurt am Main. Verlag Chemie, GmbH., Weinheim/Bergstrasse, 1959, 580 p.

Properties of ferromagnetic elements and alloys including Fe, Fe alloys, Co and Co alloys, Ni and Ni alloys, Cr alloys and permanent magnet alloys. Data on ferrospinels, iron oxides, M-Fe-oxides and M-M-Fe oxides. (P16; Fe, Co, Ni, Cr, *O*, SGA-n, 14-68)

477-P.* (Russian.) Passivation of Platinum Electrode. E. T. Aikazyan. *Zhurnal Fizicheskoi Khimii*, v. 33, May 1959, p. 1016-1022.

Passivation in HCl, HBr, H_2SO_4, $HClO_4$ and NaOH solutions showed that the process is associated with a fall in the number of pits of the electrode surface, caused by the specific adsorption of anions which lowers the Pt-H bond energy. 16 ref. (P15, R10c; Pt)

478-P.* (French.) Electrochemical Behavior of 18-8 Austenitic Stainless Steel With Molybdenum in Dilute Sulphuric Acid. Philippe Berge. *Comptes Rendus*, v. 248, June 22, 1959, p. 3557-3559.

Polarization of samples in 20% H_2SO_4. Depassivation process and dissolution potential are retarded in steels containing approximately 3% Mo. (P15m, R6g, 2-60; SS-e, *Mo*)

479-P.* (German.) Undercooling Behavior of Tin, Affected by Vibrations. Friedrich Erdmann-Jesnitzer and Jochen Schubert. *Neue Hutte*, v. 4, June 1959, p. 359-365.

Sn melt containing impurities shows no anomaly in its undercooling behavior when exposed to vertical vibrations of 40 to 70 Hz. at temperatures above the solidification point of Sn, while vibration at temperatures close to the solidification point causes slight undercooling. 26 ref. (P12n, 3-69; Sn, 14-60)

480-P. (Russian.) Thermodynamic Properties of Binary Metallic Systems by Electromotive Force Technique. A. V. Nikol'skaya,

A. L. Lomov and Ya. I. Gerasimov. *Zhurnal Fizicheskoi Khimii*, v. 33, May 1959, p. 1134-1139.

12 ref. (P12, M24b)

481-P.* (French.) Crystallization of Al-Al_2Cu Alloys. Claude Mascre and Aleth Touguet. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, June 1959, p. 1-13.

Structural changes and thermodynamic properties of Al-Cu alloys with and without Ti additions (up to 1%). Solidification and undercooling are affected by the composition ratio. The undercooling effect decreases with the addition of Ti. 19 ref. (P12n, N12, M27d, 2-60; Al-b, *Cu, Ti*)

482-P.* (Russian.) Stability of Zinc-Base Alloys. V. I. Veprintsev and A. G. Spasskii. *Liteinoe Proizvodstvo*, June 1959, p. 18-20.

Dimensional changes in Zn-base die castings are caused by the decomposition of unstable phases and the occurrence, during rapid casting, of intercrystalline corrosion. It was found that admixtures of 0.3-0.8% Pb, Cd and Sn present in Zn have no remarkable influence on the change of dimensions. Stabilized heat treatment reduces these changes. 11 ref. (P10d, R2h, 2-64, 2-60; 5-61, Zn-b, *Pb, Cd, Sn*)

483-P.* Ultrasonic Attenuation by Electrons in Metals. Eugene I. Blount. *Physical Review*, v. 114, Apr. 15, 1959, p. 418-436.

Calculation of ultrasonic attenuation for arbitrary frequency and band structure. The results are applied to the cases of a metal with a spherical energy surface and a semimetal with electrons in two "valleys". Possible experimental uses and the occurrence of saturation. (P15)

484-P.* (English.) The Delta E Effect in Iron-Nickel Alloys. Mikio Yamamoto. *Tohuku University, Science Reports of the Research Institutes*, Series A, v. 11, Apr. 1959, p. 102-119.

Variation in Young's modulus of elasticity with magnetization for annealed Fe-Ni alloys covering whole range of compositions. Density and magnetic characteristics. 32 ref. (P16, P10a, Q21a, Q27a; Fe-b, *Ni*)

485-P.* (Chinese.) The Rectangular Hysteresis Loop of Grain-Oriented Nickel-Iron Alloy. Tai Li-chi and Liu Ren-Pao. *Acta Metallurgia Sinica*, v. 4, Mar. 1959, p. 60-68.

D-c and a-c. methods for measuring magnetic properties of 50% Ni-Fe alloy. The ratio between remanence and magnetic saturation induction, and the coercive force is taken as a criterion for assessing the magnetic characteristics of the alloy. (P16a; Ni-b, *Fe*)

486-P.* (German.) Behavior of Electrical Measuring Strips Used to Control Elongation When Exposed to Radiation. H. Buhler and W. Schreiber. *Atomkern-Energie*, v. 4, no. 4, 1959, p. 138-140.

Commercial measuring strip was exposed to neutron irradiation. Insulation resistance decreases while the resistance of Ni-Cr wire increases with irradiation time. Constantan wire showing slighter resistance changes is preferred. 15 ref. (P15g, X28j, 2-67; Ni-b, Cu, U)

487-P.* (German.) Behavior of Hydrogen Present in Iron and Iron Alloys Investigated by Magnetic Measurements. Friedrich Erdmann-Jenitzer and Irmtraud Bohm. *Materials Testing*, v. 1, Feb. 20, 1959, p. 43-53.

Relay sheet, deep drawing sheet and dynamo sheet were made the cathode in a H_2SO_4 electrolyte exposing them to the action of hydrogen. Effects of hydrogen, previous deformation and Si content on coercivity. 11 ref. (P16a, 2-60, 3-68; ST, 4-53, *H, Si*)

488-P. An Experimental Determination of the Increase With Temperature of the Resonance Absorption in Uranium and Thorium. V. G. Small. *United Kingdom Atomic Energy Authority*, AERE R/R 2774, Apr. 1959, 25 p.

Measurements made with the DIMPLE pile oscillator of the change in the effective resonance absorption integral of U and Th bars of various diameters produced by heating the bars to temperatures up to 270° C. Experimental data interpreted in terms of Doppler temperature coefficients of the resonance integral. 27 ref. (P18m, 2-61; U, Th)

489-P. The Preparation and Properties of 14 to 17% Aluminum-Iron Alloys. A. Foster and D. Pavlovic. Westinghouse Electric Corp. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151472, May 1958, 41 p. $1.25.

Mechanical, physical and magnetic properties of Al-Fe alloys. Effects of heat treatment on magnetic properties. Potential applications. (P16, Q-general, 2-64; Fe-b, *Al*, SGA-n, 17-57)

490-P. Effect of Temperature on the A-C Magnetic Properties of Nickel-Iron Alloys.

J. J. Clark and J. F. Fritz. Westinghouse Electric Corp. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151601, Aug. 1958, 44 p. $1.25.

Magnetic properties studied on Hipernik, Hipernik V, Deltamax, Hymu 80, Supermalloy and 4-79 Mo-Permalloy for temperatures from -60 to 250° C. (P16, 2-61; Fe-b, *Ni*, SGA-n)

491-P.* The Properties of Metals at Low Temperatures. H. M. Rosenberg. Paper from "Progress in Metal Physics" v. 7. Pergamon Press Inc., New York, 1958, p. 339-389.

Effect of low temperature on thermal conductivity, creep, fatigue and specific heat of some dozen metallic elements. 192 ref. (P11h, P12r, Q3, Q7a, 2-63)

492-P.* (German.) Physical Properties of Pure Copper. F. Pawlek. *Metall*, v. 13, July 1959, p. 630-637.

Resistivity is affected by imperfections resulting from cold deformation, irradiation or quenching and varies both with the kind and amount of impurities. (Research at Institut fur Metallhutten kunde der Technischen Universitat, Berlin.) 44 ref. (P15g, 3-68, 3-69, 2-67; Cu-a)

493-P.* (Italian.) Surface Quality of Nonferrous Castings. *Fonderia*, v. 8, June 1959, p. 239-242.

Factors influencing surface roughness. (P13h, S15; EG-a38, 5, 9-71)

494-P. The Heats of Combustion of Some Rare-Earth Metals. F. H. Spedding, R. E. Eberts and A. W. Naumann. Ames Laboratory. *U. S. Atomic Energy Commission*, ISC-934, May 15, 1959, 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

A bomb calorimeter is used for measuring the heats of combustion of Nd, Sm, Gd and Er. (P12q; Nd, Sm, Gd, Er, EG-g)

495-P. Synthesis of a (110) 001 Type Torque Curve in Silicon Iron. C. G. Dunn and J. L. Walter. *Journal of Applied Physics*, v. 30, July 1959, p. 1067-1072.

Orientations and sizes of all the grains in a polycrystalline disk specimen of high-purity 3.25% silicon iron are measured to determine a calculated magnetic torque curve and the texture of the specimen. 11 ref. (P16, 3-72, 3-73; Fe-b, *Si*)

496-P.* Magnetic Annealing in Permivar. Pt. 2. Magnetic Properties. E. A. Nesbitt and R. D. Heidenreich. *Journal of Applied Physics*, v. 30, July 1959, p. 1000-1003.

Magnetic anisotropy introduced by heat treatment in a magnetic field arises either from short-range order within the faults or from the arrangements of the faults each of which is parallel to a (111) into regions whose shape anisotropy is along the direction of the magnetic field. 11 ref. (P16, J23, 2-60; Ni-b, *Fe, Co*, SGA-m)

497-P.* Effect of Neutron Irradiation on Thermally and Mechanically Induced Non-equilibrium States in AuCu. R. L. McCollum and G. Allen. *Journal of Applied Physics*, v. 30, July 1959, p. 1105-1108.

In thermally disordered specimens, the effect of the irradiation decreased the resistivity in completely disordered states and increased the resistivity in completely ordered states. The effect on mechanically disordered specimens was to increase the resistivity. 14 ref. (P16, 2-67; Au-b, Cu, 14-68)

498-P.* On the Electrical Conductivity of Metals. G. V. Chester and A. Thellung. *Physical Society, Proceedings*, v. 73, May 1, 1959, p. 745-766.

Application of Van Hove's techniques for quantum mechanical transport problems to the derivation of conductivity formulas without use of repeated random phase assumption. 14 ref. (P15g)

499-P.* Effect of Copper on the Work Function of Liquid Tin. T. C. Toye. *Physical Society, Proceedings*, v. 73, May 1, 1959, p. 807-810.

Photo-electric work function of liquid Sn containing up to 1% Cu determined by measurement of stopping potential when surface is irradiated by light from Sn spark. 6 ref. (P15k, 2-60; Sn-b, *Cu*, 14-60)

500-P.* Permanent Magnet Materials. F. Anselin. *Cobalt*, v. 3, June 1959, p. 17-27.

Basic magnetism, domain theory and explanation of magnetic properties in Co alloys. (To be continued.) (P16; Co-b, SGA-n)

501-P. Effects of Neutron-Induced Gas Formation on Beryllium. C. E. Ells and E. C. W. Perryman. *Journal of Nuclear Materials*, v. 1, Apr. 1959, p. 73-84.

Density decrease observed after the annealing of Be, previously exposed to irradiation, is attributed to the growth of voids containing He^4. 15 ref. (P10a, 2-67, 2-64; Be, *He*)

502-P. Heat Capacity of Copper Below 300° K. A Test of Two Calorimeter Designs. Thomas A. Sandenaw. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission*, LA-2307, Mar. 1959, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Values for the heat capacity of OFHC Cu are given to show the reliability to be expected from determinations of heat capacity of elements in which the self-heating by radioactive disintegration is appreciable and can be used as the sole source of heating. (P12r, X24e; Cu)

503-P.* Electrochemical Properties of the Platinum Metals. M. J. N. Pourbaix, J. Van Muylder and N. de Zoubov. *Platinum Metals Review*, v. 3, July 1959, p. 100-106.

Ir, Pd, Rh and Ru potential-pH diagrams for study of electrochemical and corrosion properties. 14 ref. (P15, R-general; Ir, Pd, Rh, Ru, EG-c)

504-P.* (French.) Sulphur Adsorption by Copper Surfaces at Elevated Temperatures. Jacques Oudar. *Comptes Rendus*, v. 249, July 6, 1959, p. 91-93.

Adsorption of sulphur from a $H+H_2S$ atmosphere at 830° C. and 10 cm. M.C. pressure. The surface activity varies with the ratio $H:H_2S$. 5 ref. (P13d, 3-74, 2-66; Cu, *S*)

505-P.* (Czech.) Surface Tension of Liquid Metals and Slags. Ivan Kasik and Jiri Skala. *Hutnicke Listy*, v. 14, July 1959, p. 602-608.

Various methods applied in surface tension measurements. Values for the surface tension of various slags and alloy steels at a certain temperature. 8 ref. (P13h, 2-60; AY, 14-60, RM-q)

506-P. (Russian.) Radiation Capacity of Metal in a Liquid Phase. A. M. Samarin and D. Ya. Svet. *Doklady Akademii Nauk SSSR*, v. 126, Jan. 1959, p. 78-80.

15 ref. (P18n, 14-60)

507-P. (Russian.) Thermodynamic Properties of Liquid Metallic Solutions in the Magnesium-Lead System. M. F. Lantratof. *Zhurnal Neorganicheskoi Khimii*, v. 4, June 1959, p. 1415-1419.

6 ref. (P12s; Mg-b, *Pb*, 14-61)

508-P.* (English.) Reflection of Light From a Metal With a Thin Interfering Nonmetallic Film. Antonin Vasicek. *Czechoslovak Journal of Physics*, v. 9, no. 3, 1959, p. 296-300.

Influence of the thickness of an Al_2O_3 film on the azimuth and the phase difference. (P17a; Al, 14-62, 14-68)

509-P.* (English.) The Susceptibility of Lead Telluride PbTe. Milos Matyas. *Czechoslovak Journal of Physics*, v. 9, no. 3, 1959, p. 301-308.

Susceptibility measurements carried out with PbTe samples of n-type or p-type semiconductor properties, containing either an excess of Pb or Te, or Cl or Ag^+ ions as impurities. 11 ref. (P16; EG-j, Pb-b, *Te, Cl, Ag*)

510-P.* (German.) Electron Emission of Thin Aluminum Platings. Vaclav Strelka. *Czechoslovak Journal of Physics*, v. 9, no. 3, 1959, p. 377-378.

Emission of thin Al layers on mica occurring at various temperatures in CH_2 + Ar and C_2H_5OH + Ar atmospheres of low pressure. (P15k; Al, 14-62)

511-P.* (Russian.) Influence of an Alternating Magnetic Field on the Remanence of Magnetically Soft Materials. Vladimir Hajko, Juraj Daniel-Szabo. *Czechoslovak Journal of Physics*, v. 9, no. 1, 1959, p. 37-46.

Ring-shaped sheets of Ni, Permally, transformer steel and two ferrites are exposed to an alternating field to study the remanence as a function of the field amplitude. 5 ref. (P16a; Ni, CN, SGA-n, 4-53)

512-P.* (Russian.) Determination of the Reflection Coefficient. Frantisek Lukes. *Czechoslovak Journal of Physics*, v. 9, no. 1, 1959, p. 118-123.

Measurement of the reflection coefficient for Ge in ultra-violet and visible light. 7 ref. (P17a; Ge)

513-P. (English.) Energy Balance in the Optics of Metals. Zdenek Knittl. *Czechoslovak Journal of Physics*, v. 9, no. 2, 1959, p. 133-145.

10 ref. (P15k)

514-P. (English.) Measurement of Hall Coefficient and Electrical Conductivity in Semi-Conductors by Method of an Alternating Current. Jan Dusek. *Czechoslovak Journal of Physics*, v. 9, no. 2, 1959, p. 250-255.

6 ref. (P15p, P15g; EG-j)

515-P.* Activity of Cd in Mg-Cd Alloys. Richard J. Borg and C. Ernest Birchenall. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 393-395.

Vapor pressures of eight compositions determined by the Knudsen effusion technique. Measurements are made at several temperatures for each alloy and the results interpolated to a common temperature for the calculation of the activities. 8 ref. (P12c, P12b; Mg-b, *Cd*)

516-P.* Heat Content and Specific Heat of WC-Co Alloys. H. J. Booss. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 395-397.

Mean specific heat in the temperature range from 20 to −190° C. Deviations of the individual values exclude construction of a correlation between specific heat and Co content with satisfying exactness. There seems to be a minimum of the specific heat up to 5% Co. 6 ref. (P12r; W, Co, 6-69)

517-P.* (French.) Effect of Oxygen on the Electrochemical Behavior of Stainless Steel in Dilute Sulphuric Acid. Phillippe Berge. *Comptes Rendus*, v. 249, July 15, 1959, p. 262-264.

Electrodes of 18-8 stainless steel with 3% Mo are exposed to a voltage in the electrolyte with dissolved oxygen present or absent. Effects of oxygen on the current intensity and on the passivation process. 6 ref. (P15, R10c, R1a, R6g; SS, *Mo, O*)

518-P.* Solubility of Thorium Dihydride in Thorium Metal. D. T. Peterson and D. G. Westlake. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 444-447.

Solubility increases from about 1 at.% at 300° C. to above 20 at.% at 800° C. Over this temperature range the log of the solubility is a linear function of the reciprocal absolute temperature for Th of good purity. The heat of solution of thorium dihydride is 7.9 k-cal. per atom of hydrogen in crystal bar Th and 6.6 k-cal. per atom of hydrogen in Ames Th. (P12e, 2-61; Th)

519-P.* The Isothermal Transfer From Solid to Liquid in Metal Systems. J. M. Lommel and B. Chalmers. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 499-508.

Isothermal transfer of material from solid Pb into liquid Pb-Sn alloys. When there is no stirring of the liquid the process is controlled by liquid diffusion, while at high stirring rates it is controlled by a surface reaction. The activation energy for the surface reaction was 2 ±1 k-cal. per mole, as predicted by a kinetic theory of melting and freezing. 21 ref. (P12; Pb-b, *Sn*)

520-P. (Book.) The Properties of the Rare Earth Metals and Compounds. John A. Gibson, James F. Miller, Paul S. Kennedy and George W. P. Rengstorff. 197 p. May 1959. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.

Collected properties of rare earth elements and compounds; phase diagrams of rare earth elements; properties of some 16 rare earth elements and their components. (P-general, Q-general, M24; EG-g)

521-P.* Temperature Dependence of Residual Magnetization in Alnico V. Yoshikichi Konishi and Kazuo Yamakawa. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 74.

Change in residual magnetization of Alnico V with temperature between +60 and -60° C. (P16, 2-61; Al-b, *Ni, Co, Fe*)

522-P. Magnetostriction in Iron and Silicon Steel. Eiji Tatsumoto, Tetsuhiko Okamoto, Akinori Mishimura and Akira Fukai. *Hiroshima University, Journal of Science*, v. 22, Sept. 1958, p. 120-135.

(P16b; Fe-b, AY, *Si*)

523-P. Redetermination of the Lead-Lead Sulphide Equilibrium Between 585 and 920° C. J. R. Stubbles and C. E. Birchenall. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 535-538.

Equilibrium between lead-lead sulphide and circulating atmospheres of hydrogen and hydrogen sulphide measured between 585 and 920° C. The equilibrium atmospheres were analyzed by an iodometric method. Angles between the crystallographic planes were calculated for In. (P12d; Pb)

524-P.* (French.) Hall Effect of Thin Nickel Films. Antoine Colombani and Guy Goureaux. *Comptes Rendus*, v. 249, July 20, 1959, p. 381-383.

Measurements in a vacuum on Ni films obtained by evaporation. Hall effect varies with thickness of film and testing temperature. (P15p, 2-61, 3-73; Ni, 14-62)

525-P.* (French.) Variations of the Coefficient of Secondary Emission by the Enery of Bombarding Ions. Pierre Cousine, Nicole Colombie, Charles Fert and Rene Simon. *Comptes Rendus*, v. 249, July 20, 1959, p. 387-389.

Bombardment of Al, Pb, Mo and Cu with A^+ and H^+ ions. Secondary emission coefficient varies with the metal and the kinetic energy of ions. 6 ref. (P15k, 2-60; Al, Pb, Mo, Cu)

526-P. (French.) Method for the Determination of Adiabatic Shock and Its Application to Metals. Jean Jacquesson. *Comptes Rendus*, v. 249, July 20, 1959, p. 369-371.

5 ref. (P12r)

527-P.* (English.) Thermostatic Bimetal. *Aciers Fins et Speciaux*, no. 32, July 1959, p. 42-47.

Increase in the specific deflection of the bimetal results in increased sensitivity for same length and thickness, reduced bulk, increased work output or forces developed. Good results are obtained by Fe-Ni-Co alloys in which the deflection gain is 30-50%. Double helicoidal bimetal design assured a linear expansion. (P11g, X9q; Fe-b, *Ni, Co*, SGA-s, 8-66)

528-P. Nuclear Irradiation Effects on Ferromagnetic Core Materials. R. S. Sery and D. I. Gordon. U. S. Naval Ordnance Laboratory. *U. S. Office of Technical Services*, PB 151174, June 1958, 72 p. $2.

The highest permeability, lowest coercive force materials, such as Supermalloy and 4-79 Mo Permalloy, were degraded drastically by irradiation. Materials such as Mumetal, grain-oriented 50-50 Ni-Fe and 48 Ni-Fe also deteriorated appreciably, but to a lesser degree. Least damage was shown by Si-Fe, Al-Fe and 2 V Permendur. (P16, 2-67; Ni-b, *Fe*, Fe-b, *Si, Al*, SGA-n)

529-P. Thermal Properties of Certain Metals. Pt. 2. Iron, Beryllium, Iridium, Palladium, Platinum and Tungsten. T. C. Goodwin, Jr., and M. W. Ayton. Library of Congress. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151679, Sept. 1958, 321 p. $5.

Bibliography of references, with abstracts, to pertinent open literature published from 1920 to 1957, and to unclassified military research reports issued from about 1944 to 1957. Among the thermal properties included are heat capacity, thermal conductivity, emissivity, thermal diffusivity and thermal expansion. (P11; Fe, Be, Ir, Pd, Pt, W)

530-P. The Effect of Radiation on the Physical and Mechanical Properties of Metals and Alloys. Stanley Wallack. *Wright Air Development Center*, Technical Report no. 68-605, Feb. 1959, 30 p.

Results of fast neutron irradiation of Al 1100, Al SAP, Al 2024-O, Al 2024-T3, Ti 75A and Ti 6A1 4V alloys. 7 ref. (P-general, Q-general, 2-67; Al-b, Ti-b, *Al, V*)

531-P.* Properties of Various Semiconductors. A. Joffe. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 6-14.

Thermal conductivity as a function of electrical conductivity. Thermal resistivity, Hall constant and electrical conductivity as a function of testing temperature. Carrier mobility of semiconducting mixtures varying with the concentration of a component. (P15g, P15p, P11h, 2-61, 2-60; EG-j)

532-P.* Binding and Semiconductor Properties of $A^{III}B^{V}$ Compounds. O. G. Folberth and H. Welker. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 14-20.

Polarization of valence electrons is thought to increase with increasing B^{V}-ions, with the chemical bond and with the mean atomic weight. Lattice potential as a function of polarization. 18 ref. (P15, 2-60; EG-j)

533-P.* Studies on the Recombination of Electrons and Holes in Germanium. S. G. Kalashnikov. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 52-59.

Lifetime of nonequilibrium charge carriers in Al, B, P and Cu-doped Ge as a function of equilibrium carrier concentration. 26 ref. (P15g, 2-60, 3-69; Ge, *Al, B, P, Cu*)

534-P.* Deep Level Impurities in Germanium. W. W. Tyler. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 59-65.

Positions, with reference to the band edges, of deep acceptor levels introduced into Ge by the elements Zn, Cd, Mn, Fe, Co, Ni, Cu, Ag and Au, and of deep donor levels introduced by S, Se and Te. 54 ref.

(P15g, 2-60, 3-69; Ge, *Zn, Cd, Mn, Fe, Co, Ni, Cu, Ag, Au, S, Se, Te*)

535-P.* Giant Traps. Melvin Lax. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 66-73.

Theories explaining the existence of centers of giant (10^{-15} to 10^{-12} sq.cm.), large (10^{-17} to 10^{-15} sq.cm.) and minuscle (10^{-22} sq.cm.) neutron capture cross-sections in Si and Ge containing impurities. 5 ref. (P15g, P18j, 3-69; Si, Ge)

536-P.* Radiative Recombination and Lifetime in Germanium. Patricia H. Brill and Ruth F. Schwarz. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 75-77.

Experiments showing the relationship between the net rate of radiation per unit volume, the equilibrium concentration and excess concentration of carriers. After exposing a Ge semiconductor to light, the recombination radiation and change in resistance were measured. (P15g, P18h, 2-67; Ge, 9-51)

537-P.* Carrier Recombination in Germanium as a Function of Temperature Between 100 and 550° K. S. Goldstein, H. Mette and W. W. Gartner. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 78-80.

Conductivity and photoconductance and the open-circuit photo-magneto-electric (PME) field of Ge crystals are measured as functions of temperature to evaluate the lifetimes. 6 ref. (P15g, 2-61; Ge, 14-61)

538-P.* Effect of Annealing on the State of Certain Impurities in Germanium. V. E. Lashkarev, E. G. Miselyuk and K. D. Glinchuk. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 84-86.

Samples of Ge, doped with Fe, Ni or Co, were annealed and the effect on carrier concentration and lifetime studied. (P15g, 2-64, 3-69; Ge, *Fe, Ni, Co*)

539-P.* The Electrical Structure of Semiconductor Surfaces. A. Many. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 87-96.

Energy distribution and hole and electron capture cross-sections of the fast states in Ge and Si are deduced from field effect and surface recombination measurements. 26 ref. (P15g, P18j, Ge, Si)

540-P.* The Effect of Some Surface Treatments on the Characteristics of Fast States on Germanium Surfaces. E. Harnik and Y. Margoninski. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 96-99.

Influence of etching in various media on the surface combination velocity and trapped charge density. 4 ref. (P15g; Ge)

541-P.* Optical and Magnetic Surface Studies on Germanium. Ralph Bray and R. W. Cunningham. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 99-102.

Remarkable conductance increase after illumination by white light is explained by an increase of electron charge in the slow states inside or on the oxide layer. 6 ref. (P15g, P17, R2r; Ge, *Au, O*)

542-P.* Magneto-Surface Properties of Near Intrinsic Germanium. J. N. Zemel and R. L. Petritz. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 102-105.

Surface conditions are modulated by a cycle consisting of wet, dry and sparked oxygen. The sample is then exposed to a magnetic field to measure Hall coefficient and magnetoresistance as functions of the conductance change. Discrepancies between measured and theoretical results allow the assumption of a diffuse surface scattering mechanism. (P15g, R1h; Ge, 9-51)

543-P.* Effect of the Metal-to-Semiconductor Potential on the Semiconductor Surface Barrier Height. N. J. Harrick. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 106-108.

The infrared intensity transmitted by a Ge sample exposed to infrared light was measured when the etched Ge surface was brought in contact with Hg or Ga. Changes in transmitted intensity are interpreted as changes in surface conductivity and changes in the semiconductor surface barrier height. 4 ref. (P15g, 2-66; Ge, 9-51, EG-j, *Hg, Ga*)

544-P.* Hall Mobility of a Cleaned Germanium Surface. Rolland Missman and Paul Handler. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, 109-111.

The surface of Ge slab is cleaned by argon ion bombardment and annealed in a vacuum at 650° C. The effect of a thin oxygen atmosphere on conductivity and Hall coefficient were measured. (P15g, 2-60; Ge, *O*)

545-P.* Electrical Properties of Clean Germanium Surfaces. G. A. Barnes and P. C. Banbury. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 111-113.

Ge surfaces are exposed to the air after cleaning by bombardment with positive ions from an inert gas discharge and after vacuum annealing. Effects of composition and oxygen contamination on field effect and photoconductance. (P15g, R3, 2-60; Ge, 9-51, *O*)

546-P.* (English.) Magnetostriction Constants of Face-Centered Cubic Nickel-Copper and Nickel-Cobalt Alloys. Mikio Yamamoto and Takuro Nakamichi. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 11, June 1959, p. 168-182.

Determination of saturation magnetostriction in (110) and (111) directions at room temperature using single crystal disk specimens and strain gage technique. Magnetostriction of Ni alloys containing 7 to 25 at.% Cu or 10 to 55 at.% Co. 20 ref. (P16b, 2-60, 3-73; Ni-b, *Cu, Co*)

547-P.* (English.) Thermocouples With Curved Characteristics Composed of Fe-Al-Cr and Cu-Ni Alloys. Yuki Shirakawa, Toru Ohara and Daiji Amemiya. *Tohoku University, Science Reports of the Research Institutes,* Series A, v. 11, June 1959, p. 190-200.

Thermo-electromotive forces of Fe-Al (up to 8% Al), Fe-Cr (up to 15% Cr), Fe-Al-Cr (up to 6% Al), and 11% Cr and Cu-Ni alloys (up to 5% Ni) between 100-800° C. Characteristics of thermocouples composed of Fe-Al-Cr and Cu-Ni alloys. 10 ref. (P15j, X9q; Fe-b, *Al, Cr,* Cu-b, *Ni*)

548-P.* (German.) Variation in Electrical Resistance of Tungsten Wire at Low and High Temperatures as Dependent on Metal Structure. W. Kleber and G. Kohlstrung. *Technik,* v. 14, Apr. 1959, p. 281-285.

Measurements between 20 and 800° C. indicate that heated and recrystallized wires show a greater variation in electrical resistance than hot drawn wires. Relative deviation in recrystallized specimens increases proportionally with increasing grain size. 9 ref. (P15g, 2-61, 2-59, N5; W, 4-61)

549-P.* (Spanish.) Antiferromagnetism. Victor S. Giron. *Revista de Ciencia Aplicada,* v. 13, May-June 1959, p. 213-221.

General exposition of Neel theory of decomposition of the magnetic lattice into two equal sublattices magnetized in opposite directions. (P16p)

550-P. (Russian.) Calculation of New Nucleus to Measure Pressure of Vapor Saturated Metals. Yu. N. Lubitov and V. M. Polyanskii. *Doklady Akademii Nauk SSSR,* v. 125, Jan. 1959, p. 135-138.

(P12c)

551-P. (Russian.) Heat of Formation of Alloy Calcium-Aluminum. I. V. Kocherov, Yu. M. Gertman and I. V. Gel'd. *Zhurnal Neorganicheskoi Khimii,* v. 4, May 1959, p. 1106-1112.

13 ref. (P12q; Ca-b, *Al*)

552-P.* (German.) Properties of Metallic Melts. Pt. 26. The Internal Friction of Eutectic Aluminum Alloys. Erich Gebhardt and Karl Detering. *Zeitschrift fur Metallkunde,* v. 50, July 1959, p. 379-385.

For alloys with 80-100% Zn and 0-32% Si both the viscosity-concentration isotherms and the graphs representing the activation energy for the viscous flow as a function of concentration show continuity. The viscosity and viscous flow activation energy of alloys with 20-43% Mg are influenced by the presence of the intermetallic compound Al_3Mg_2. 29 ref. (P10f, Q22, 2-61, 2-60; Al-b, *Zn, Si, Mg,* 14-60)

553-P.* (German.) The Specific Volume of Liquid Antimony-Bismuth Alloys. Erich Pelzel. *Zeitschrift fur Metallkunde,* v. 50, July 1959, p. 392-395.

Determination of specific volume in the solid state at room temperature and in the liquid state near 700° C., for alloys with 0-100% Bi. On the Bi side, formation of Bi_3Sb causes dilation; contraction occurs by Sb_3Bi formation on the Sb side. 14 ref. (P10a, 2-60, 2-61; Sb-b, *Bi,* 14-60)

554-P.* (German.) Thermodynamic Activities of Liquid In-Cd Alloys and Formation Enthalpy of the Intermetallic Phase $InCd_3$. Theo Heumann and Bruno Predel. *Zeitschrift fur Metallkunde,* v. 50, July 1959, p. 396-402.

Thermodynamic activities are determined from vapor pressure measurements at 426-580° C. with alloys containing 0-100% Cd. Computation of the formation enthalpy for $InCd_3$, based on the enthalpy change occurring in the dissociation of $InCd_3$, and on the formation enthalpy of the solid solution of high In content. 10 ref. (P12, 2-60, M24b; In-b, *Cd*, 14-60)

555-P.* (Russian.) The Anisotropy of Heat Conductivity in Monoclinic Tellurium. Kh. I. Amirkhanov, G. B. Bagdyev and M. A. Kazhlaev. *Doklady Akademii Nauk, SSSR*, v. 123, Mar. 1959, p. 554-556.

Measurement of the heat conductivity of a monoclinic Te produced in the furnace by slow cooling from 750° K. to room temperature. The anisotropy of heat conductivity is explained by the fact that the direction of the heat flow is perpendicular to the shearing off plane. (P11h, Te)

556-P.* The Effect of Uniaxial Tensile Stress on Impurity Conduction in Germanium. H. Fritzsche. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 257-259.

The conductance of samples was measured for various stresses and temperatures. (P15g, 3-66, 3-69, 2-61; Ge)

557-P.* Absorption Spectra of Group V Donors in Germanium. H. Y. Fan and P. Fisher. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 270-272.

Effect of quantity of Sb impurities on the absorption spectrum for light of 60-170 microns wavelength. 5 ref. (P17c, 3-69; Ge, *Sb*)

558-P.* Far Infrared Magneto-Optic Effects From Impurities in Germanium. W. S. Boyle. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 321-323.

Effect of a magnetic field on the far infrared transmission by Ge single crystals at liquid He temperature. 7 ref. (P16e, 3-69; Ge, 14-61)

559-P.* Microwave Hall Effect in Germanium and Silicon at 20 Kmc/s. G. E. Hambleton and W. W. Gartner. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 329-332.

Determination of the Hall mobility in a d.c. and in a 20 kmc/s field for temperatures from 80 to 500° K. 10 ref. (P15p, 3-69; Ge, Si)

560-P.* (French.) Electromagnetophotomic Effect in Germanium. Maurice Bernard. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 332-337.

An intrinsic Ge-semiconductor sample cut from a crystal is exposed to a magnetic field and simultaneously to an electric field. Infrared emission through recombination transitions is the result. 8 ref. (P15k; Ge)

561-P.* Thermal Conductivity of Germanium in the Temperature Range 300-1080° K. B. Abeles. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 340-343.

Single crystals of n-type Ge were placed between a heater and a sink to measure thermal conductivity. Thermal and electrical conductivities vary with testing temperature. 12 ref. (P11h, P15g, 2-61; Ge, 14-61)

562-P.* Electronic Properties of Gray Tin Single Crystals. A. W. Ewald and O. N. Tufte. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 523-525.

Measurements of conductivity, Hall coefficient, magnetoresistance coefficient and transverse magnetoresistance at temperatures from 4.2 to 273° K. 4 ref. (P15, P16; Sn, 14-61)

563-P.* Measurement of the Galvanomagnetic Effects in Pure Tellurium. H. Roth. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 525-530.

Resistivity and Hall coefficient as functions of temperature. Magnetoresistance as a function of the angle between the current and the magnetic field. 11 ref. (P15p, P16, 2-61; Te-a)

564-P.* (French.) Usefulness of Tests in a High Magnetic Field: Application to Study of Steels. P. Bastien and A. Sulmont. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 131-143.

Apparatus measures intensity of magnetization between 20 and 700° C. in cylindrical specimens about 100 mm. long by 6 mm. diameter, in a variable field of 100 to 3500 oersteds. Fields of application include determination of magnetic phases in a duplex material, such as austenitic-ferritic steel. 19 ref. (P16, X26; ST)

565-P. Electrode Potential Behavior on Titanium in Fluoride Media. E. M. Khairy and M. M. El-Khatib. *Egyptian Journal of Chemistry*, v. 1, no. 1, 1958, p. 65-74.

Fluoride ion exerts a specific activating effect on the metal surface depending on both its concentration and concentration of the hydrogen ion in the solution. (P15; Ti)

566-P. (Russian.) Cathodic Behavior of Stainless Steel in Nitric Acid Solution. E. N. Mirolyubov and M. M. Kurtetsov. *Doklady Akademii Nauk, SSSR*, v. 125, June 1959, p. 1288-1291.

11 ref. (P15; SS)

567-P.* Radiation Effects on Recombination in Germanium. Orlie L. Curtis, Jr. *Journal of Applied Physics*, v. 30, Aug. 1959, p. 1174-1180.

Minority carrier lifetime is studied as a function of temperature and gamma or fission-neutron irradiation and conclusions reached on the recombination process. 30 ref. (P15g, 2-61, 2-67; Ge)

568-P.* High-Energy Electron Irradiation of Germanium and Tellurium. Victor A. J. van Lint and Harold Roth. *Journal of Applied Physics*, v. 30, Aug. 1959, p. 1235-1238.

Effect of irradiation at 78° K. on conductivity and the reciprocal of the Hall coefficient of Te. By annealing, the original conductivity is restored. Irradiation of n-type Ge at room temperature caused first intrinsic properties and then p-type behavior. 8 ref. (P15g, 2-61, 2-64, 2-67; Ge, Te)

569-P.* Heat Capacity of Aluminum Between 0.1° K. and 4.0° K. Norman E. Phillips. *Physical Review*, v. 114, May 1, 1959, p. 676-685.

Heat capacity of Al between 0.11 and 4.0° K. in normal state and between 0.17 and 1.2° K. in superconducting state. 31 ref. (P12r, 2-63; Al-a)

570-P.* Impurity Effects on the Superconductive Critical Temperature of Indium and Aluminum. G. Chanin, E. A. Lynton and B. Serin. *Physical Review*, v. 114, May 1, 1959, p. 719-724.

Superconductive critical temperatures of In containing small amounts of Bi, Pb, Tl, Sn, Cd or Ga and of Al containing small amounts of Zn, Mg, Ag, Ge or Si. Effect of electronic mean free path and of valence difference between solvent and solute. 6 ref. (P15g, 2-63, 3-69; In, Al, *Bi, Pb, Tl, Sn, Cd, Ga, Zn, Mg, Ag, Ge, Si*)

571-P.* Aluminum Clad Copper 40%. *Sylvania Wire Technical Information Bulletin*, n. d., 4 p.

Electrical conductivity of Al-clad Cu wire at temperatures to 900° F. Density, composition and mechanical properties. Applications of anodized wire. (P15g, P10a, Q27a; Cu, *Al*, 4-61, 8-66)

572-P.* Capture Diameter of Dislocations in Low-Angle Grain Boundaries in Germanium. Rolf K. Mueller. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 157-161.

The conductance of a sample of n-type semiconductor properties measured at testing temperatures from 350-200° K. and at various angles to the direction of grain boundaries. 5 ref. (P15g, 2-61, M26b, M27f; Ge, 9-51)

573-P.* The Effect of Pressure on the Properties of Germanium and Silicon. William Paul. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 196-204.

Effects of pressure on intrinsic resistivity, carrier mobility, magnetoresistance and dielectric constant. 20 ref. (P15g, P15n, 3-74; Ge, Si, 9-51)

574-P.* Dielectric Constant of Germanium and Silicon as a Function of Volume. Manuel Cardona, William Paul and Harvey Brooks. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 204-206.

The refractive index for infrared wavelengths from 1-5 microms measured at various temperatures. 5 ref. (P15n, P17b, 2-61; Ge, Si)

575-P.* On Photo-Ionization by Fast Electrons in Germanium and Silicon. Victor S. Vavilov. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 223-226.

Reflectivity and photo-electric efficiency as a function of photon energy. 18 ref. (P15k; Ge, *In*)

576-P.* Effect of Electron and Impurity Density on the Field-Dependence of Mobility. J. B. Gunn. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 239-241.

Measurements of the resistance of a thin Ge filament (containing Sb) as a function of applied voltage. 6 ref. (P15g, 3-69; Ge, *Sb*)

577-P.* The Mobility of Electrons Heated by Microwave Fields in n-Type Germanium.

T. N. Morgan. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 245-249.

Simultaneous exposure of an n-type Ge semiconductor to a steady d.c. field and to a modulated microwave field. Electron mobility varies with the microwave field. (P15g; Ge)

578-P.* The High-Temperature Stability of Oxides and Sulphides. D. T. Livey. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 145-151.

Free energy of formation, melting point and vapor pressure of refractory oxides. 20 ref. (P12; NM-a34, NM-a37)

579-P.* Hall Effect, Resistivity and Magnetoresistivity of Th, U, Zr, Ti and Nb. Ted G. Berlincourt. *Physical Review*, v. 114, May 15, 1959, p. 969-977.

Effect of temperature and of exposure to a magnetic field on Hall effect, resistivity and magnetoresistivity. 30 ref. (P15, P16e, 2-61; Th, U, Zr, Ti, Cb)

580-P. Anodic Behavior of Titanium at Low and High Current Densities With Particular Reference to the Specific Effect of the Fluoride Ion. E. M. Khairy and M. M. El-Khatib. *Egyptian Journal of Chemistry*, v. 1, no. 1, 1958, p. 75-85.

Ti exposed to air is covered with a protective dioxide film, making it passive; fluoride ion exerts an appreciable corrosive action on its surface. (P15, R-general; Ti)

581-P.* Activity of Carbon in Liquid-Iron Alloys. Tasuku Fuwa and John Chipman. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 708-716.

The effects of various elements on the activity coefficient of carbon in liquid Fe have been studied by two experimental methods: equilibration with controlled mixtures of CO and CO_2 and the solubility of graphite in the melt. Activity coefficient of C is increased by Al, Co, Cu, Ni, P, Si, S and Sn. It is decreased by Cr, Cb, Mn, Mo, W and V. 22 ref. (P12b, 2-60; Fe, 14-60, *Al, C, Co, Cu, Ni, P, Si, S, Sn, Cr, Cb, Mn, Mo, W, V*)

582-P.* On the Heats of Formation of Copper-Nickel Alloys. J. S. Ll. Leach and Michael B. Bever. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 728-729.

Calorimetric measurements of the heat effects on dissolution of some Cu-Ni alloys in Sn. 10 ref. (P12q; Cu-b, *Ni, Sn*)

583-P.* (German.) The Ratio V_{15}/V_{10} of Hot Rolled Transformer Sheet and the Hysteresis Loss as a Function of Specific Gravity. Theodor Bruggemann. *Neue Hutte*, v. 4, Apr. 1959, p. 207-209.

Lowering of hysteresis loss by vacuum annealing and vacuum treatment in the ladle. Variation of the ratio V_{15}/V_{10} (V_{15}, V_{10} = hysteresis losses for field strengths of 15000 and 10000 G.) Specific gravity as a function of Si content. 6 ref. (P16s, P10a, D9m, 2-60, 2-64, 1-73; CN, 5-59, SGA-n, *Si*)

584-P.* (Spanish.) Deterioration of Magnetic Properties of Tungsten Magnet Steel. Pt. 2. Jose Terraza Martorell, Jose M.ª Bermudez de Castro y Mosquera. *Instituto del Hierro y del Acero*, v. 12, Apr-June 1959, p. 122-135.

Measurement of magnetic properties after various heat treatments. Metallographic and radiographic structure tests. (P16, 2-64, 3-71; SGA-n, AY, *W*)

585-P. Electrode Potential Behavior of Titanium in Solutions Initially Free From the Metal Ions. E. M. Khairy and M. M. El Khatib. *Egyptian Journal of Chemistry*, v. 1, no. 1, 1958, p. 47-55.

9 ref. (P15; Ti)

586-P. Methods for Determining the Thermodynamic Activities of Alloy Constituents at High Temperatures. P. Gross, D. L. Levi and G. L. Wilson. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 113-115.

Effusion and capillary vessel methods. (P12, 1-54)

587-P. Gamma Rays Following Thermal Neutron Capture in Titanium. J. W. Knowles, G. Manning, G. A. Bartholomew and P. J. Campion. *Physical Review*, v. 114, May 15, 1959, p. 1065-1074.

36 ref. (P18j; Ti)

588-P. The Magnetic Susceptibility of Semi-Conductors. R. Bowers. Paper from "Advances in Semi-Conductor Science". Pergamon Press, Inc., New York 22, 1959, p. 206-211.

Literature review covering Ge, In and Sb. 20 ref. (P16; Ge, In, Sb)

589-P.* Deviations From Matthiessen's Rule and Lattice Thermal Conductivity of Alloys. P. G. Klemens. *Australian Journal of Physics*, v. 12, June 1959, p. 199-202.

The difference in the ideal electronic thermal conductivity between an alloy and a pure metal can be estimated from the

difference in the ideal electrical resistivity using the Wiedeman-Franz law. The ideal resistivity arises by the scattering of electrons by lattice waves. (P11h, M26)

590-P.* Thermodynamics of the Lead-Tin System. W. B. Kendall and R. Hultgren. *Journal of Physical Chemistry*, v. 63, July 1959, p. 1158-1160.

The heats of formation of solid solutions of Sn in Pb are measured at 450° K. by liquid Sn solution calorimetry. Results are correlated with thermodynamic data and phase diagrams. A wide range of thermodynamic properties for both liquid and solid alloys are determined. (P12, M24b; Pb, Sn, 14-60, 14-67)

591-P.* The Melting of Finite Slabs. Theodore R. Goodman and John J. Shea. *American Society of Mechanical Engineers*, Paper no. 59-APMW-11, 1959, 9 p.

Use of heat balance integral method to determine melting rate of finite slab, which is initially at uniform temperature below melting point and is acted upon by a constant heat input at one face and has its other face either insulated or kept at initial temperature. Time histories of melting and temperature distribution in slab. (P11k, P12; 4-52)

592-P.* Solubility of Carbon in Silicon and Germanium. R. I. Scace and G. A. Slack. *Journal of Chemical Physics*, v. 30, June 1959, p. 1551-1555.

Solubility of carbon in Si is measured from 1500-2900° C. The enthalpy of the solution is established. Phase diagrams for the system include solubility data and peritectic point. Solubility of carbon in Ge was measured at temperatures from 2780 to 3170° C. (P12e, M24b; Si, Ge, *C*)

593-P.* The Dissociation Pressure of Aluminum Carbide. D. J. Meschi and A. W. Searcy. *Journal of Physical Chemistry*, v. 63, July 1959, p. 1175-1178.

The vapor pressure of Al_4C_3 has been measured in the temperature region 1500 to 1800° K. by Knudsen effusion and torsion methods. Results indicate there to be no more than 2% C content in the vapor when Al carbide is dissociated at 1600° K. (P12c; Al, NM-a35)

594-P.* Heat Continues as Major Problem. F. C. Krug. *Missiles and Rockets*, v. 5, July 20, 1959, p. 90-100.

Capabilities of high-temperature materials, melting points, recrystallization temperature and estimated capacity of basic materials for missile applications. (P11k, T24e, 2-62; SGA-h, 17-57)

595-P.* Effects of Dissolved Gas on Superconducting Characteristics of Tantalum. W. B. Ittner and J. F. Marchand. *Physical Review*, v. 114, June 1, 1959, p. 1268-1269.

Thin wires of varying nitrogen content are exposed to longitudinal magnetic fields of 0-600 oersteds and resistance is measured as a function of the field strength. A higher nitrogen content caused a resistance increase. (P15g, P16, 2-60; Ta, *N*, 4-61)

596-P.* (English.) Anodic Behavior of Titanium in Alkaline Solution. Hiroshi Chiba. *Electrochemical Society of Japan, Journal*, v. 27, no. 1-3, 1959, p. E6-E8.

Effect of dissolved oxygen upon the anodic potential time curves and potential changes in aerated sodium borate solutions. Oxygen has no effect on the initial linear portion of the potential increase but it effects the flat and upper parts of the potential increase. (P15; Ti)

597-P.* (English.) Electrochemical Behavior of Zinc in H_2SO_4-Zn. Yoshihiro Hisamatsu. *Electrochemical Society of Japan, Journal*, v. 27, no. 1-3, 1959, p. E44-E45.

Polarization behavior of Zn in Zn electrolyte such as sulphuric acid-zinc sulphate solution. (P15)

598-P.* Effect of Irradiation on Fuel Materials. Pt. 2. J. H. Kittel and S. H. Paine. *Nuclear Energy*, v. 13, July 1959, p. 357-360.

Deleterious changes occurring at moderate irradiation temperatures in unalloyed uranium with suitable metallurgical treatment are principally caused by surface roughening and anisotropic growth. Alloying additions alter the transformation kinetics of uranium so that preferred orientations, resulting from fabrication procedures, may be removed by heat treatment. (P10d, 2-67, 2-60, 2-64, N-general, T11g, M26c; U-a)

599-P.* (English.) Anodic Polarization and Anodic Protection of Titanium Against Hydrochloric and Sulphuric Acids. Rikuro Otsuka. *Electrochemical Society of Japan, Journal*, v. 27, no. 1-3, 1959, p. E41-E43.

Specimens used were prepared from cold rolled and vacuum-annealed Ti sheet 0.5 mm. thick and 99.5% pure. Anode potential-current density curves of Ti were obtained together with the open-circuit activation and passivation potentials and minimum current density. (P15, L17; Ti)

600-P.. (Russian.) Magnetic Susceptibility of Al-Sb and Ga-Sb Alloys in the Liquid State. A. A. Vertman and V. M. Glazov. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*,. Jan-Feb. 1959, p. 60-63.

Susceptibility tests performed at temperatures from 1050-1350° C. (for Al-Sb alloys) and from 700-1180° C. (for Ga-Sb alloys). At an composition ratio of 50 at. %, a chemical reaction of the two components and dissociation at higher temperatures are assumed. 7 ref. (P16, 2-60, 2-62; Al-b, *Sb*, Ga-b, *Sb*, 14-60)

601-P. (Russian.) Correction of Formulas Applying to Normal Solutions. I. T. Sryvalin and O. A. Esin. *Nauchnye Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 5-9.

Formulas concerning thermodynamical properties are applied to the alloys Sn-Tl, Sn-Zn and Na-Cd. 13 ref. (P12; Sn-b, *Tl, Zn*, Cd-b, *Na*)

602-P. (Book.) Advances in Semi-Conductor Science. J. Badeen and H. Brooks. 553 p. 1959, Pergamon Press Inc., 122 E. 55th St., New York 22, N. Y. $15.

Collection of papers presented at the Third International Conference on Semi-Conductors held at the University of Rochester, U.S.A. Subjects covered include band theory, impurity centers, dislocations, excitons and photons, ionic crystals, magneto-optical effects, semi-conducting compounds, etc. Papers abstracted separately. (P15g; EG-j)

603-P.* The Thermal and Electrical Conductivities of Ductile Cast Iron and Several Gray Cast Irons. J. H. Brophy and M. J. Sinnott. *American Society for Metals, Transactions*, Preprint no. 139, v. 52, 1959, 16 p.

Thermal conductivity increased and electrical conductivity decreased as the effective length of the graphite particles increased. The lowest thermal conductivity and highest electrical conductivity were found when the graphite was spheroidal. In ferritic ductile cast irons, the thermal conductivity was found to be higher and the electrical conductivity lower than those of the graphite-free iron matrix. The magnitude of this difference was independent of the maximum graphite sphere size, but was dependent upon the volume percent of the graphite present and the orientation of the atomic structure in the graphite phase. 17 ref. (P11h, P15g, N8s; CI-r, CI-n)

604-P.* The Lattice Thermal Conductivity of Dilute Alloys of Silver and Gold. G. K. White, S. B. Woods and M. T. Elford. *Philosophical Magazine*, v. 4, June 1959, p. 688-692.

Electrical and thermal conductivities of fully annealed dilute alloys of Fe in Au and Sn in Ag between 2 and 150° K. Calculation of lattice thermal conductivity and comparison with theoretical values. 12 ref. (P11h; Ag-b, *Sn*, Au-b, *Fe*)

605-P. (Russian.) Coercivity Change of Patented Steel by Deformation. K. F. Starodubov and V. K. Babich. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 151-153.

Effects of deformation and heat treatment on the coercivity of patented carbon steel. (P16a, 3-68, 2-64; CN-p, CN-r)

606-P. (Russian.) Structural Changes Occurring in the Heat Treatment of K40NKHM Type Alloys After Cold Deformation. B. G. Livshits and and N. G. Makhukov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 175-178.

Effects of testing temperature and heat treatment temperature on the expansion coefficient and electrical resistance. Changes of the same properties caused by the presence of Mo. (P11g, P15g, N11h, 2-64, 3-68, 2-60, 2-61; Co-b, *Cr, Ni, Fe*)

607-P.* Electrochemical Process in the Decomposition of Sodium Amalgam. I. Hine, M. Okada, S. Yo. Shizawa and S. Okada. *Electrochemical Society of Japan, Journal*, v. 27, no. 1-3, 1959, p. E46-E50.

Polarization data in the decomposition of the amalgam—electrolytic current, hydrogen over-voltage on the graphite and steel cathode, anode polarization curves and temperature characteristics. (P15; Hg-b, Na, NM-k36)

608-P.* The Solubility of Tantalum and Cobalt in Sodium by Activation Analysis. J. A. Grand, R. A. Baus, A. D. Bogard, D. D. Williams, L. L. Lockhart and R. R. Miller. *Journal of Physical Chemistry*, v. 63, July 1959, p. 1192-1194.

Solubilities of Ta and Co were determined by equilibrating Na in Ta and Co vessels at three temperatures. Na was irradiated in the material testing reactor and the solubility values determined from a separation and counting of the active

isotopes in the Na. (P12e, S11q, 1-59; Ta, Co, Na)

609-P.* (English.) Electrical Conductivity of Metals at Low Temperatures. I. Supek. *Nuovo Cimento*, v. 12, May 1959, p. 1202-1204.

Bloch's integral equation for metal electrons in an electrical field, at very low temperatures, can be reduced to a differential equation on the energy surface. The same can be done for Peierl's system where the change of lattice quanta distribution is taken into consideration. (P15g, 2-63)

610-P. (Russian.) Determination of Melting and Solidification Points of Co-Cr-Ti Alloys by the Optical Method. E. K. Zakharov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 239-243.

Measurements with a photo-electric pyrometer. Constitution diagrams. 5 ref. (P12n, N12, S16; Co-b, *Cr, Ti*)

611-P.* Hydrogen in Uranium. R. Darras and R. Caillat. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 19-27.

Hydrogen can be associated with uranium in two distinct ways; either dissolved in the metal, or in the form of a hydride. The solubility of hydrogen in uranium depends on the allotropic form of the metal; it is greater in molten than in solid uranium. Two types of hydride, both given by the formula UH_3, have been identified. The first, the alpha-type, is stable at low temperature. It is generally accompanied by small amounts of the beta-type, into which it is wholly transformed above 140°C. 36 ref. (P12e, N6p; U, *H*)

612-P.* Wetting by Liquid Metals. J. W. Taylor. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". Pergamon Press, Inc., New York 22, 1959, p. 398-416.

Wetting is controlled by the three interfacial tensions, liquid-vapor, liquid-solid and solid-vapor. Dependence of these on temperature and composition. 24 ref. (P13h, 2-60, 2-61; 14-60)

613-P.* (English.) Effects of Heat Treatment on the Electrical Properties of Silicon. Y. Matukura. *Physical Society of Japan, Journal*, v. 14, July 1959, p. 918-923.

Changes in carrier concentration and minority carrier lifetimes are observed in pulled single crystals of Si after heat treatment in the range 400-1200°C. At low temperatures, the formed donors are fewer near defects. At high temperatures, carrier concentration decreases in both p and n-type crystals, and formed donors are annihilated. (P15g, 2-64; Si, 14-61)

614-P.* Chemistry and Physics of Zinc Technology. R. Schuhmann, Jr. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 65-102.

Structures and physical properties of Zn and its compounds. Thermodynamics of Zn roasting and smelting reactions. 31 ref. (P-general, M25, P12, M26, C21, B15; Zn)

615-P. (German.) Use of a Slightly Inhomogeneous Magnetic Field for the Quantitative Determination of Small Ferromagnetic Admixtures in Susceptibility Measurements. Dieter Gerstenberg. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 472-477.

14 ref. (P16, S11g, 1-53; SGA-n)

616-P.* Magnetothermal Effects in Iron and Silicon-Iron. L. F. Bates and D. J. Sansom. *Physical Society, Proceedings*, v. 74, July 1, 1959, p. 53-64.

Measurement of thermal changes accompanying the magnetization of Fe, 0.05% Si-Fe, and a single crystal of 2.7% Si-Fe. (P16, P11; Fe-b, Si, 14-61)

617-P.* (German.) Addition Elements Influencing the Activity of Carbon Dissolved in Liquid Iron in Quantities Near the Saturation Point. Franz Neumann and Hermann Schenck. *Archiv fur das Eisenhuttenwesen*, v. 30, Aug. 1959, p. 477-483.

Effect of V, Mo, Cr, Mn, Ni, Cu, Al, Sb, Si, P, Sn and S additions. The influence on the activity exerted by an element depends on its position in the periodic system. 13 ref. (P12b, 2-60; Fe, 14-60, *C, V, Mo, Cr, Mn, Ni, Cu, Al, Sb, Si, P, Sn, S*)

618-P.* (German.) New Research on Supraconductivity. W. Buckel. *Metall*, v. 13, Sept. 1959, p. 814-818.

Transition temperatures for Sn and its isotopes and of Zr-Rh, Zr-Os and Zr-Co alloys. Specific heat of electrons for Zr, Co, Rh, W, Cr and Mo. Effect of a magnetic field on supraconductivity. (P15g, 2-63, P16, M25g; Zr-b, *Rh, Os, Co*, Sn, 14-63)

619-P. Rhenium as an Incandescent Source. W. G. Mathesson. *Illuminating Engineering Society, National Technical Conference,* Preprint no. 36, Sept. 1959, 5 p.

Properties of Re wire in terms of mechanical strength, formability, evaporation, emissivity, resistivity and incandescent brightness in relation to temperature. (P17f, P15; Re, 4-61)

620-P.* Thermodynamics of Liquid Mg-Bi Alloys. J. J. Egan. *Acta Metallurgica,* v. 7, Aug. 1959, p. 560-564.

Thermodynamic studies using the e.m.f. method. A cell suitable for measuring Mg activities in this system is described. Values of the excess partial molar free energy, the relative partial molar free energy, entropy and enthalpy are listed along with the corresponding integral quantities. 16 ref. (P12; Mg-b, *Bi,* 14-60)

621-P.* The Lattice Stability of Metals. Pt. 1. Titanium and Zirconium. Larry Kaufman. *Acta Metallurgica,* v. 7, Aug. 1959, p. 575-587.

The difference in free energy between the b.c.c. and h.c.p. modifications of Ti and Zr was calculated between 0 and 2000° K. using existing thermodynamic data. The chemical driving force for martensitic b.c.c.→h.c.p. reactions in these systems is about 50 cal. per mol. This value, compared to 300 cal. per mol. for Fe-base alloys, can be explained by the difference in physical characteristics of martensitic transformations in Fe-base and in Ti-base alloys. 37 ref. (P12a, N6q; Ti-b, Fe-b)

622-P.* Permanent Magnet Materials. F. Anselin. *Cobalt,* no. 4, 1959, p. 29-39.

Classification of magnet materials—quench-hardened steels, precipitation-hardened alloys, including Fe-Co-Mo and Fe-Co-W alloys, Fe-Co-V alloys, Ni-Co-Cu alloys, Alni alloys, Alnico Alloys and work-hardened alloys such as Vicalloy II and Silmanal. (P16; Fe-b, *Co, Mo, W, V, Cu,* Co-b, *Ni,* SGA-n)

623-P.* The Nature, Cause and Effect of the Porosity in Electrodeposits. Pt. 5. An Evaluation of the Sensitivity of the Ferroxyl Test. Fielding Ogburn, D. W. Ernst and W. H. Roberts. *Plating,* v. 46, Sept. 1959, p. 1052-1053.

Comparison of porosity in Au coatings on steel as determined by ferroxyl tests and photographic and microscopic examinations. Importance of pore size. (P10m; ST, *Au,* 8-62)

624-P.* (French.) Effect of Cold Work on the Electrical Resistivity of Copper Solid Solution Alloys. W. R. Hibbard, Jr. *Acta Metallurgica,* v. 7, Aug. 1959, p. 565-574.

Measurements of stress and strain during tensile deformation at 78° K. and after subsequent recovery treatments suggest that in solid solution alloys the higher strength is primarily associated with the higher yield stress and the presence of additional or more effective dislocation barriers in the initial structure rather than the more rapid or effective generation of dislocation barriers for a given strain during strain hardening. 16 ref. (P15g, 3-66, N7e; Cu-b, 14-67)

625-P. The Effect of Flux Distribution on Iron Losses. M. J. Schindler. *American Institute of Electrical Engineers, Transactions,* Paper no. 59-1204, Oct. 30, 1959, 11 p. $1.

Determination of approximate solutions for Maxwell's field equation under the condition of variable permeability that will lead to a modified formula for the eddy-current losses. (P16s; Fe)

626-P. An Analysis of a Reactivity Transient in Irradiated Thorium. R. G. Nisle. Phillips Petroleum Co. *U. S. Atomic Energy Commission,* IDO-16513, July 9, 1959, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Change in reactivity of Th slugs immediately after irradiation is due to the change in uranium 233 content. This content can be determined at any time, after correlation with standards, by a simple reactivity measurement. 5 ref. (P18h, 2-67; Th)

627-P.* (Russian.) Effect of Some Elements on the Surface Tension of an Al-Mg Alloy. L. Kubichek and M. V. Mal'tsev. *Izvestiya VUZ—Tsvetnaya Mettallurgiya,* no. 4, 1959, p. 112-117.

Surface tension of an alloy with 10.6% Mg; effects of temperature and elements present, such as Li, Sn, Sb, Ca, Pb and Bi. Influence of holding time after additioning on the surface tension. Structural changes caused by addition. 13 ref. (P13h, M27d, 2-60, 2-61, 3-67; Al-b, *Mg, Li, Sn, Sb, Ca, Pb, Bi*)

628-P.* (Russian.) Surface Tension of Copper Alloys. V. M. Chursin and V. M.

Ryumshin. *Izvestiya VUZ—Tsvetnaya Mettallurgiya*, no. 4, 1959, p. 118-124.

Changes in the surface tension of molten binary and ternary alloys of Cu with Sn, Pb and Zn. Effects of small P additions on surface tension and macrostructure. 13 ref. (P13h, M28h, 2-60, 2-61; Cu-b, *Sn, Pb, Zn, P*)

629-P.* Swelling and Inert Gas Diffusion in Irradiated Uranium. R. S. Barnes, A. T. Churchman, G. C. Curtis, V. W. Eldred, J. A. Enderby, A. J. E. Foreman, O. S. Plail, S. F. Pugh, G. N. Walton and L. M. Wyatt. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 543-565.

Description of the experimental procedure; experiments show the way in which inert gases escape from uranium metal under irradiation or on heating after irradiation; method of calculation based on the assumption that the fission product gases are present in bubbles under very high pressure and that the resultant stresses in the uranium matrix cause it to creep or to yield plastically and thus allow the bubbles to grow. 38 ref. (P10d, N1, 2-67; U, EG-m)

630-P.* Influence of the Structure and Properties of Uranium on Its Behavior Under Irradiation. A. S. Zaimovsky, G. Y. Sergeev, V. V. Titova, B. M. Levitsky and Y. N. Sokursky. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 566-573.

Creep of uranium under irradiation; surface distortion of nontextured uranium; influence of composition and heat treatment on uranium structure and mechanical properties. 12 ref. (P10d, Q3n, 2-59, 2-60, 2-64, 2-67; U)

631-P.* Development of High-Temperature Thermocouple-Materials. R. C. Lever. *Society of Automotive Engineers*, Preprint no. 105V, 1959, 12 p.

The ultimate temperature measurement capacity of alloys operating unprotected in an oxidizing atmosphere should be about 1800° C. and consists of platinum metals containing minor alloying additions. Above this temperature it is necessary to rely on the development of devices based on other principles, such as microwave attenuation. 17 ref. (P12n, 2-60; Pt, SGA-a)

632-P. A Simple Method of Determining the Magnetization Curve of High-Permeability Cast Steel. J. F. Hinsley. *Edgar Allen News*, v. 38, Sept. 1959, p. 195.

(P16, 1-54; 5-60, ST)

633-P. (Polish.) Principle of Additivity in Relation to Thermodynamic Functions. Aleksander Krupkowski and Kazimierz Szpunar. *Archiwum Hutnictwa*, v. 4, no. 2, 1959, p. 123-131.

Investigation on formulas applied in the computation of thermodynamic properties, such as internal energy, entropy and enthalpy. (4 ref.) (P12)

634-P. (Book.) Engineering Thermodynamics. D. B. Spalding and E. H. Cole. 375 p. July 9, 1959. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $8.50.

Fundamentals and theory. (P12)

635-P. (Book.) Property Measurements at High Temperatures. W. D. Kingery. 416 p. 1959. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $16.50.

Factors affecting the physical properties of materials and their measurement at temperatures above 1400° C. (P-general, 2-62, 1-54; SGA-h)

636-P. (Translation—ConBur.) Secondary Emission Characteristics of Magnesium and Beryllium Alloy Cathodes After Short-Term Activation. V. L. Boisov and V. N. Lepeshinskaia. *Bulletin of the Academy of Sciences of the USSR, Physical Series*, v. 22, July 1959, p. 537-546.

Due to the high secondary emission coefficient of Mg and Be alloys increased application is found in photomultipliers and electron tubes. An activation procedure with a high secondary emission yield coefficient at small primary energies is described. (P15k; Mg, Be)

637-P.* Lattice Thermal Conductivity of Copper Alloys: Effect of Plastic Deformation and Annealing. W. R. G. Kemp, P. G. Klemens and R. J. Tainsh. *Philosophical Magazine*, v. 4, July 1959, p. 845-857.

Thermal and electrical conductivities measured and the lattice thermal conductivities deduced of Cu-0.4% As and Cu-32% Zn after severe torsional deformation and after subsequent annealing. 16 ref. (P11h, P15g, 3-68, 2-64; Cu-b, *Zn*, As)

638-P. A Simple Method of Determining the Magnetization Curve of High-Permeability Cast Steel. F. J. Hinsley. *Edgar Allen News*, v. 38, Aug. 1959, p. 173-175.

Application of British Standard 2454: 1954 to ring-shaped test pieces; Fluxmeter calibration. (P16r, P16a; ST, 5-60)

639-P.* (German.) Shrinkage of Weldments. I. Bizinger. *Periodica Polytechnica (Budapest)*, v. 3, no. 2, 1959, p. 123-145.

Available theoretical shrinkage equations were correlated with actual shrinkage measurements. None of the theoretical equations covers the actual shrinkage results. The closest correlation was observed with the use of the Werner Gilde equation. (P10c; 7-51)

640-P.* (German.) Influence of Aging on the Contraction of Steels. G. Ziaja. *Periodica Polytechnica (Budapest)*, v. 3, no. 2, 1959, p. 147-156.

The contraction activities of 35 F and C15 steel showed no changes after aging. Cold working decreases contraction activity. (P10d, 3-68, 2-65; ST)

641-P.* (German.) Shrinkage of Aluminum as Influenced by Magnesium. L. Juhasz. *Periodica Polytechnica (Budapest)*, v. 3, no. 2, 1959, p. 157-161.

A clear relationship exists between alloy structure and shrinkage. A shrinkage increase is noted up to the limit of the metal's solubility. The peak contraction is reacted at the equilibrium point of the saturated solution. (P10c, 2-60; Al, *Mg*)

642-P.* Effects of Ultra High Temperature on Magnetic Properties of Core Materials. Michael Pasnak and Richard Lundsten. *American Institute of Electrical Engineers*, Paper no. 59-1117, Oct. 30, 1959, 12 p.

Effects on Orthonol, 4-79 Mo Permalloy, AEM 4750, L and Z Silectron, Transformer A, Audio Transformer A, 11.7 Alfenol, 15.5 Alfenol, 3 Mo Thermenol, 7-70 Perminvar and Supermendur. Coercive force decreased with increase in temperature. The maximum permeability increased with increasing temperature until the Curie temperature was approached, then it started to decrease. 7 ref. (P16, 2-61; Fe-b, *Si, Al*, Ni-b, *Co*, SGA-n)

643-P.* High Temperature Alloys for the Glass Industry. Pt. 2. Bruce F. Richardson. *Glass Industry*, v. 40, Sept. 1959, p. 473-475, 498.

Application and properties of Ni base, precipitation-hardened alloys. (P11, T29a; Ni-b, SGA-h, 17-57)

644-P.* (English.) Electrical Resistivity Properties of Noble Metal Alloys. J. O. Linde. *Physics*, v. 24, Sept. 1958, p. 109-117.

Temperature dependence of the resistivity of alloys at low and medium high temperatures. Influence of elastic and plastic deformation at normal temperatures. Theory of the resistivity with transition metals as solutes. (P15g, 2-61, 3-68; EG-c)

645-P.* (French.) Temperature Coefficient of the Photo-Electric Effect of Metals. A. Meessen. *Journal de Physique et la Radium*, v. 20, May 1959, p. 513-576.

Temperature coefficient of the photoelectric current is positive near the threshold but becomes negative toward the blue and ultra-violet. This is due to a surface photo-electric effect whose function is linearly temperature dependent. (P15k, 2-61)

646-P.* Thermodynamic Behavior of Solids. M. A. Jaswon. *Research Applied in Industry*, v. 12, July 1959, p. 274-284.

Thermodynamics of solids with reference to liquid-solid phase transformations, order-disorder and stable and metastable equilibriums. (P12, N10)

647-P. Determination of Electrical Resistance of Metal Parts. G. A. Escoffery. *Electrical Manufacturing*, Sept. 1959, p. 108-113.

Tables of resistivity and related quantities for all common metals. Resistance nomogram for circular wire. (P15g)

648-P. Materials for Service Above 1000° F. Metals and Ceramics. Julius J. Harwood. *Mechanical Engineering*, v. 81, Oct. 1959, p. 46-51.

Physical and mechanical properties of some high-temperature alloys and ceramics. (P-general, Q-general, 2-62; 6-60, SGA-h)

649-P.* Examination of Some Refractory-Slag Reactions by Contraction Tests. J. F. Hyslop. *British Ceramic Transactions*, v. 58, June 1959, p. 329-340.

Potential volume and melting change characteristics of openhearth brick + slags at 1300 to 1750° C. (P10d; D2, RM-j, RM-q)

650-P.* Transitions From Ferromagnetism to Antiferromagnetism in Iron-Aluminum Alloys. Experimental Results. A. Arrott

and H. Sato. *Physical Review*, v. 114, June 15, 1959, p. 1420-1426.

Fe-Al alloys from 0 to 40 at.% Al investigated between He point and room temperature. Transition was determined by both temperature and composition. (P16e, 2-60, 2-63; Fe-b, *Al*)

651-P.* Transitions From Ferromagnetism to Antiferromagnetism in Iron-Aluminum Alloys. Theoretical Interpretation. Hiroshi Sato and Anthony Arrott. *Physical Review*, v. 114, June 15, 1959, p. 1427-1440.

Theoretical model for magnetic anomaly of alpha phase Fe-Al alloys in terms of magnetic interaction of Fe atoms. Correlation of conclusions with neutron diffraction data. (P16e; Fe-b, *Al*)

652-P.* Temperature Dependence of the Work Function of Silver, Sodium and Potassium. C. R. Crowell and R. A. Armstrong. *Physical Review*, v. 114, June 15, 1959, p. 1500-1506.

Freshly evaporated films of Ag by capacitive contact potential of Na and K by diode retarding-field method for mean work function of surface. Temperature effects and anisotropy. (P15j, 2-61; Ag, Na, K, 14-61)

653-P.* Anodic Behavior of Aluminum at Low Potentials. J. V. Petrocelli. *Electrochemical Society, Journal*, v. 106, July 1959, p. 566-570.

Electrode potentials, differential capacities and anodic polarization curves in H_2SO_4 solutions. Very thin film formed and modified by electrochemical action of Al with electrolyte. 30 ref. (P15p, L19m; Al, 14-62)

654-P.* Kinetic Studies on Corrosion Systems. Pt. 2. The Reduction of Cupric Ion on Passive Stainless Steel Electrodes. Franz A. Posey, G. H. Cartledge and R. P. Yaffe. *Electrochemical Society, Journal*, v. 106, July 1959, p. 582-589.

Effect of addition of cupric ion on the electrode potential and rates of partial processes of the passive 347 stainless steel in aerated, dilute H_2SO_4 system. 14 ref. (P15m; SS)

655-P.* Temperature Dependence of the Electrical Properties of Bismuth-Antimony Alloys. A. L. Jain. *Physical Review*, v. 114, June 15, 1959, p. 1518-1528.

Resistivity and Hall coefficient as a function of temperature for zone-levelled single crystals. Carrier activation energies, lattice parameters, interpretation of data in terms of band structure. (P15g, P15p, 2-61; Bi-b, *Sb*, 14-61)

656-P.* Sources of Fuel Element Instability. A. H. Willis. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 532-536.

The nature of fissionable materials appears to be decidedly influenced by irradiation. Post-irradiation tests may not provide a suitable measure of in-pile behavior. The ductility appears to be increased and the strength reduced in U-Zr during irradiation while in Zr-B, this effect is not observed. The exact source of this property change has not been established. High fission rates and low diffusion rates reduce bubble size and swelling and decrease the importance of material imperfections as sources of volume instability. 21 ref. (P10d, T11g, 2-67; U-b, *Zr*, Zr-b, *B*)

657-P.* Radiation Stability of Fuel Elements for the Enrico Fermi Power Reactor. D. O. Leeser, F. A. Rough and A. A. Bauer. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 587-592.

Test program included binary alloys of U-Cr, U-Zr and U-Mo. Post-irradiation metallographic examinations and physical property measurements of density, dimensions, electrical resistivity and thermal expansion on specimens irradiated to 2.5 % burn-up, and in-pile temperature. Post-irradiation mechanical properties investigated include hardness, ductility, elastic modulus and ultimate strength. 6 ref. (K10d, T11g, 2-67; U-b, *Cr*, *Zr*, *Mo*)

658-P.* (English.) Composition of Products Formed by Thermal Neutron Fission of U^{235}. Pt. 3. Isotopic Composition and Atomic Weight of the Fission Product Elements. Jan Prawitz. *Acta Chemica Scandinavica*, v. 13, no. 1, 1959, p. 163-173.

Calculations for all product elements for seven different irradiation times, two cooling periods and three thermal neutron fluxes. 21 ref. (P10h, P10k, 2-67, U, 14-63)

659-P. (French.) Calculation of the "Fission Spike" of Uranium. Y. Quere and F.

Nakache. *Journal of Nuclear Materials*, v. 1, July 1959, p. 203-209.

Annihilation of pre-existing lattice defects in region of intense thermal agitation, "fission spike", associated with each fission. Evaluation of the volume of the "fission spike". (P18n, P26s, 2-67; U)

660-P. (Russian.) Effect of Grain Elements on the Surface Tension of Aluminum Alloys. L. Kubichek. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 96-103.

Effect of various additions on the surface tension of an Al-Cu and an Al-Mg alloy. Structural modifications are explained by changes in surface tension. 17 ref. (P13h, 2-60, Al-b, *Cu, Mg*, 14-60)

661-P. (Russian.) Effect of the Composition of Al-Cu Alloys on the Dimensional Changes in Cycling Heat Treatments. A. A. Zyikova. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 115-116.

Influence of repeated heating and cooling on the dimensions of samples. (P10d, 2-60, J-general, 1-63; Al-b, *Cu*)

662-P. (Russian.) Measurement of the Surface Tension and Density of Liquid Chromiun. V. N. Eremenko and Yu. V. Naidich. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 111-112.

Equipment and method. (P13h, P10h, 1-53; Cr, 14-60)

663-P. A Variable Shear-Rate Capillary Viscometer for Use With Fluid Metals. F. A. Johnson. *United Kingdom Atomic Energy Authority*, AERE R/M 232, 1959, 11 p.

A viscometer designed to investigate the rheological properties of fluid metals with various flow rates at temperatures up to 600° C. (P10f, 1-53, 2-62; Bi, Th-b, 14-60)

664-P.* (English.) Measurement of Dielectric Constant of Germanium at Microwave Frequencies. Tadao Fukuroi and Kazuo Yamagata. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 285-295.

Dielectric constants and electrical conductivity at microwave frequencies from 1.6 to 300° K. measured by resonant cavity method. Errors due to size and relaxation time were corrected. (P15n, 2-61; Ge)

665-P.* (French.) Electrical Properties of Very Thin Films of Germanium. Clement Uny. *Comptes Rendus*, v. 249, Aug. 3, 1959, p. 645-647.

Evolution of films and observed deviations from Ohm's law during vacuum deposition. (P15g, L25g; Ge, 14-62)

666-P.* (French.) Influence of pH and Current Density on Hydrogen Overvoltage of Tungsten and Molybdenum. Jean Amosse and Marie-Jeanne Barbier. *Comptes Rendus*, v. 249, Aug. 3, 1959, p. 686-688.

Changing overvoltages in solutions of potassium phthalate. (P15m; W, Mo)

667-P.* (German.) Determination of the Most Favorable Current Density in a Zinc Electrolyte Solution. Zoltan Horvath. *Freiberger Forschungshefte*, v. B34, May 1959, p. 38-79.

Equations are derived as a function of the specific energy consumption. Minimum specific energy consumption in the Zn electrolysis process. Current density is increased with a high H_2SO_4 concentration, a low Zn concentration and small electrode distance. (P15; Zn)

668-P.* (Japanese.) Effects of Nickel, Cobalt, Tungsten and Molybdenum on Activity of Carbon in Liquid Steel. Pt. 1. Activity of Carbon in Liquid Iron Alloys. Tasuku Fuwa and John Chipman. *Tetsu to Hagane*, v. 45, June 1959, p. 600-607.

Equilibrium studies at 1560° C. on carbon monoxide-carbon dioxide mixtures with carbon dissolved in liquid Fe alloys (0.1-0.3% C). An equation shows the relationship between the activity of carbon and concentration of carbon and Ni, Co, W and Mo. (P12d, 2-60; CN, Fe-b, ST, *Ni, Co, W, Mo*)

669-P. (Russian.) Viscosity and Electrical Properties of the Melts of Some Binary Systems. D. K. Belashchenko and A. P. Lyubimov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 135-172.

Measurements with Sb-Sn, Cd-Sb, Bi-Tl, Cd-Cu, Pt-Tl and Fe-Ni melts. Relationship between ordering and the values for viscosity and electrical resistance. 19 ref. (P10f, P15g, N10b; Fe-b, *Ni*, Cd-b, *Cu*, Sb-b, *Sn, Cd*, Tl-b, *Bi, Pb*, 14-60)

670-P. (Russian.) Solution of Metalloids in Metals. V. K. Zhuravlev and A. A. Zhukhovitskii. Paper from "Production and Further

Processing of Steel and Alloys. Collection of Papers no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 226-244.

Thermodynamic activity of sulphur in the systems Fe-S, Fe-C-S, Fe-Si-S and Fe-P-S. 20 ref. (P12b, D11n, Fe, S, C, Si, P, 14-60)

671-P. (Russian.) Uses and Properties of Columbium. G. V. Zakharova, I. A. Popov, L. P. Zhorova and G. V. Kurganov. *Tsvetnye Metally*, no. 1, 1959, p. 73-79.

Physical and mechanical properties. 12 ref. (P18j, P10a, P12r, Q27a, Q23p, Q28g; Cb)

672-P.* Kovar—the "Friendliest Alloy". *Advanced Materials Technology*, v. 2, Sept. 1959, p. 8-9.

Thermal properties and applications where a variable rate of thermal expansion is needed—metal to glass bands, other places where thermal expansion of dissimilar materials is encountered. (P11g, P11g, P12; Fe-b, *Ni, Co*, SGA-s)

673-P.* Experimental Determination of Atomic Scattering Factors. R. B. Roof, Jr. *Journal of Applied Physics*, v. 30, Oct. 1959, p. 1599-1603.

Corrections to the atomic scattering factor of Al taking into account effects of temperature, surface roughness, primary and secondary extinction and anomalous dispersion. Powder slab specimen under monochromatic X-ray irradiation. (P17d, 2-61, 2-67; Al-a, 6-68)

674-P.* Density Measurements of Some Thin Copper Films. N. Wainfan, Nancy J. Scott and L. G. Parratt. *Journal of Applied Physics*, v. 30, Oct. 1959, p. 1604-1609.

Density distribution across thickness of vaccum deposited Cu film determined by reflection coefficient and glancing angle for X-rays. Comparison to optical measurements. (P10a, 2-67; Cu-a, 14-62)

675-P.* The Influence of the Valency States of Cations on Electrical Conductivity of Mg-Mn Ferrite. S. Krupicka and K. Zaveta. *Journal of Electronics and Control*, v. 6, Apr. 1959, p. 333-336.

Correlation between valency states of Mn and Fe. Electrical resistivity of Fe-deficient Mg-Mn ferrite and effect of firing temperature on bulk density and resistivity. 4 ref. (P15g; Mn, Fe, NM-a34)

676-P.* The Effects of Nuclear Radiation on Materials. T. P. Flanagan. *Journal of Electronics and Control*, v. 6, Apr. 1959, p. 337-346.

Effects of charged particles, gamma radiation and neutrons to produce ionization, lattice defects and other mechanical, chemical and physical changes in metals and other materials. 10 ref. (P-general, Q-general, 2-67)

677-P.* High-Temperature Thermodynamics of the Silicon, Nitrogen, Silicon-Nitride System. R. D. Pehlke and J. F. Elliott. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 781-785.

Equilibrium pressure of nitrogen gas over pure Si metal and Si nitride measured from 1400 to 1700° C. Standard free energies and enthalpies of formation of Si_3N_4 (alpha) are calculated as functions of temperature over the above temperature range. Specific heat, molar enthalpy, molar entropy, standard enthalpy of formation and standard free energy of formation are estimated for the temperature range 298 to 1400° C. 8 ref. (P12, 2-62, 2-61; Si, NM-k36)

678-P.* The Effect of Plastic Deformation on the Resistivity of Copper-Palladium Alloys. Erik Klokholm and Barry Hyatt. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 792-794.

Resistivity of Cu-Pd alloys of 9.6 to 29% Pd alloys was measured after plastic deformation in tension. A continuing decrease in resistivity with increasing plastic strain is observed. Anomalous decreases in resistivity are due to the decrease in short-range order caused by cold work. 5 ref. (P15g, 3-68; Cu-b, *Pd*)

679-P.* Resistivity Measurements on Eutectoid Beryllium Copper. Robert J. Block and G. H. Kehl. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 878-879.

Values of the resistivity and temperature coefficient over a ± 5° C. range for selected temperatures. There is seen to be a significant discontinuity at -62° C. The sudden increase in resistivity suggests the spontaneous transformation of one of the phases present. The inherent instability of the bcc. structure at low temperatures leads to the conclusion that the gamma phase of Be-Cu undergoes a spontaneous martensitic reaction in the region of -62° C. (P15g, 2-61; Cu-b, *Be*)

680-P. The Determination of Solid Solubilities by Quantitative Metallography of a

Single Alloy. D. L. Douglass and R. E. Morgan. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 869-870.

Method consists of equilibrating samples of the alloy in a two-phase region adjacent to the desired solid solution at three or more temperatures, quenching measuring the volume fraction of second phase present and applying an analytical treatment to calculate the unknown solid solution. 4 ref. (P12e; 14-67)

681-P. Determination of Maximum Terminal Solid Solubility. A. S. Yue. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 870-871.

Experiments to determine maximum solid solubility in Mg-base alloys. 5 ref. (P12e; Mg-b)

682-P. (French.) Occurrence of Two Different Kinetics During Low-Temperature Anneals for the Variation of Electrical Resistivity of Zone Refined Aluminum, Cold-Worked at Liquid Nitrogen Temperature. Omourtague Dimitrov and Phillippe Albert. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, Oct. 1959, p. 491-496.

6 ref. (P15g, N5f, J23c, 2-63, 3-68; Al)

683-P. (French.) Activity of Dissolved Phosphorus in Molten Iron. G. Urbain. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, Oct. 1959, p. 529-547.

Established thermodynamic behavior of dissolved phosphorus in molten Fe as a function of temperature and for phosphorus contents corresponding to dilute solution of the Fe_2 P compound. 23 ref. (P12b; Fe, *P*)

684-P. (Japanese.) Effects of Chromium, Copper, Niobium, Sulphur, Tin and Vanadium on the Activity of Carbon in Liquid Iron. Pt. 2. Activity of Carbon in Liquid Iron Alloys. Tasuku Fuwa and John Chipman. *Tetsu to Hagane,* v. 45, July 1959, p. 681-689.

Equilibration with controlled mixtures of CO and CO_2 ; solubility of graphite in the melt. 16 ref. (P13; Fe, 14-60, *Cb, Cr, Cu, S, Sn, V, C*)

685-P. Measurements on the Magnetic Susceptibilities of Ag-Mn and Cu-Mn Alloys. A. Van Itterbeek, R. Pollentier and W. Peelairs. *Applied Scientific Research,* Series B, v. 7, no. 5, 1959, p. 329-337.

(P12; Ag-b, Cu-b, *Mn*)

686-P. (German.) Behavior of Nickel Anodes in Sulphuric Acid. R. Landsberg and G. Jost. *Zeitschrift fur Physikalische Chemie,* v. 211, no. 5-6, 1959, p. 294-306.

The galvanostatic passivation of Ni anodes in sulphuric acid determined in relation to time and diffusion intensity. In highly concentrated acids an increased viscosity is apparent. 11 ref. (P15; Ni)

687-P.* Fusion Curves of Four Group VIII Metals to 100,000 Atmospheres. H. M. Strong and F. P. Bundy. *Physical Review,* v. 115, July 15, 1959, p. 278-284.

Melting temperatures and change in volume during melting are determined experimentally for Ni, Pt, Rh and Fe. (P12n, P10d; Ni, Pt, Rh, Fe)

688-P.* Magnetic Susceptibility of Close-Packed Hexagonal Gold-Indium Alloys. T. B. Massalski, L. Meyer and D. Weiner. *Physical Review,* v. 115, July 15, 1959, p. 301-302.

Magnetic susceptibility is measured at 300, 77, 4.2 and 1.2° K. by Gouy method. The susceptibility shows a maximum at 19 at.% In. 11 ref. (P16e, 2-63; Au-b, *In*)

689-P.* Ultrasonic Attenuation in Bismuth at Low Temperatures. Darrell H. Reneker. *Physical Review,* v. 115, July 15, 1959, p. 303-313.

Attenuation of ultrasonic waves measured at frequencies between 12 and 84 Mc per sec. Attenuation exhibits a saturation region at fields between 5 and 1600 oersteds. Method for measuring maximum Fermi velocity for given orientation. (P16e, 2-63; Bi)

690-P.* Low-Temperature Transport Properties of Copper and Its Dilute Alloys. Pure Copper, Annealed and Cold-Drawn. Robert L. Powell, Hans M. Roder and William J. Hall. *Physical Review,* v. 115, July 15, 1959, p. 314-323.

Experimental results for thermal conductivity, electrical resistivity and thermo-electric force and power between 4 and 300° K. (P15g, P11h; Cu)

691-P.* Surface States in Metals. G. Bonfiglioli and R. Malvano. *Physical Review,* v. 115, July 15, 1959, p. 330-335.

Conductivity modulation in metals by an electric field is measured in Au, Sb and Bi between -20 and +80° C., confirming the existence of localized and conducting surface states at metal/dielectric interface. (P15p; Au, Sb, Bi)

692-P.* Piezoresistance of n-Type Germanium. H. Fritzsche. *Physical Review*, v. 115, July 15, 1959, p. 336-345.

Changes in electrical resistance in uniaxial tension of Ge single crystals doped with As or Sb is measured from 6 to 300° K. (P15g, 2-63, 3-69; Ge 14-61, *Sb, As*)

693-P.* Electron Damage Thresholds in InSb. F. H. Eisen and P. W. Bickel. *Physical Review*, v. 115, July 15, 1959, p. 345-346.

Conductivity recovery in InSb by electron bombardment as a function of electron energy is determined by measuring the rate at which carriers are removed from the conduction band. (P18n; In-b, *Sb*, 14-68)

694-P.* Elastic Scattering of Protons by Vanadium, Chromium, Iron and Cobalt. C. A. Preskitt and W. P. Alford. *Physical Review*, v. 115, July 15, 1959, p. 389-397.

Angular distributions of elastically scattered protons are measured between 3.49 and 6.42 mev. for V, Cr, Fe and Co as targets. (P18n; V, Cr, Fe, Co)

695-P.* Total Photoelectric Cross Sections of Copper, Molybdenum, Silver, Tantalum and Gold at 662 Kev. W. F. Titus. *Physical Review*, v. 115, July 15, 1959, p. 351-356.

Total photo-electric cross sections are measured at 662 kev. from a beam of gamma rays from a Cs-137 source. (P18h; Cu, Mo, Ag, Ta, Au)

696-P. Thermal Property Data Requirements for New Weapons Systems. J. I. Wittebort. Paper from "Proceedings of the Florida Conference on High-Speed Aerodynamics and Structures". v. 1. U. S. Office of Technical Services, PB 151538, Washington 25, D. C., 1959, p. 95-108.

Thermal conductivity, heat capacity, thermal expansion, thermal emissivity of Cu, Ni, Cr, Ta, Mo, Pt, Pb and Al are graphite form as a function of temperature up to melting point. (P11, T2, 2-61; Cu, Ni, Cr, Ta, Pt, Pb, Al)

697-P.* (French.) Low-Temperature Electrical Conductivity of Zone-Melted Zirconium. L. Renucci, J. P. Langeron and P. Lehr. *Comptes Rendus*, v. 249, Sept. 28, 1959, p. 1113-1115.

Alpha-phase behavior of Zr prepared by Van Arkel method and Zr purified by zone melting measured as to electrical resistivity of liquid hydrogen and liquid oxygen temperatures. (P15g, 2-63, N5f; Zr-a)

698-P.* (German.) Thermal Potential in Physical Processes. W. Scheuble and P. Wiest. *Harterei-Technische Mitteilungen*, v. 14, no. 1, 1959, p. 14-23.

Thermal potential measurements of metallographic polished microsections. The potential is dependent on heat conductivity of the measured material. Measurements on steel showed considerable dependence on carbon content, heat treatment and alloy composition. 6 ref. (P11h, M23r, 2-60, 2-64; ST)

699-P.* (Japanese.) Activity of Nitrogen in High Purity Liquid Iron. Yutaka Kasamatsu and Sachio Matoba. *Tetsu to Hagane*, v. 45, Feb. 1959, p. 100-105.

Equilibrium of pure Fe under pressures up to 2.3 atmospheres and temperatures from 1566 to 1740° C. Nitrogen solubility deviates from Sieverts' law under these conditions. Formulae of equilibrium constant, free energy change and activity coefficient. (P12a, P12b, P12d; Fe, *N*)

700-P. Optical Properties of Some Ferromagnetic Films. John R. Holmes, Anda Rosen and Fred McClung. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 76-78.

Properties of vacuum-evaporated films of Co and Gd. 11 ref. (P17, 1-73; 8-72, Co, Gd, 14-62, SGA-n)

701-P. (Swedish.) Steel With Low Cobalt and Manganese Content. *Teknisk Tidskrift*, v. 89, Oct. 16, 1959, p. 1030.

Use of Cr-Ni steel with less than 0.10% Mn and 0.005-0.007% Co in nuclear reactors. (P18, T11g, 2-60; AY, *Co*, 17-57)

702-P. The Contribution of Microfissures to the Dielectric Losses of Anodic Oxide Films on Tantalum and Zirconium and Their Role in Electrolytic Rectification. L. Young. *Faraday Society, Transactions*, v. 55, May 1959, p. 842-849.

25 ref. (P15n; Ta, Zr)

703-P.* (Japanese.) Ar "Transformation of High-Carbon and High-Chromium Steel Studied by the Direct-Vision Determination of the Magnetization Curve. Tsuneo Matsukura, Akira Nagai and Etsuo Matsumoto. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 473-477.

Changes in magnetization curves during heat treatment. Effects of temperature and time. 10 ref. (P16, 2-64, 2-61, 3-67; CN-r, *Cr*)

704-P. Copper and Copper Alloy Castings for High Conductivity Applications. *Copper*, Summer 1959, p. 12-18.
14 ref. (P15g; Cu, 5-60)

705-P. The Combustion of Titanium and Zirconium. P. L. Harrison. *Seventh Symposium (International) on Combustion, Aug. 28-Sept. 3, 1958*. 1959. p. 913-920.
6 ref. (P12q; Ti, Zr)

706-P. Electron Emission From Plastically Strained Aluminum. W. D. Von Voss and F. R. Brotzen. *Journal of Applied Physics*, v. 30, Nov. 1959, p. 1639-1645.
Al under tension emits electrons, probably from oxide or nitride surface layer. Emission rates are related to mechanical variables. (P15k, 3-68, 3-69; Al-a)

707-P. Measurement of the Linear Magnetostriction of Hard-Worked Nickel. H. E. Stauss. *Journal of Applied Physics*, v. 30, Nov. 1959, p. 1648-1650.
Anisotropic effect of plastic deformation of Ni does not cause measurable volume magnetostriction. (P16b, 3-68; Ni-a)

708-P. Magnetic Viscosity in Iron Due to Carbon Atoms Anchored in Dislocations. G. Biroci, A. Ferro and G. Montalenti. *Journal of Applied Physics*, v. 30, Nov. 1959, p. 1732-1735.
Iron containing carbon in solid solution shows a marked decrease of magnetic permeability at 180° C. after cold working. Relaxation data interpreted as due to diffusion of carbon in surroundings of dislocations. (P16g, N1c, 3-68; Fe, *C*, 14-67)

709-P. The Solubility of Krypton in Liquid Lead, Tin and Silver. G. W. Johnson and R. Shuttleworth. *Philosophical Magazine*, v. 4, Aug. 1959, p. 957-963.
Solubility of Kr in liquid Pb and liquid Sn measured by radioactive Kr^{85}. 15 ref. (P12e, 1-59; Pb, Sn, Ag, 14-60, *Kr*)

710-P. Investigation of the Reaction of Manganese and Bismuth by Differential Thermal Analysis. A. Goldman and G. I. Post. Westinghouse Electric Corp. *Wright Air Development Center Technical Note* no. 58-254, Aug. 1958, 21 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.
8 ref. (P13b, M23r; Mn, Bi)

711-P. (English.) Semiconducting Properties of Bismuth-Antimony Alloys. Seiichi Tanuma. *Physical Society of Japan, Journal*, v. 14, Sept. 1959, p. 1246.
(P15g; Bi-b, *Sb*)

712-P. (English.) Curie Point in Thin Ni Films Determined by Electrical Method. Kaizo Kuwahara. *Physical Society of Japan, Journal*, v. 14, Sept. 1959, p. 1247.
5 ref. (P16d; Ni, 14-62)

713-P. (English.) Time Decrease of Permeability in Silicon-Iron. Kunveo Tsushima, Mitswru Asanumat and Syohei Miyahard. *Physical Society of Japan, Journal*, v. 14, Sept. 1959, p. 1253-1254.
(P16q; Fe-b, *Si*)

714-P. (English.) Changes of Coercivities by Heat Treatment and Cold Rolling in Cu-Co Alloy. Masayoshi Sato and Tadayasu Mitui. *Physical Society of Japan, Journal*, v. 14, Sept. 1959, p. 1254.
7 ref. (P16, 2-64, 3-68; Cu-b, *Co*)

715-P. (French.) Magnetic Structure of the Alloy $MnAu_2$. Andre Herpin, Pierre Meriel and Jaques Villain. *Comptes Rendus*, v. 249, Oct. 12, 1959, p. 1334-1336.
4 ref. (P16; Au-b, *Mn*)

716-P. (French.) Effect of Electromagnetic Frequency on the Complex Refraction of Metals. Marcel Gourceaux. *Comptes Rendus*, v. 249, Oct. 12, 1959, p. 1338-1339.
Variations of the transparency of alkali metals for ultraviolet light. 4 ref. (P16e; EG-e)

717-P. (Hungarian.) Magnetically Soft Materials on Iron-Nickel and Iron-Nickel-Molybdenum Base. Janos Papp. *Kohaszati Lapok*, v. 92, Oct. 1959, p. 437-441.
(P16; Fe-b, *Ni, Mo*)

718-P. (Russian.) Sign Changes (From Minus to Plus) of the Hall Constant During the Ordering of Atoms in Alloys. A. P. Komar, N. V. Volkenstein and G. P. Federov. *Doklady Academii Nauk, SSSR*, v. 125, Mar. 1950, p. 530-531.
10 ref. (P15p, N10a)

719-P. (Russian.) Abnormally Large Hall Effect in Chromium-Tellurium Ferromagnetic Alloys. I. K. Kikoin, E. M. Buryak and Yu. M. Muromkin. *Doklady Akademii Nauk*,

SSSR, v. 125, May 1959, p. 1011-1014. 7 ref. (P15p; Cr-b, Te)

720-P.* Heat Transfer to Liquid Metals With Variable Properties. R. Viskanta and Y. S. Touloukian. *American Society of Mechanical Engineers*, Paper no. 59—A-148, 1959, 7 p.

Heat transfer to liquid metals with variable physical properties in the case of fully developed turbulent flow in cylindrical tubes of constant diameter. (P11k, S16a; 14-60, 4-60)

721-P.* Electrokinetic Measurements on Stainless Steel Capillaries. B. Levy and A. R. Fritsch. *Electrochemical Society, Journal*, v. 106, Aug. 1959, p. 730-735.

Zeta potentials of types 304 and 347 stainless steel measured by steaming current technique in H_2SO_4 and HCl solutions in the concentration range of 10^{-6} to 10^{-1} *N*. (P15; SS)

722-P.* Selection of Alloy Tubing for Glass Sealing. Malcolm W. Keenan. *Electronic Design*, v. 7, Oct. 14, 1959, p. 38-41.

Solid pins, tubular pins, ribbon and wire are used for glass-to-metal sealed feed-through terminals. (P11g, T1j; Ag-b, Ti-b, Fe-b, Ni-b, Co-b, CN, 4-61)

723-P.* Recombination Properties of Nickel in Germanium. G. K. Wertheim. *Physical Review*, v. 115, July 1, 1959, p. 37-47.

Carrier lifetimes in Ni-doped Ge interpreted by means of multilevel model as a function of electroncapture cross-section of Ni. (P15g, 3-69; Ge, *Ni*)

724-P.* Studies of the Semiconducting Properties of the Compound CsAu. W. E. Spicer, A. H. Sommer and J. G. White. *Physical Review*, v. 115, July 1, 1959, p. 57-62.

CsAu is shown to be a semiconductor by existence of an optical excitation threshold in the absorption characteristic, and by the resistivity values at low temperature. Structure and lattice parameter determined by X-ray diffraction. (P15g, P17c, M22g, M26, 2-63; Cs-b, *Au*, EG-j)

725-P.* Nernst and Ettingshausen Effects in Germanium Between 300 and 750° K. Herbert Mette, Wolfgang W. Gartner and Claire Loscow. *Physical Review*, v. 115, Aug. 1, 1959, p. 537-542.

Determination of Nernst and Ettingshausen coefficients for single-crystal Ge in high magnetic flux. Comparison of thermal conductivity is calculated from these measurements with accepted values. Derivation of the Nernst constant from photomagneto-electric theory. (P15g, P11h; Fe-a, 14-61)

726-P.* Effect of Oxygen on the Work Function of Barium. P. A. Anderson and A. L. Hunt. *Physical Review*, v. 115, Aug. 1, 1959, p. 550-552.

In metals which absorb gases strongly, work function is sensitive to gas; in nonsorbing metals, work function is insensitive. Ba is unique in absorbing gas without any effect on work function. Mechanism at Ba surface determined by engulfment of oxygen ions. (P15j, N15e, 2-60, 2-66; Ba-a, *O*)

727-P.* Work Function of Gold. P. A. Anderson. *Physical Review*, v. 115, Aug. 1, 1959, p. 553-559.

Work function of Au determined by Kelvin method contact potential with reference to Ba surfaces of known work function. (P15j; Au-a)

728-P.* Application of the Diffusion-Modified Bloch Equation to Electron Spin Resonance in Ordinary and Ferromagnetic Metals. Jerome I. Kaplan. *Physical Review*, v. 115, Aug. 1, 1959, p. 575-577.

Derivation of diffusion constant for electrons in ferromagnetic and nonmagnetic metals. Approximate calculation of saturation in a nonmagnetic metal. (P16p, P16r, N1; SGA-n)

729-P.* Typical Design and Materials Problems. W. A. Maxwell. Paper from "Metals for Nuclear Reactors". American Society for Metals, Metals Park, Novelty, Ohio, 1959, p. 18-31.

Fission process and heat utilization in heat and power production. Shielding of radiation, gamma heating, material requirements for nuclear reactors. Thermal neutron cross-sections of metals. Physical and mechanical properties, phase transformations and thermal expansion characteristics of uranium. Problems of dimensional stability, corrosion and diffusion. (P10b, P18j, P-general, Q-general, N6p, T11, 17-51; U)

730-P.* (French.) Change of the Optical Properties of a Thin Film of Gold When Tested in Properties of a Thin Film of Gold When Tested in a Vacuum and in Atmospheric Air. Roger Philip. *Comptes Rendus*, v. 249, Oct. 12, 1959, p. 1343-1345.

Effect of the atmosphere on the reflection factor and extinction coefficient. (P17c, 3-74; Au, 14-62)

731-P.* (German.) Magnetic Behavior of Aluminum and Aluminum Solid Solutions. R. Lingelbach and E. Vogt. *Acta Metallurgica*, v. 7, July 1959, p. 441-445.

Magnetic susceptibility of Al and Al alloyed with up to 1.6 at.% Mn between 67 and 293° K. Theoretical considerations. 15 ref. (P16p, 2-63, 2-60; Al-b, *Mn*)

732-P. (Translation—AIP) Determination of the Degree of Perfection of the Texture of Polycrystalline Ferromagnetics. Pt. 1. A. S. Viglin and J. P. Kudryavtsev. *Soviet Physics, Solid State*, v. 1, no. 2, n.d., p. 229-233.

Mathematical function characterizing the degree of perfection of cold rolled steel for the electrical industry and its possible experimental determination. 5 ref. (P16, M26c; ST, SGA-n)

733-P. (Translation—AIP.) Determination of the Degree of Perfection of the Texture of Polycrystalline Ferromagnetics. Pt. 2. A. S. Viglin and J. P. Kudryavtsev. *Soviet Physics, Solid State*, v. 1, no. 2, n.d., p. 234-237.

Approximation of distribution function characterizing the perfection of texture of cold rolled steel. (P16, M26c; ST, SGA-n)

734-P. (Translation—ATS.) Investigations in the Field of Metallochemistry. Pt. 2. The Reaction of Iron With Different Chemical Elements. I. I. Kornilov. *Bulletin of the Academy of Sciences of the USSR*, no. 7, 1959, p. 1147-1153.

Fe interacts with 65 elements in the periodic table, in most cases forming solid solutions. 14 ref. (P13b; Fe, 14-67)

735-P. (Translation—ConBur.) Equilibrium Potentials of Titanium in Chloride Melts. M. V. Smirnov, L. E. Ivanovskii, and N. A. Loginae. *Proceedings of the Academy of Sciences of the USSR, Physical Chemistry Section*, v. 121, July-Aug. 1958, p. 569-572.

Measurement made in pure argon in a hermetically sealed cell. 12 ref. (P15j; Ti)

736-P. (Translation—ConBur.) Influence of Pressure on the Solubility of Molecular Hydrogen in Niobium and Tantalum. P. S. Perminov. *Proceedings of the Academy of Sciences of the USSR, Physical Chemistry Section*, v. 121, July-Aug. 1958, p. 601-602.

Solubility of hydrogen of Ta-hydrogen and Cb-hydrogen system at 620-680° C. A logarithmic relationship is suggested. 5 ref. (P12e, N15e, 3-74; Cb, Ta, *H*)

737-P. (Translation—ConBur.) Heats of Formation of UAl_2, UAl_3 and UAl_4. M. I. Ivanov and V. A. Tumbakov. *Soviet Journal of Atomic Energy*, v. 5, Aug. 1959, p. 1007-1011.

Intermetallic compounds prepared by high-temperature interdiffusion of Al and dispersed uranium obtained from decomposition of hydride. Single-phase structure parameters from Debye X-ray diffraction; heats of formation. (P12; N1e, M22g, 2-62, U-b, Al-b, 14-68)

SECTION Q

MECHANICAL PROPERTIES and TEST METHODS; DEFORMATION

1-Q.* A Theory for the Effect of Mean Stress on Fatigue of Metals Under Combined Torsion and Axial Load or Bending. W. N. Findley. *American Society of Mechanical Engineers,* Paper no. 58-A-61, 1958, 5 p.

The concept that alternating shear stress is the primary cause of fatigue with the normal stress on the critical shear plane as an influencing factor is developed for the case of mean (or static) stresses superimposed on combinations of torsion and axial load or bending. Influence of the maximum stress of the cycle of stress on the allowable alternating stress for a given number of cycles and on the orientation of the critical shear plane. Predictions of the theory are consistent with the known trends of fatigue data both for ductile metals and cast irons. 13 ref. (Q7e)

2-Q.* An Investigation of Dry Adhesive Wear. R. P. Steijn. *American Society of Mechanical Engineers,* Paper no. 58-LUB-8, 1958, 10 p.

Sliding-motion experiments under unlubricated conditions were carried out on various metals. Oxide film formation was studied by electrical contact-resistance measurements made in conjunction with wear tests. Effects on the wear rate and basic wear formula. 9 ref. (Q9)

3-Q.* Sliding Wear and Metal Transfer Under Unlubricated Conditions. R. P. Steijn. *American Society of Mechanical Engineers,* Paper no. 58-LUB-9, 1958, 11 p.

Wear experiments on radioactive brass rings against hardened steel in a ring tester. Effect on metal transfer of sliding speed, surface finish, material of the harder surface and presence of slots in the steel ring. Tests also conducted in argon atmospheres to exclude oxidation. 6 ref. (Q9, R2a)

4-Q.* Consider Cr-Mo-V Low Alloy Steels for 1000° F. Service. C. M. Cosman. *Materials in Design Engineering,* v. 48, Oct. 1958, p. 93-96.

Addition of V improves high-temperature properties. Long-time high-temperature properties of creep and stress-rupture in Cr-Mo-V and other low-alloy steels compared and evaluated. 6 ref. (Q-general, 2-62; Ay, *Cr, Mo, V*)

5-Q.* Some Properties of Zinc-Aluminium Alloys. K. P. Scott. *Metallurgia,* v. 58, Oct. 1958, p. 188-192.

Results of mechanical tests on Zn-Al alloys containing 2-50% Al. In the cast state, optimum mechanical properties are obtained with a 4% Al alloy. Alloys containing more than 10% Al have poor impact strength, and shrinkage porosity is present in alloys containing more than 20% Al. (Q-general, 2-60; 5-60, *Zn,* Al)

6-Q.* Low Ductility in Cast Carbon Steel. T. A. Cosh and W J. Jackson. *Metallurgia,* V. 58, Oct. 1958, p. 190-192.

Low ductility in plain carbon steel castings suggests presence of indigenous or exogenous inclusions. Former type are those involving metallic compounds of oxygen, sulphur or nitrogen which separate out of molten steel. The latter type arises from slag entrapment, from occlusion of refractory material or from the interaction of constituents of the molten steel with refractory materials. (Q23p; CN, 5-60, 9-69)

7-Q.* Tensile Properties of Microshrinkage-Graded AZ-63 Magnesium Alloy. I. J. Feinberg and J. D. Grimsley. *Modern Castings*, v. 34, Aug. 1958, p. 71-76.

Microshrinkage is damaging to tensile properties of Mg casting alloy AZ-63. Determination of tensile properties is related to the degree of the defect obtained in radiographic classification. Quantitative determinations of ultimate strength, yield strength and elongation values through statistical analysis. Transverse alignment reduces elongation and ultimate strength; longitudinal alignment of microshrinkage reduces yield strength. 3 ref. (Q27a; Mg-b, 9-67)

8-Q.* Effect of Vanadium on the High and Low Temperature Mechanical Properties of a 1Cr-1Mo Cast Steel. L. D. Tote and R. S. Zeno. *Modern Castings*, v. 34, Aug. 1958, p. 87-94.

Steels were tested in normalized and tempered condition. About 0.25% V was added to 10,000 lb. heats of steels. Effects on rupture strength, ductility, creep strength, transition temperature, grain-size and structure. (Q-general, 2-60, 2-62, 2-63; AY-b, *Cr, Mo, V*)

9-Q.* Ductile-Brittle Transition in the Fracture of Alpha-Iron. Pt. 1. N. J. Petch. *Philosophical Magazine*, v. 3, Oct. 1958, p. 1089-1097.

A criterion for the transition in fracture mode from ductile to cleavage is calculated for fracture at a notch. Transition temperature is found to be a function of grain size, the friction on a free dislocation, the strength of the dislocation locking, the degree of tri-axiality of the applied stress and the elastic constants. 11 ref. (Q26; Fe)

10-Q.* Orientation Dependence of Cyclic Work-Hardening in Aluminum Crystals. P. Charsley and N. Thompson. *Philosophical Magazine*, v. 3, Oct. 1958, p. 1098-1104.

Crystals of Al were subjected to several hundred slow cycles of stress; the rate of decrease of the width of the hysteresis loop is taken as a measure of cyclic work hardening. The manner of hardening depends on the orientation of the crystal and is qualitatively similar to the hardening observed in unidirectional straining. 7 ref. (Q24; 14-61, Al)

11-Q.* Effect of Atmospheric Corrosion on Metal Fatigue. N. J. Wadsworth and J. Hutchings. *Philosophical Magazine*, v. 3, Oct. 1958, p. 1154-1166.

Polycrystalline specimens of Cu, Al and Au were fatigued in reversed bend in various pressures of air and in water vapor and inert gases. The ratio of life in atmosphere of air to that in vacuum (about 10^{-5} mm. Hg) at lives of about 10^6 cycles was 1:20 for Cu, 1:5 for Al and about 1:1 for Au. Small cracks a few microns deep formed in the first few hundredths of the life in air and after the same number of cycles in vacuum. Effect of air was to speed the propagation of cracks in Cu and Al but not in Au. 5 ref. (Q7; R3, Cu, Al, Au)

12-Q.* (German.) Behavior of Ferritic and Austenitic Steels at the Temperature of Liquid Air. H. Schumann. *Technik*, no. 6, 1958, p. 417-427.

Embrittlement of carbon steels observed at 0°C, while a normalized and low-Mn alloy steel shows a distinctly diminishing notch impact strength at about -50°C. Neither an austenitic Mn-Cr steel nor a 5% Ni steel nor a Cr-Ni heat treatable steel showed a satisfactory strength at -180°C. An austenitic Cr-Ni steel, however, proved to be resistant to low temperatures, retaining almost the same strength. 9 ref. (Q26s, Q27a, 2-63; CN, AY)

13-Q.* (Japanese.) Studies on the Standard Indentation Hardness Tester. Pt. 1. Design of the Tester. Kentaro Yamamoto, Hiroshi Yano and Nobuaki Yajima. *Central Inspection Institute of Weights and Measures, Tokyo, Report*, v. 7, no. 2, 1958, p. 10-14.

New lever-type hardness tester employs two weights which are connected to the lever with knife edges. These weights are floated in tanks and by draining water from the tanks the load of indentation increases up to its subscribed value for testing. Accuracy of indentation measurement is 0.2 micron when magnification of micrometer-microscope is 200 and that of the load measurement is 0.3%. Range of measured values of standard hardness specimens less than 0.5 Rockwell hardness number. (Q29b)

14-Q.* (Japanese.) Study on the Micro-Indentation Hardness Measurement by New

Testing Apparatus. Pt. 1. Kentaro Yamamoto, Namiteru Hida and Seizo Koizumi. *Central Inspection Institute of Weights and Measures, Tokyo, Report,* v. 7, no. 2, 1958, p. 15-22.

New microhardness apparatus continuously records depth of indentation and elastic recovery. Indentation load is controlled by bouyancy. Vertical displacement of the indentor is picked up by differential transformer, amplified and recorded. Accuracy of measurement of indentation is 0.1 micron and that of indentation load is within 2 g. while maximum load of indentation is 2 kg. (Q29q)

15-Q.* (Japanese.) Study on Plastic Deformation of Aluminum at Low Temperatures (-196°C.) Jiro Wada and Masanobu Sasagawa. *Light Metals,* no. 31, July 1958, p. 5-12.

Fragmentation of polycrystalline Al at low temperatures studied by X-ray diffraction. Deformation of single crystals at -196°C and at room temperature investigated by optical microscope, electron microscope and X-ray diffraction. Differences among slip bands, deformation bands and cross slip formation provide basis for discussion on mechanism of low-temperature deformation. 11 ref. (Q24, Q26, 2-63; Al)

16-Q.* (Japanese.) Heterogeneous Properties of Commercially Pure Aluminum Under Rolling Process. Takashi Ikeno, Kizo Shibata and Tyogo Keiji. *Light Metals,* no. 31, July 1958, p. 16-21.

Change in hardness and microstructure of 2S slab ingots made by semicontinuous casting when hot rolled to various reductions and then cold rolled without intermediate annealing. Hardness of hot rolled sections generally tended to be lowest at the surface and higher toward the center. Recrystallized grains appeared on outer parts of hot rolled stock but not inner parts. The heterogeneity of hot rolled stock affected the property of sheets cold rolled without intermediate annealing. 5 ref. (Q29n, M27, 3-68; Al-a, 4-53, 5-59)

17-Q.* (Russian.) Some Data on Effects of Cold Formed Hardened Structure on Temper Brittleness of Steel. F. P. Stepanov. *Fizika Metallovi Metallovedenie,* v. 6, no. 8, 1958, p. 483-486.

Cold plastic deformation (by elongating 1.5%) after hardening raises the resilience and considerably lessens the tendency to temper brittleness; raising the cold plastic deformation to 4% entirely eliminated this tendency. 9 ref. (Q26s, 2-64, 3-68; AY, *Cr*)

18-Q.* (Russian.) Structure Transformations of Nickel-Chromium Alloy by Creep. G. Ya. Kozyrskii, V A. Kononenko and P. N. Okrainets. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* Aug. 1958, p. 90-92.

Rapid crystalline transformation and creep was found with alloys in metastable state that show increased strength at low temperatures. Transformations caused by creep go faster than transformations caused by temperature. 6 ref. (Q3, Q24m, 2-61; Ni-b, *Cr*)

19-Q.* The Engineering Properties of Commercial Titanium Alloys (Revision.) M. W Mote, R. B. Hooper and P. D. Frost. Titanium Metallurgical Laboratory. *U.S. Office of Technical Services,* PB 121647, June 1958, 248 p. $4.

General characteristics of mill products. Engineering properties have reached a comparatively stable state, thus permitting design and fabrication of production items to an extensive degree. Three new alloys, Ti 16V-2.5Al, Ti-6Mo-3Al and Ti-4Al-3Mo-IV. (Q-general; Ti-b)

20-Q. Development of Tough, High-Strength Quarternary Titanium-Base Alloys of the Ti-Al-V-X System. W. F Kirk and H. Margolin. New York University. (Watertown Arsenal Laboratories.) *U. S. Office of Technical Services,* PB 131502, Nov. 1956, 100 p. $2.75.

Nine alloys of the Ti-Al-V-X system showed promise of meeting yield strength requirements of 150,000 psi. or greater. Research to develop alloys of high yield strength and with adequate ductility and toughness was performed on a group of 20 1 1/4-lb. ingots. Al varied from 4 to 8%, V from 2 to 4%, other additions from 2 to 4%. The aging behavior for four solution temperatures and four aging temperatures was studied. Jominy end-quench tests and a few tensile tests were also carried out. Three alloys fell below the 150,000 psi. requirement but showed

high ductility. (Q23b, Q23p, Q27a, J5, 2-64; Ti-b, *Al, V*)

21-Q. The Effect of Structure and Interstitials on the Impact Strength of Titanium and Titanium Alloys. C. B. Dittmar, G. W. Bauer and D. Evers. Mallory-Sharon Titanium Corp. *U. S. Office of Technical Services,* PB 131541, Dec. 1956, 29 p. $ .75.

Production, heat treating and testing procedures employed to produce and evaluate three heats of Ti-6A1-4V, two heats of Ti-3Mn complex and one heat of Ti-16V-2.5 alloy in 5/8 in. diameter bar. Plates 5/8 x 6 x 6 in. were also obtained for Navy ballistics testing. (Q6n, 2-64, 3-69, 3-71; Ti-b, *Al, Mn, V*)

22-Q. Investigation of Heat Treatments and Mechanical Properties of High Strength Steel Castings. J. W. A. Tyler and P. J. Ahearn. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131638, Aug. 1957, 33 p. $1.

Aim was to produce castings with the transverse physical properties of steel forgings. Two heats of steel of different composition were cast into 5-in. diameter finned cylindrical coupons and heat treated to high strength levels. Testing was conducted at the fin, midwall and center of the coupons to ascertain the effect of increasing casting thickness on properties. SAB 4340 steel castings modified with 0.15% V can be heat treated to a strength of 280,000 psi. with a yield stress at 0.1% offset of 200,000 psi. High-silicon steel castings can be heat treated to a strength level of 290,000 psi. with a yield stress at 0.1% offset of 215,000 psi. (Q27a, Q23b, 2-64, 3-73; ST, *Si, V,* 5-60)

23-Q. The Effect of Cadmium Plating on SAE 4340 Steel in the Presence of Stress Concentrations at Elevated Temperatures. E. M. Kennedy, Jr. Wright Air Development Center. *U. S. Office of Technical Services,* PB 131814, Mar. 1958, 40 p. $1.25.

Plating on steel heat treated from 240,000 to 260,000 psi. tensile strength causes a sharp decrease in the rupture strength at or near the melting point of Cd (612° F). However, exposure of unstressed Cd-plated parts to these temperatures causes no decrease in the tensile strength at room temperature. (Q3m, Q27a, 2-62, 3-66; ST, *Cd,* 8-62)

24-Q. Fatigue Strength Reduction Factors for Inclusions in High Strength Steels. H. N. Cummings, F. B. Stulen and W. C. Shulte. Curtiss-Wright Corp. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131816, Apr. 1958, 38 p. $1.

Effect of nonmetallic, nonmalleable inclusions on the fatigue strength of specimens of SAE 4340 steel and 4350 steel in the tensile strength range 140,000 to 300,100 psi. "Fatigue strength reduction factors" for the inclusions found in the single-nucleus origins of fracture of specimens tested in rotating bending machines. Values of the factors depend on the size of the inclusions and hardness level of the steel. For very small inclusions (less than 0.00025 in.) other inhomogeneities inherent in the steel itself may dominate the failure of a specimen. (Q7a, Q27a, Q29n; ST, 9-69)

25-Q. Lubrication of Titanium. N: Fatica. Clevite Research Center. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131981, May 1958, 78 p. $2.25.

Two testers, the Shell Four Ball and the Falex, used to obtain information about the frictional properties of modified Ti coatings. Comparison of the wear resistance of the best surface treatments with various lubricants. It appeared possible to obtain equivalent wear resistance in many cases using electroless Ni plates, cyanided, nitrided, carburized, oxidized or carburized Fe-plated Ti. The higher the halogen content of the lubricant, the better its lubricating properties. (Q9n, Q9p, 2-61; Ti-b, 8-62, NM-h)

26-Q. Development of Niobium-Base Alloys. R. T. Begley. Westinghouse Electric Corp. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151004, May 1958, 113 p. $2.50.

Potentialities of Cb-base alloys for structural applications above 1800°F. Creep-rupture properties, flow and fracture characteristics, oxidation behavior and weldability of commercially pure Cb. Cb was found to undergo a ductile to brittle transition in the range -125 to -196° C., and its transition temperature range was less affected by the presence of interstitial impurities than many other body-centered cubic metals. Creep-rupture

studies at 982 and 1093° C. showed that the 100-hr. rupture strength of commercial Cb in vacuum is significantly greater than that of unalloyed Mo. (Q-general, 2-60, 2-62, 3-69; Cb-a, SGA-h)

27-Q.* Beam and Column Tests of Welded Steel Tubing With Design Recommendations. Don S. Wolford and M. J. Rebholz. *ASTM Bulletin,* no. 233, Oct. 1958, p. 45-51.

Tests were performed on 3/8 to 3-in. diameter tubing made by forming and welding Armco Zincgrip flat rolled steel of sheet gages from 20 to 12. Yield strengths in tubing were higher than the flat rolled steel stocks from which they were made. 12 ref. (Q27; 4-60, ST, 7-51)

28-Q.* Alloy Ductile Irons Promise Better High Temperature Strength. *Materials in Design Engineering,* v. 48, Oct. 1958, p. 97.

Superior creep and rupture properties have been developed in Mo iron, Ni-Cu iron, Ni-Cr iron and Ni-Cr-Mo iron. Mo-containing irons have the higher stress-rupture strength. At 1100° F., adding 0.7-1% Mo to Ni-Cr irons raises 1000-hr. rupture stress by 6000 psi. Raising Ni content from 30% to 35% provides another increase of 1500-2000 psi. (Q3m; CI-q, *Mo, Ni, Cu, Cr*)

29-Q.* Some Observations on the Fatigue Behaviour of Aluminium-7% Magnesium in Various Conditions of Heat Treatment. C. A. Stubbington. *Metallurgia,* v. 58, Oct. 1958, p. 165-171.

Grain size is important in determining fatigue, extruded material with fine grain size having better fatigue properties than solution treated material (in which grain growth had occurred) in all aged conditions. As-extruded 7% Mg alloy gives a steel-type S-N curve, but any form of heat treatment, whether aging or solution treatment, produces S-N curves typical of those obtained on other Al alloys. Cold working improves the properties of solution treated material. 4 ref. (Q7, 2-64; Al, *Mg*)

30-Q.* (Japanese.) Studies on Material for Gas Turbine Wheels. Pt. 2. Taro Hasegawa and Osamu Ochiai. *Sumitomo Metals,* v. 10, Apr. 1958, p. 68-80.

Influence of heat treatment and cold working on mechanical properties at room temperature and at 650°C. of Timken 16-25-6 Cr-Ni-Mo steel. Creep-rupture life and yield strength at 650° C. increased and creep ductility decreased by long-time solution treatment before cold working. Pre-heat treatment below 1050° C. or precipitation hardening before cold working decreased creep-rupture life and increased creep ductility. Cold working after solution treatment at 1150° C. gave longest creep-rupture life and low creep ductility. Rupture time decreased and ductility increased as working temperature was raised from 700 to 850° C. Creep-rupture life increased with cold working up to 25% reduction but decreased with higher percentages of deformation. 7 ref. (Q-general, Q3, 2-60, 2-64, 3-68; SS)

31-Q.* (Japanese.) Effects of Iron and Silicon on Some Aging Characteristics of Chromium Copper. Keiichi Mizuno. *Sumitomo Metals,* v. 10, Apr. 1958, p. 93-104.

Effects of solution treating temperature, aging time and temperature, Si and Fe content and intermediate cold working on the electrical conductivity and hardness of Cu alloys containing 0.18 to 0.89% Cr. Addition of Fe decreased conductivity, hardness and rate of precipitation hardening at low temperature. Precipitation hardenability increased by intermediate cold working after solution treatment. Si additions decreased conductivity and precipitation rate but resulted in retention of hardness for longer periods during aging at 475° C. 16 ref. (Q29, P15g, N7a, 2-60; Cu-b, *Cr, Fe, Si*)

32-Q. (Russian.) Effect of Phosphorus and Nickel on Cold Fracture of Medium Carbon Steel. V. N. Svetchnkov and Yu. B Yakovtchuk. *Fizika Metallov i Metallovedenie,* v. 6, No. 8, 1958, p. 505-511.

As C contents increase (0.44-0.54%) the damaging effect of P on cold fracture is increased, while the beneficial effect of Ni is lessened. 11 ref. (Q26, 2-60; CN, *Ni, P*)

33-Q. (Russian.) Dampening Oscillations of a Cylinder. V. S Postnikov. *Fizika Metallov i Metallovedenie,* v. 6, no. 8, 1958, p. 522-523.

From point of view of a vibrating medium possessing plastic properties. 18 ref. (Q8)

34-Q. (Russian.) Determining Impact Hardness and Constants in Steels. B. A. Vandyschev and F. S. Savitsky. *Fizika Metallov i Metallovedenie*, v. 6, no. 8, 1958, p. 534-539.

Energy loss is proportional to impact force; dynamic coefficient depends on C content of the steel; medium C steels give the lowest dynamic coefficient. 11 ref. (Q6s; CN)

35-Q. (Russian.) Long-Time Strength and Creep. L. M. Kachanov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, Aug. 1958, p. 26-31.

Theory of calculation. 11 ref. (Q3m)

36-Q. (Russian.) Characteristics of Curves in Bi-Axial Deformation. A. M. Zhukov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, Aug. 1958, p. 32-40.

Stress-strain calculations on bi-axial deformation, based on experiments with steels 30 KhNZA, 45 and pure Al. 11 ref. (Q25n, Q24; ST, Al-a)

37-Q. (Russian.) Testing Titanium for Wear Resistance. E. S. Reinberg. *Zavodskaya Laboratoriya*, v. 24, no. 9, 1958, p. 1107-1110.

Tests conducted by bending rotating console-shaped specimens 5-7.5 mm. in diameter, with frequent variations in stress of 1370-1430 cycles per min. Testing base was set at 10^7 cycles. 4 ref. (Q9n,; Ti-b)

38-Q. (Russian.) Plasticity and Brittleness of Structural Steels Arising From Off-Center Elongation of Cut Specimens. V. A. Bykov. *Zavodskaya Laboraboriya*, v. 84, n. 9, 1958, p. 1116-1119.

Testing of cut specimens subjected to off-center expansion makes it possible to determine more precisely many mechanical properties of steel, particularly plasticity and ductility. 5 ref. (Q-general, Q23, 1-54; ST)

39-Q.* Creep Properties of Three Low-Shrinkage Copper-Base Casting Alloys. *American Society for Testing Materials, Proceedings*, Reprint, v. 58, 1958, 14 p.

Creep evaluation conducted on cast specimens of 80-10-10, 85-5-5-5, and Navy "M" alloys at 350, 450, and 550° F. Short-time, room-temperature tension tests made on creep tested specimens to determine residual tensile properties after long-time exposure to stress and temperature. (Q3, 2-62; Cu-b, Cu-s)

40-Q.* Creep Under Changing Complex Stress Systems. Pt. 1. A. E. Johnson, J. Henerson and V. Mathur. *Engineer*, v, 206, Aug. 8, 1958, p. 209-216.

Generalized relationships concerning creep of carbon steel, Al and Mg alloys under changing stress systems. (Q3; CN, Al-b, Mg-b)

41-Q.* Variation in Fatigue Properties Over Individual Casts of Steel. Pt. 2. E. Ineson, J. Clayton-Cave and R. J. Taylor. *Iron and Steel Institute, Journal*, v. 190, Nov. 1958, p. 277-283.

Variations in fatigue properties within an ingot and between ingots of the same cast of steel determined for a typical cast of basic electric steel. Metallurgical information concerning composition variations, distribution of nonmetallic inclusions, hardenability and tensile properties. Fatigue properties of material with a tensile strength of 125 tons per sq. in. were inferior to those of the same material with a tensile strength of 85 tons per sq. in. 13 ref. (Q7; CN-b, 5-59)

42-Q.* An Evaluation of Structural Sheet Materials in Missile Applications. George Gerard. *Jet Propulsion*, v. 28, Aug. 1958, p. 511-520.

Short-time tensile and compression tests at elevated temperatures, strain rate under tensile loads given for Mg, Al, Ti, alloys, PH steels and Be. 19 ref. (Q-general, T24e; Mg-b, Al-b, Ti-b, Be, SGA-h, SS, 17-57)

43-Q.* On the Fatigue Limit of Metals. P. Feltham. *Philosophical Magazine*, v. 3, Aug. 1958, p. 806-810.

Ratio of fatigue limit to critical tensile strength is shown to be independent of temperature for Cu, Au, Ag, Mg and Cd. Al acts anomalously. 6 ref. (Q7b; 2-61, Cu, Au, Ag, Mg, Cd, Al)

44-Q.* Static and Dynamic Strength of a Carbon Steel at Low Temperatures. C. J. Maiden and J. D. Campbell. *Philosophical Magazine*, v. 3, p. 872-885.

Low-carbon steel investigated in the range 15 to -121° C. exhibits increased

upper and lower yield stresses as temperature is decreased. 13 ref. (Q27, 2-63; CN-g)

45-Q.* Titanium Alloys Developed for Aircraft-Missile Applications. *Automotive Industries*, v. 119, Aug. 15, 1958, p. 65.

High-temperature strength characteristics and formability of Crucible C-105VA, Crucible C-115 A MoV and Crucible B-120VCA. (Q27a, 2-62, T24, 17-52; Ti-b)

46-Q.* Modified Keel-Block Design for Acceptance Testing of Ductile Iron. Gilbert McGlothlin. *Foundry Trade Journal*, v. 105, Nov. 6, 1958, p. 563-566.

Modification of standard shape reduces casting and machining costs, gives equivalent results (Q27d, 1-60; CI-r)

47-Q.* (French.) Study of Heterogeneity in Tensile Tested Metals. W. Truszkowski. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 716-724.

Plastic deformation of samples of 99.9% Cu, Monel metal and carbon steel containing 0.55% C studied. A formula was deduced which permits calculation of coefficient of heterogeneity, which the experiments showed to be influenced by impurities at grain boundaries, grain size and impurities scattered throughout the metal. Method permits calculation of coefficient of uniform elongation of perfectly homogeneous material. 9 ref. (Q27a, 3-69, 3-71; Cu-a, CN, Ni-b)

48-Q.* (French.) Influence of Crystal Orientation on the Bending Fatigue Limit and the Formation of Slip Lines in Alpha-Iron Monocrystals. M. Hempel and E. Hillnhagen. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 749-760.

Determination of S-N curves of single crystals and of bi and tricrystalline specimens of Armco iron with 0.006% C. Relation between bending fatigue limits and static strength; influence of crystal orientation; metallographic study with optical and electron microscopes of influence of conditions of loading on formation of slip lines on surface of cyclic-stressed specimens; crystal orientation and formation of slip lines in single and multiple slip; connection between position of fatigue cracks and direction of grain boundaries in bi and tricrystalline specimens. 36 ref. (Q7g, Q24a, 3-72; Fe)

49-Q.* (French.) Theory of the Changes in Metals During Fatigue. Variation of the Spatial Distribution of the Stability of Obstacles to Plastic Slip. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 761-777.

It is theorized that fracture of metals is the result of process of distribution of internal reactions to external forces among ever smaller and fewer domains during application of mechanical stress. This stress, whether slowly or rapidly applied, and whether permanent or cyclic, causes increasingly greater differentiation between plastic rigidity and spatial distribution of stability of metastable atomic or molecular configurations, returning certain domains to their original condition (recrystallization and polygonization) or a new condition, and increasing disorder of others. 56 ref. (Q24, M25m, Q7, 3-68)

50-Q.* (French.) Remarks on Cumulative Damage in Fatigue. W. Weibull. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 778-784.

The theory of linear fatigue damage becomes invalid under certain conditions because of incorrect assumption that endurance limit of metals does not vary during development of fatigue. A new method is proposed which takes into account the effect of prestressing of fatigue tested materials. Some results obtained with this method. (Q7, 3-68)

51-Q.* (French.) Statistical Study of Fatigue. F. Bastenaire and M. Weisz. *Revue de Metallurgie*, v. 55, Aug. 1958, p. 785-796.

Influence of tensile properties on relative scatter of fatigue results as reported in literature. Statistical study of phenomenon of underloading. There is a possibility of a marked underloading effect (from 6 to 8 kg. per sq.mm.) in a heat treated steel, a moderate effect in the presence of notches; increased scatter of results is noted in case of underloaded specimens. 6 ref. (Q7, Q27a, S12)

52-Q.* (Italian.) Cracks in the Thermally Altered Zone of Welds Made on Self-Hardening Alloy Steels. H. Sekiguchi and T. Kobayashi. *Rivista Italiana della Saldatura*, v. 10, May-June 1958, p. 108-114.

Toe cracks, underbead cracks, transverse and longitudinal cracks were found on transverse and longitudinal sections of small square specimens of Ni-Cr-Mo steel on which welding beads were deposited. From frequency of different types of cracks, it appears that hydrogen has marked influence only on underbead type. Intervals between end of welding operation and crack initiation were determined and related to degree of martensite transformation in joints. Pre and postheating techniques designed to prevent crack formation. 4 ref. (Q26q, N8p; ST, *Ni, Cr, Mo,* 7-51)

53-Q.* Steels for Use in the Chemical, Petroleum and Allied Industries. *British Standard Specification,* BS 1501-1506, 1958, 84 p.

Chemical composition, tensile tests, bend tests, mechanical properties for all carbon and alloy steel plates; sections; bars; forgings; castings; bolting materials. Comparable British and American specifications and repairs by welding to castings. (Q27, Q5, S22, T29, 17-57, CN, AY, SS)

54-Q.* Steels for Use in the Chemical, Petroleum and Allied Industries. *British Standard Specification,* BS 1510, 1958, 6 p.

Low-temperature requirements shown by statistics concerning heat treatment, chemical composition, selection and number of impact tests, test specimens and their properties. (Q6, T29, 17-57; ST, SGB-r)

55-Q.* Glide Path Effects and Work Hardening in Aluminium Single Crystals. N. A. McKinnon. *Commonwealth of Australia, Dept. of Supply, Aeronautical Research Laboratories,* Report ARL/MET 29, Mar. 1958, 25 p.

Specimens were of rectangular cross-section and the primary slip direction was parallel to either the large or the small side of the prism. Metallographic and X-ray techniques used to study the influence of length of glide path on the work hardening of Al single crystals oriented within the basic sterographic triangle. The important factor altering the hardening characteristics was the relative length of the secondary slip systems with respect to the primary systems and not the absolute length of glide path in the primary slip direction. 32 ref. (Q24a; Al, 14-61)

56-Q.* Heat Treated Ductile Iron Offers Wide Property Range. C. A. Anderson. *Iron Age,* v. 182, Nov. 20, 1958, p. 102-104.

Compares ductile iron with steel; how heat treatment affects properties; tensile and yield strength, elongation, wear resistance. (Q-general, 2-64, CI-r)

57-Q.* (Dutch.) Aging of Aluminum-Magnesium Casting Alloys. L. J. G. van Ewijk. *Metalen,* v. 13, Oct. 31, 1958, p. 360-365.

Test bars aged at various temperatures, after which mechanical properties were determined at room temperature. Aging is more severe and the loss in mechanical properties is greater, the higher the Mg. Plastic deformation accelerates aging. 18 ref. (Q-general, 2-65; Al-b, *Mg*)

58-Q.* (Russian.) Influence of Internal Friction on the Rupture of Parts Subject to Cyclic Strain. Ya. S. Podstrigach and M. I. Chaevskii. *Doklady Akademii Nauk SSSR,* v. 121, no. 2, 1958, p. 268-270.

With cyclic torsional strains thermal stresses are caused by internal friction resulting in flaws in tangential and axial direction. With diameter of the sample increased from 10 to 200 mm., the fatigue strength decreases to 40-50% of the original value. 10 ref. (Q7, Q22)

59-Q. Development of Plastic Theory Methods in Structural Steel Design. L. K. Stevens. *Australian Welding Journal,* v. 1, Feb. 1958, p. 7-11.

6 ref. (Q23; ST, SGB-s, 17-51)

60-Q. Recent Survey in the Research Field of Fatigue and Creep of Materials. Yokobori Takeo. *Japan Science Review,* v. 4, no. 1, Oct. 1958, p. 135-138.

Literature review. 58 ref. (Q7, Q3, 10-54)

61-Q. (Japanese.) Strength of Tire Thread. Naoteru Oda and Kunio Nishioka. *Sumitomo Metals,* v. 10, Apr. 1958, p. 81-92.

Shelling or spalling of locomotive wheels. Factors determining contact area

and contact pressure between wheel and rail. 11 ref. (Q9, T23q; ST)

62-Q.* The Failure of Metals Under Load--Some Recent Research in Melbourne Laboratories. Hugh Muir. *Australian Institute of Metals, Journal,* v. 3, May 1958, p. 44-60.

Research projects on yielding, brittle fracture, creep, stress-corrosion and fatigue. Dislocation theory provides a method of integrating the different modes of failure in terms of four basic processes: elastic deformation, plastic deformation, crack formation and crack propagation. Australian discoveries include: production of ductile Cr, cell formation and grain displacement effects in creep, explanation of grain boundary cavitation in metals stressed at high temperatures and crack initiation at intensified slip bands under fatigue conditions. 67 ref. (Q26, Q24, Q23, Q21, Q3; Cr)

63-Q.* (German.) High-Strength Structural Steels. Stefan Kronmarck. *Neue Hutte,* v. 3, July 1958, p. 433-442.

Prerequisites for required properties (more than 33 kg. per sq. mm. yield strength). In rolling, properties are influenced by drawing temperature of ingots, Al treatment, rolling temperature, cooling conditions, normalizing, annealing, cold work hardening. Survey on composition and properties of high-strength constructional steels. 54 ref. (Q-general, 2-60, 2-61, 3-68; ST, SGB-a)

64-Q.* (Russian.) Method of Conducting Tests for Thermal Failure. S. V. Serensen and P. I. Kotov. *Zavodskaya Laboratoriya,* v. 24, no. 9, 1958, p. 1097-1106.

Progressive failure of metal subject to repeated heating and cooling. Analysis of process of deformation during thermal failure; factors influencing distribution of thermal stresses; speed of deformation during cyclic heating; crack formation during thermal failure and methods to determine resistance of materials to thermal failure. 40 ref. (Q25p)

65-Q.* (Russian.) Investigation of Influence of Change in Frequency of Stress on Wear Resistance of Armco Iron. V. I. Shabalin. *Zavodskaya Laboratoriya.* v. 24, no. 9, 1958, p. 1110-1112.

By keeping all conditions the same, except variations in cyclical stress, curves show that increasing frequency from 20 to 3000 cycles per min. resulted in an insignificant change in endurance limits of Armco iron (from 22 to 23 kg. per sq. mm.) (Q9n, 2-66; Fe-b)

66-Q.* (Russian.) Testing Quality of Sheet Steel by Means of Impact Toughness Experiments. V. G. Chernashkin, A. M. Gofner and M. A. Sivryukova. *Zavodskaya Laboratoriya.* v. 24, no. 9, 1958, p. 1112-1115.

Traces failure of welded cylindrical petroleum tanks to formation of small cracks in weld seams during cooling which caused embrittlement in steel frame. Tests were aimed at finding type of steels for this purpose that would localize cracks in welds and prevent further embrittlement. (Q6, Q26s, T26q; ST, 7-51, 9-72)

67-Q.* Pressure Vessels and the Problem of Brittle Fracture. H. Harris. *Metallurgia,* v. 58, Nov. 1958, p. 213-217.

Brittle fracture at low applied loads occurs when there are residual welding stresses, a defect of sufficient severity is present and the structure is at a low temperature. Effect of irradiation also considered. (Q26s; 2-61, 2-67, ST)

68-Q.* Properties of a Large Extrusion Supplied to Specification D.T.D. 363. T. R. G. William, S. W. Hallwood and R. W. Hayden. *Metallurgia,* v. 58, Nov. 1958, p. 219-224.

Static and fatigue testing on a large heat treated extrusion in an Al-Zn-Mg-Cu type alloy. The center showed a lower tensile strength than the surface. (Q27a, Q7a; Al-b, 4-58)

69-Q.* Thermal Fatigue of Ductile Materials. Pt. 1. Effect of Variations in the Temperature Cycle on the Thermal Fatigue Life of S-816 and Inconel 550. Francis J. Clauss and James W. Freeman. *National Advisory Committee for Aeronautics,* NACA TN 4160, Sept. 1958, 61 p.

Effect of maximum cycle temperature, temperature difference of cycling, cycling time of exposure at the maximum cycle temperature cyclic plastic strain. Tensile specimens were heated and cooled while constrained in a manner that prevented their free axial expansion and

contraction, and the number of cycles to fracture was determined. Hardness measurements and microstructural studies were made. Cycles to failure was more sensitive to changes in the maximum cycle temperature than to changes in the temperature difference. 21 ref. (Q7j; ST, Ni-b)

70-Q.* Thermal Fatigue of Ductile Materials. Pt. 2. Effect of Cyclic Thermal Stressing on the Stress-Rupture Life and Ductility of S-816 and Inconel 550. Francis J. Clauss and James W. Freeman. *National Advisory Committee for Aeronautics*, NACA TN 4165, Sept. 1958, 43 p.

Experimental study of changes in stress-rupture life, ductility, hardness and microstructure of S-816 and Inconel 550 specimens exposed to varying amounts and conditions of thermal fatigue. Exposure to thermal fatigue conditions strengthened S-816 in stress-rupture and weakened Inconel 550. 33 ref. (Q7j, Q7f, Q3q; Ni-b)

71-Q.* An Investigation of the Effects of Atmospheric Corrosion on the Fatigue Life of Aluminum Alloys. Herbert A. Leybold, Herbert F. Hardrath and Robert L. Moore. *National Advisory Committee for Aeronautics*, NACA TN 4331, Sept. 1958, 17 p.

Specimens of 2024-T3 and 7075-T6 Al alloys in both the bare and clad forms were tested. Atmospheric effects shortened the average lives by a factor of about 3 for 7075-T6 and 2024-T3 in the bare condition and by a factor of about 1.5 for 7075-T6 in the clad condition. (Q7, R3; Al-b)

72-Q.* Plastic Creep of Germanium Single Crystals. H. G. Van Bueren. *Physica*, v. 24, Oct. 1958, p. 831-837.

Temperature and stress dependence of the creep rate of Ge single crystals, loaded in tension. Three parts in the creep wave. The initial part is explained in terms of the liberation of dislocation sources from impurity atoms, whereas the stationary creep rate attained in the second part is determined by the mobility of the dislocations themselves. 5 ref. (Q3, 2-61, 3-66; Ge, 14-61)

73-Q.* Properties of Whiskers. S. S. Brenner. Paper from "Growth and Perfection of Crystals", John Wiley & Sons, Inc., New York, 1958, p. 157-190.

Elastic behavior of whiskers, effect of size and temperature on strength; plastic behavior, creep in the elastic strain region; dekinking of whiskers; magnetic, electric and surface properties. 61 ref. (Q-general, P-general; 14-61)

74-Q.* (Dutch.) Brittle Fracture. G. M. Boyd. *Lastechniek*, v. 24, Sept. 1958, p. 177-186.

Confined to fractures in low-carbon steel. Most fractures are attributed to fatigue, elastic or plastic instability, corrosion or brittleness. Discussion of different kinds of fracture; factors favoring the occurrence of brittle fractures; influence of temperature; connection between toughness and strength; influence of welding; protective measures. 14 ref. (Q26s; CN-g)

75-Q.* (French.) Plasticity and Creep. Note 3. Gustavo Colonnetti. *Comptes Rendus*, v. 247, Sept. 22, 1958, p. 840-842.

Only one half of the plastic deformation undergone by a material disappears, the other half remaining permanent, regardless of speed of variation of loads, provided that this speed remains constant during test. (Q24, Q3)

76-Q.* (German-French.) Temperature Influence on Cold Drawn and Heat Treated Aluminum. E. von Burg. *Aluminium Suisse*, v. 8, Sept. 1958, p. 151-160.

Tests on rods made of pure Al and a number of Al alloys using apparatus for rupture tests plus manometer. Tests of behavior at low temperatures show increase of strength and plasticity. Sintered Al superior in heat resistance, but low in tensile strength. 12 ref. (Q-general, 2-61, 2-64, 3-68; Al-a, Al-b, 4-55, 6-72)

77-Q.* (Polish.) Investigation of Plastic Deformation of Sintered Carbides. Edmund Bryjak, Stanislaw Piaskowski and Zbigniew Borjarski. *Hutnik*, v. 25, July-Aug. 1958, p. 295-303.

Investigated by application of special equipment and pressure up to 100 tons per sq. cm. Prints were measured and controlled metallographically and by X-rays. Sintered carbides containing below 10% Co may undergo plastic deformation in strictly specified conditions. (Q24; Co, W, 6-69)

78-Q.* (Rumanian.) Properties of Low-Alloy Manganese-Molybdenum Structural Steels. B. Rotenstein. *Studii şi Cercetări de Metalurgie*, v. 1, July-Dec. 1956, p. 261-282.

Simultaneous presence of several alloying elements in small quantities is more effective than influence of each one of them in an amount equivalent to the sum of these elements. Investigation of the influence of Mn, Cr, Mo, Cu and C on properties and structure of Cr-Mn-Mo steel. Influence of chemical composition and conditions of heat treatment studied by great variety of tests. Conclusion: Low-alloy Mn-Mo steel with slight additions of Cu and Si can be used for machines and ships instead of Cr-Ni or Cr-Mo steels. 21 ref. (Q-general; ST, *Cr, Mo, Cu, Si*, 2-60, 2-64)

79-Q. More Surface Polishing—Less Galling. William H. Moore. *Product Engineering*, v. 29, Nov. 24, 1958, p. 63-65.

Test results showing why components should be "worn-in" before they take loads. (Q9q, L10b)

80-Q. (French.) Fatigue Fracture. *Revue de la Soudure*, v. 14, no. 3, 1958, p. 155-157.

Studied on welded parts of steel with 0.5 to 0.55% carbon. (Q7; ST, 7-51)

81-Q. Some Mechanical Properties of Graphite in the Temperature Range 20 to 3000° C. C. P. Wagner, A. R. Driesner and E. A. Kmetko. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/702, 1958, 28 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Strength in tension and compression, tensile and compressive creep, coefficient of friction, coefficient of thermal expansion, thermal conductivity. Measurements performed to study effects of temperature, stress level, anisotropy and graphite type. (Q-general; P11, 2-61, 3-66, NM-k36)

82-Q. Effect of Quenching and Neutron Irradiation on Internal Friction of a Super-Purity Al-5% Mg Alloy. W. G. Nilson. Chalk River, Ontario. CRMet-801, Sept. 1958, 16 p. (Available from Atomic Energy of Canada Limited, Chalk River, Ontario) $.50.

Low-frequency internal friction peak near 150° C. is probably due to stress-induced local ordering of the solute atoms. Its movement to lower temperatures after either quenching or neutron irradiation, corresponding to a reduction in relaxation time for the damping process, is compatible with the idea that the Mg atoms act as traps for the vacancies produced by these treatments. 23 ref. (Q22, 2-67; Al, *Mg*)

83-Q.* (French.) Mechanical Properties and Structures of Magnesium and Its Alloys. M. B. Boudouresques. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p. 57-72.

Studies on pure (99.8%) Mg, a 0.56% Zr alloy and a 0.85% Zn, 0.59% Zr alloy. When exposed to cyclic torsion stress at 400° C., a pure Mg sheath on a U rod for a nuclear reactor broke and showed strong grain growth, while the grain growth of the alloys was moderate. (Q-general, N3, 2-60, Mg-a, Mg-b, *Zr, Zn*)

84-Q.* (French.) Development of Mechanical Properties and Structure Changes in the Stress Relieving of Titanium Sheet After Cold Rolling. A. Saulnier and R. Develay. Paper from "Symposium on Special Problems in Metallurgy", Presses Universitaires de France, Paris, France, 1958, p 89-101.

Accepted theory on the recrystallization of Ti gives only a rough approximation. After strong cold deformation (to the order of 100%) a very fine polygonization grain is obtained by heat treating at 550-600° C. for 30 min. (Q24m, J1a, N5, 2-61; Ti-a)

85-Q.* (German.) Reaction of Some Light Metal Alloys to Cyclic Temperature Stress. K. Lohberg. *Aluminium*, v. 34, Nov. 1958, p. 634-642.

Leads to considerable structural changes, limited to relatively thin surface layer, which can be reversed by appropriate subsequent heat treatment. 8 ref. (Q26p; Al-b)

86-Q.* (German.) Results of Static Notch Bending Tests Compared With Notch Impact Tests. G. Kruger. *Fertigungstechnik*, v. 8, Aug. 1958, p. 370-376.

Static notch bending tests preferred to notch impact tests in determination of susceptibility to brittle fracture. 6 ref. (Q26s, Q5, Q6, 1-54; ST)

87-Q.* (German.) Thermal Stresses in Toolsteels During Hot Upsetting and Die Forging. Gunter Beck. *Stahl and Eisen*, v. 78, Oct. 30, 1958, p. 1556-1563.

Calculation on temperature field patterns and temperature changes during the working process. Heat conduction influenced by surface properties, disturbed by heat cracks. Reduction of thermal stresses by an adequate preheating is suggested. 9 ref. (Q25p, F22j, F22p; TS)

88-Q.* (Russian.) Atomic Concentration of Cr, Mo, W and the Properties of Their Solid Solutions With Nickel. I. I. Kornilov and N. T. Domotenko. *Doklady Akademii Nauk SSSR*, v. 120, no. 2, 1958, p. 311-313.

Solubility limit in at. % at eutectic temperature: Cr 50.0, Mo 23.0, W 18.1; at 7000° C.: Cr 40.0, Mo 14.9, W13.0. Ni alloys with 10 at. % Cr, Mo or W, respectively, showed a hardness of 124, 166 and 142 kg. per sq. mm. at 20° C., and of 26, 64 and 42 at 1000° C. The Mo-alloy shows also the highest hot strength. (Q-general; Ni, Cr, Mo, W, 14-67)

89-Q.* (German.) Microhardness of Iron and Its Alloys Influenced by Temperatures up to 1000° C. Hermann Schenck, Eugen Schmidtmann, Helmut Brandis and Karl Winkler. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 653-660.

Microhardness of pure Fe, Fe-C-Mn alloys and nitrided pure Fe was tested at different temperatures. Hardness of pure Fe decreased uniformly up to about 650° C. (recrystallization limit), then a faster decline appeared. 38 ref. (Q29q, 2-61; Fe, *Mn*)

90-Q.* (German.) Heating Speed and Critical Strain of Tin With Traces of Alloying Elements. F. Erdmann-Jesnitzer and R. Krumpholz. *Metall*, v. 12, Oct. 1958, p. 891-900.

Samples water quenched, hammered to 10 mm. thickness, rolled to 1 mm., heat treated at 50° C. for 20 min. in air; heated at different speeds; influence of these on critical strain limit. 44 ref. (Q25, N3, 2-61, 2-64, 3-68; Sn-a, *Bi, Sb, Cd*)

91-Q.* (German.) Strength Tests With Hard Metals. W. Spath. *Metall*, v. 12, Oct. 1958, p. 925-929.

Compressive strength of a tungsten-carbide-cobalt alloy shows highest values for low Co content. Bending strength behaves inversely increasing from lower Co content. 8 ref. (Q28g, Q5g, 2-60, 3-66; W, Co, 6-69)

92-Q.* (Slovak.) Embrittlement of Austenitic Cr-Ni Steels of 18-8 and 16-13 Type. Alois Zapletalek. *Zvaranie*. v. 7, Sept-Oct. 1958, p. 298-300.

Formation of sigma phase thought to be the cause of embrittlement. This phase found to develop from the alpha or gamma phase. Unstable carbides, rich in Cr, may be nuclei for sigma phase. (Q26s, 2-60, 2-61; SS, *Cr, Ni*)

93-Q.* On Indentation of Ball. Pt. 1. Experiments on Specimens of Finite Dimensions. Shigehiko Yazawa, Kiyoshi Sato, Masao Unno and Go Yaguchi. *Journal of Mechanical Laboratory of Japan*, v. 4, no. 1, 1958, p. 1-5.

Indentation is basic process for indentation hardness testing and die-hobbing. (Q29b; CN)

94-Q.* Severe Wear of Pearlitic Steel Weld Metal. Sukemitu Ito, Kozo Honda and Kikuzo Ishiyama. *Journal of Mechanical Laboratory of Japan*, v. 4, no. 1, 1958, p. 15-21.

Relationship between wear and microstructure or chemical composition. By microscopic examination of the wearing surfaces, it was possible to form a picture of the movement of the wear debris. (Q9p; ST)

95-Q.* The Random Abrasion of a Cu (110) Face. Y. N. Trehan and A. Goswami. *Journal of Scientific & Industrial Research*, v. 17B, June 1958, p. 209-212.

A Cu (110) face subjected to random abrasion under various cooling conditions. Dry abrasion resulted in appreciable diorientation of surface layers accompanied by the formation of CuO and Cu_2O. No oxidation occurred when abrasion was carried out in presence of excess benzene. Rotational slip around the <110>axis was observed even though the abrasion direction was not preferential. Formation of oxides ascribed to rise of surface temperature during abrasion. (Q9, Q24a, R1h; Cu)

96-Q.* Pure Torsion Creep Tests on Magnesium Alloy (2% Al) at 20°C. and on 0.2% C Steel at 450° C., at Low Rates of Strain (10^{-6} to 10^{-9} Per Hr.) A. E. Johnson, J. Henderson and V. D. Mathur. *Metallurgia*, v. 58, Sept. 1958, p. 109-117.

The continuously cast Mg alloy at 20° C. and the cast carbon steel at 450° C. displayed similar creep behavior in the range of creep rate 10^{-7} to 10^{-9}. Creep strain for each of the materials showed a dependence on time which did not alter throughout range of creep rate investigated. In the region of low creep rate the log stress/log creep strain curves showed a region of changing shape running eventually to 45° slope corresponding to largely anelastic or recoverable creep. (Q3, 2-61, 3-67, 3-68; CN-g, Mg-b, *Al*)

97-Q.* Deformation Mechanisms in Magnesium and Some Magnesium-Aluminium Alloys. R. D. Stacey. *Metallurgia*, v. 58, Sept. 1958, p. 125-128.

Reviews literature. Mechanism of nucleation and growth of intergranular holes. Development of fine-grain structure adjacent to original grain boundaries and relationship with variation of elongation with temperature. 24 ref. (Q24; Mg-b)

98-Q.* Comparison of Charpy V, Charpy U and Izod Notched Bar Tests on Steel Over Transition Temperature Range. A. W. Johnston. *Metallurgia*, v. 58, Sept. 1958, p. 129-135.

Results on three mild and three alloy steels, for both standard and subsidiary standard test pieces. No simple relationship appeared between results of three tests that could be applied to all six steels. Transition from ductile-to-brittle fracture for V-notch Charpy test pieces occurred at higher temperatures than U-notch. Transition curves obtained respectively from Izod and Charpy U-notch tests extended over approximately the same range of temperature. (Q6r, Q23r, 2-61; CN, SS)

99-Q.* Ductile-Brittle Transition in Steels Irradiated With Neutrons. D. Hull and I. L. Mogford. *Philosophical Magazine*, v. 3, Nov. 1958, p. 1213-1222.

Yield and fracture stresses of unirradiated and irradiated En2 steel were measured at 20 to 78 and 196° C. Effect of irradiation on grain size transition was determined experimentally and an equation relating transition surface with grain size, yield stress and temperature obtained. 7 ref. (Q23r, M27c, 2-67; ST)

100-Q.* On the Delay Time in Plastic Flow of Indium Antimonide. J. W. Allen. *Philosophical Magazine*, v. 3, Nov. 1958, p. 1297-1305.

Delay time before the onset of plastic deformation was studied as a function of temperature and stress for indium antimonide in uniaxial compression. Temperature range was 150-300° C. at a given stress. 8 ref. (Q24, 3-66, 2-61; In, Sb, 14-68)

101-Q.* Design Properties of Sinterings. Pt. 2. Ferrous Alloys. *Precision Metal Molding*, v. 16, Nov. 1958, p. 30-33.

Composition and typical mechanical properties of some 150 ferrous alloys. Variation in mechanical properties is most noticeable in sinterings of relatively low density. (Q-general; 6-72, 17-51)

102-Q.* Scratch Hardness. Pt. 2. X-Ray Investigation of Structural Change. Tomiya Sutoki and Koichi Nakajima. *Tohoku University, Science Reports of the Research Institutes*. v. 10, Aug. 1958, p. 269-275.

X-ray analysis used to study structural changes due to scratching or indenting single or polycrystals of Al and Ag. Diffraction patterns indicate that scratch hardness of metal relates to the annealed state rather than the hardened state. 4 ref. (Q29d, Q29c, M22g, 3-68; Al, Ag)

103-Q.* Attenuation of the Ultrasonic Waves in Metals. Pt. 2. Stainless Steel. Tokutaro Hirone and Kazuo Kamigaki. *Tohoku University, Science Reports of the Research Institutes*, v. 10, Aug. 1958, p. 276-282.

Pulse ultrasonic waves at frequencies ranging from 0.5 to 6 megacycles per sec. were used to measure attenuation of austenitic 19-10 Cr-Ni stainless steels with various grain sizes. Attenuation coefficient increased with frequency and grain size. Attenuation behavior explained by assuming that the traveling ultrasonic waves were scattered by austenite grains in accordance with Rayleigh's law. 4 ref. (Q21f, 1-74, 2-59; SS-e)

104-Q.* The Plastic Theory of Structures. Pt. 3. T. M. Charlton. *Welder*, v. 27, July-Sept. 1958, p. 63-68.

A means of determining correct design and load capacity of continuous beams and single-story mild steel structural frames with rigid joints. (Q24; ST, 7-51, 17-51)

105-Q.* Internal Friction of Load. Pt. 1. Yosio Hiki. *Physical Society of Japan, Journal*, v. 13, Oct. 1958, p. 1138-1144.

Measurement of Pb single crystals with longitudinal vibration in kilocycle range using the composite piezo-electric quartz oscillator. Internal friction is mainly dependent on the strain amplitude, frequency of vibration, purity and temperature. 16 ref. (Q22, 3-68, 3-69, 2-61; 14-61, Pb)

106-Q.* (Czech.) Manufacture and Some Properties of Aluminum-Manganese Alloy Sheet. Miroslav Brzobohaty. *Hutnicke Listy*, v. 13, p. 769-778.

Influence of Mn content and impurities on the mechanical properties of Al sheet in the soft and cold worked conditions. Tendency of Al-Mn alloys currently used in the manufacture of sheet and semicontinuously cast plates to grain coarsening upon annealing. Grain refinement resulting from the heating velocity of 50 to 60° C. per sec. or the addition of Mg or Fe. Homogenizing to prevent grain coarsening upon subsequent annealing. 5 ref. (Q-general, J23, 2-60, 3-69· Al-b, *Mn*, 4-53)

107-Q.* (French.) Study of the Mechanical Properties of Arsenical Copper. Jean R. Marechal. *Metaux-Corrosion-Industries*, v. 33, Sept. 1958, p. 377-383.

Properties and crystal structures of Cu containing up to 8% As. Antiquity of arsenical coppers and bronze; use of "fahlerz" coppers; terminology of these ancient alloys. (Q-general, M26, A2; Cu-b, *As*)

108-Q.* (French.) 5000-Cycle-Per-Second Micromachine for Tension-Compression Fatigue Tests. G. Vidal, F. Girard and P. Lanusse. *Revue de Metallurgie*, v. 55, July 1958, p. 613-619.

New micropulsator capable of producing rupture in steel specimens of 4 sq.mm. cross section and in light alloy specimens of 10 sq.mm. Maximum available load is about ± 250 kg. Using this pulsator and an Amsler machine, fatigue limits of identical specimens of an AU2GN Al alloy were tested at frequencies of 110 and 5300 hertz. Fatigue limits after 10^6, and 10^7 and 10^8 cycles at 5300/hertz are about 10% higher than at 110 hertz. 9 ref. (Q7, 1-53; Al-b)

109-Q.* (French.) Use of the Prot Machine to Determine Slight Variations in the Fatigue Resistance of Different Areas of Machined Carbon Steel Parts. A. Ferro and U. P. Rossetti. *Revue de Metallurgie*, v. 55, July 1958, p. 650-655.

Specimens taken from large crankshaft forgings, including material from joint areas of high deformation, were tested under a single, very low rate of increase of load. Use of Prot machine permits direct expression of results as breaking stresses. With one exception, no significant differences in fatigue resistance were found in different areas of same forging. 10 ref. (Q7a, T21c; CN, 4-51)

110-Q.* (Japanese.) Influence of the Slip Deformation of Aluminum Upon the Paint Film. Hiroshi Asada and Yasuhiro Horiguchi. *Metal Finishing Society of Japan, Journal*, v. 9, Aug. 1958, p. 295-301.

Behavior of films of Zn chromate or mellamin paints on single crystals or coarse grain of Al when Al was subjected to deformation by tension. Breaks occurred in the thin films of chromate or paint with a tensile strain of 3%. With thicker films cracks were not found until deformation was 5%. Soft mellamin films deformed 12 to 15% before breaking. (Q24a; Al, 8-70)

111-Q.* (Russian.) Creep of Single Crystals of Zinc in Low-Melting Metal Melts. V. A. Labzin and V. I. Likhtman. *Doklady Akademii Nauk SSSR*, v. 121, no. 3, 1958, p. 443-445.

Monocrystalline pure Zn wires were coated with a 3-5 micron thin film of Sn, Pb and Sn-Pb-Hg alloy. Creep of crystals was studied under a tension load of 0.7-0.8% yield strength, at room temperature and at steps up to 350-400° C. The ratio of creep-with-film to creep-without-film determined. (Q7, 2-61; Zn, Pb, Sn, 14-61, 14-62)

112-Q.* (Russian.) Superimposed Motion Picture Photography of Internal Metal Movements in a State of Deformation. O. G. Muzelevskii. *Zhurnal Nauchnoi i Pricladnoi Photogrphii i Kinematographii*, v. 3, Sept-Oct. 1958, p. 363-367.

Distribution characteristics of deformation, metal velocity, deformation velocity and tension in the internal reduction zone, during hot rolling of Al castings. (Q24, X5h; Al-b, 5-60)

113-Q.* (Ukrainian.) Arrangement for Testing Endurance of Materials at High Frequency Loading. V. O. Kuzmenko. *Dopovidi Akademii Nauk Ukrainskoi R.S.R.*, v. 9, 1958, p. 946-950.

Employs the resonance principle of inducing longitudinal vibrations of the specimen by means of a magneto-constricted vibrator. Tests are carried out with a symmetrical tension compression cycle with a frequency loading of 20,000 H_z. Steel and cermets were tested. (Q7b; ST, 6-70)

114-Q. Structure of Steel. Edwin Gregory and Eric N. Simons. *Edgar Allen News*, v. 37, Nov. 1958, p. 249-251.

Vickers, Firth, Rockwell and Avery hardness tests. (Q29)

115-Q. Activation Energies for High-Temperature Creep of Polycrystalline Zinc. W. J. M. Tegart. *Philosophical Magazine*, v. 3, Nov. 1958, p. 1287-1296.

22 ref. (Q3, 2-62, P13a; Zn)

116-Q. (Japanese.) Wear of Carbon Steel Weld Metal. Pt. 1. Sukemitsu Ito, Kozo Honda and Kikuzo Ishiyama. *Journal of Mechanical Laboratory*, v. 12, Sept. 1958, p. 12-19.

Microscopic observations of structural changes in the worn surface. 13 ref. (Q9p, M27; CN, 7-51)

117-Q. (Japanese.) Indentation Hardness Testing. Pt. 2. Experiments on Copper. Shigehiko Yazawa, Masao Unno, Go Yaguchi and Iwakichi Sawano. *Journal of Mechanical Laboratory*, v. 12, Sept. 1958, p. 158-161.

Experimental results compared with steel specimens. Straight lines obtained in the diagram of Meyer's hardness against the diameters of impressions; radii of curvature of impressions can be obtained from Hertz's equation. (Q29b; Cu)

118-Q.* Metallurgical Examination of Weld Failures. R. S. Cox and J. W. Shedden. *Australian Welding Journal*, v. 1, Apr. 1958, p. 7-10.

Failures due to fatigue, embrittlement, crack formation in steels. 6 ref. (Q26, Q7, 3-66; ST, 7-51)

119-Q. Strength of Metals Undergoing Rapid Heating. W. K. Smith and A. T. Robinson. Paper from "Short-Time High-Temperature Testing", American Society for Metals, Cleveland, 1958, p. 5-35.

Method and equipment for measuring strength of various metals under conditions of constant load and rapid heating. Metals can be used at higher strength levels than is indicated by results obtained from conventional short-time high-temperature tensile tests. Additional strength is attributed to the time required for the substructure to change as the temperature increases. The concept of yield temperature was introduced as the criterion of high heating rate strength. 10 ref. (Q27, 2-62, 1-53, 1-54)

120-Q. Fluid Analogy to Aerodynamic Heating. T. C. McGill, J. V. Dutzi and W. D. Ayers. Paper from "Short-Time High-Temperature Testing", American Society for Metals, Cleveland, 1958, p. 36-57.

Problems imposed by aerodynamic heating on missile structures. For laboratory simulation of the high heat fluxes experienced by airborne vehicles a molten salt system was developed. Ultra-short-time tension (yield) tests were made for 2024-T4 and T6 Al alloys for two time-duration exposures. Elevated temperature data for AZ91 HTA and HK31-T6 Mg alloys, 4340 steel and 17-7 PH stainless steel sheet. (Q-general, 2-62; SGA-h, Mg-b, Al-b, SS)

121-Q. Short-Time Creep of Structural Sheet Metals. John A. Vanecho. Paper from "Short-Time High-Temperature Testing", American Society for Metals, Cleveland, 1958, p. 58-91.

Comparison of creep strengths of some 37 Mg and Al and Ti alloys, low-alloy

steels, stainless steels, heat resistant alloys, A-286, an iron-base alloy, Inconel X and V-36 and a Co-base alloy. 4 ref. (Q3; Mg-b, Al-b, Ti-b, AY, SS, SGA-h, Fe-b, Ni-b, Co-b, 4-53)

122-Q. Effect of Holding Time and Strain Rate on the Tensile Properties of Structural Metals. J. R. Kattus. Paper from "Short-Time High-Temperature Testing", American Society for Metals, Cleveland, 1958, p. 92-113.

Data for Al, Co, Fe, Mg, Ni and Ti alloys. Tensile strength decreased with increasing temperature. Increasing strain rates resulted in increased strength properties. 4 ref. (Q27, 2-61, 3-68; Al-b, Co-b, Fe-b, Mg-b, Ni-b, Ti-b)

123-Q.* (French.) Results of Tests on Effects of Surface Treatments on Fatigue Resistance of Some Titanium Alloys. R. Develay and H. Richaud. *Revue de Metallurgie*, v. 55, Sept. 1958, p. 853-859.

Rotary bending tests and fragility tests at 20° C. were carried out on unalloyed Ti and T-C3Fe and T-A4M type alloys that had undergone anodic oxidation, Cd, Cr and Ni plating, sulphinuzation and silvering. (Q7; Ti, 8-62, 8-73)

124-Q.* (French.) Damping and Aging of Alloys in the Iron-Carbon-Phosphorus System. W. Dickenscheid and H. J. Seeman. *Revue de Metallurgie*, v. 55, Sept. 1958, p. 872-875.

Damping measurements made by torsional pendulum on artificially aged alloys revealed diminution of maximum value of SNOEK-damping with increasing P content, unchanged temperature of maximum damping, assymetric damping-temperature curves for higher P contents, influence of P and C on residual damping. (Q8, 2-60, 2-64; Fe-b, *C, P*)

125-Q.* (French.) Improvement of Ductility in Low-Alloy Steels. G. Delbart and F. Maratray. *Revue de Metallurgie*, v. 55, Sept. 1958, p. 876-888.

Study of a Cr-Mn-Si steel containing 0.8 to 1% each of these elements. Two series of melts, one of pure dead-soft Fe containing 0.016% S and one of puddled Fe containing 0.006% S, were made. Half of each melt was cast without addition, other half with addition of 0.20% Mo. Sulphur increased ductility; addition of 0.20% Mo is sufficient to reduce differences in ductility at a given hardness. 9 ref. (Q23p, 2-60; AY, *Cr, Mn, Mo*, S, *Si*)

126-Q.* (Russian.) Antifriction Properties of High-Strength Nodular Iron. A. P. Antonov. *Vestnik Mashinostroeniya*, v. 38, Oct. 1958, p. 37-40.

Metal was normalized and hardened at 250, 300, 350 and 450°. High-strength Fe produced in induction furnace by treating melt with 15% Mg, 10% SiCa and 75% FeSi. Lowest friction coefficient, in dry and lubricated state, was bronze OTSS 5-5-5. Of iron and steels the lowest friction coefficient was shown by high-strength normalized and high-strength isothermically hardened iron. (Q9p, 2-64; CI-r, ST)

127-Q.* (Russian.) Stampability of Sheet Steel. L. A. Rubenkova. *Vestnik Mashinostroeniya*, v. 38, Oct. 1958, p. 49-52.

Laboratory investigation shows that major influence on metal behavior is the stressed state arising in stamping process. Three types of stress states studied: (1) uniaxial stress, (2) biaxial stress arising during hydrostatic pressure, (3) compressive stresses combining bending and elongation stresses as well as compression. Metallic structure has great bearing on internal stress state. In the drawing process the friction conditions have considerable effect on stamping results. 3 ref. (Q23q, Q25, 3-66; ST, 4-53)

128-Q. (Book.) Short-Time High-Temperature Testing. 137 p. 1958. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $6.

Proceedings of a symposium during the Tenth Metal Congress and Exposition, Los Angeles, Mar. 25-29, 1957. Papers abstracted separately. (Q-general, 2-62, 1-54)

129-Q. (Translation—AIP.) Dynamic Compressibility of Metals Under Pressures From 400,000 to 4,000,000 Atmospheres. L. V. Al'tshuler, K. K. Krupnikov and M. I. Brazhnik. *Soviet Physics JETP*, v. 34, Oct. 1958, p. 614-619.

Method for determining pressures and densities of shock compression based on

measurement of velocities of propagation of shock waves. Method applied to Cu, Zn, Ag, Co, Sn, Au, Pb and Bi. (Q28g; Cu, Zn, Ag, Co, Sn, Au, Pb, Bi)

130-Q. (Translation-Brutcher, 4389.) Internal Transformation Effect on Stress Relaxation During Tempering of Steel 30KNGSNA and Aging of Alloy V-95. A. A. Goldenberg. *Metallovedenie i Obrabotka Metallov,* Oct. 1958, p. 11-17.

Intensity of stress relaxation increases strongly if the metals held at elevated temperatures are undergoing a phase transition. The steel was hardened at 900° C. in oil and tempered at 200, 300 and 500° C.; V-95 alloy was hardened at 470° C. in H_2O and artificially aged at 100, 140 and 200° C. Intensity of stress relaxation depends upon structure stability and when it is not accompanied with interior transformations. (Q25m, Q3a, 2-61, 2-64; ST, Al-b)

131-Q. (Translation-Brutcher, 4390.) Effect of Heat Treating Upon Temperature Curve for Impact Strength of Steel. V. K. Tselikov. *Metallovedenie i Obrabotka Metallov,* Oct. 1958, p. 17-23.

Change in temperature curve after heat treatment is characterized by (1) sharp lowering in impact strength at room temperature and considerable lowering of the critical temperature of brittleness; (2) sharp lowering of impact strength at room temperature without change in the critical temperature of brittleness; (3) sharp drop at room and low temperatures. There is a regular consistency in the curve change during microstructural changes resulting from heat treatment. (Q6, Q26s, 2-61, 2-64; ST)

132-Q. (Translation—Brutcher, 4391.) Failure of High-Strength Alloys During Cyclic Variations of Temperature and Load. G. V. Kurganov and Yu. A. Sutina. *Metallovedenie i Obrabotka Metallov,* Oct. 1958, p. 23-27.

Failure of Ni steels under long loading and high temperature is due to crack formation along grain boundaries. Crack development at high temperature is favored by brittleness of intermetallic phases formed as well as additions of low-melting Pb, Bi, and S, collected along grain boundaries. Cyclic changes of strain and temperature shorten the time prior to failure, because of more intensive crack formation. A small addition of Pb brings premature failure especially during cyclic variations. (Q26, 2-60, 2-61; ST, *Ni, Bi, Pb, S*)

133-Q. (Translation—Brutcher, 4392.) Wear Entailing Spalling. F. Ya. Iokheles. *Metallovedenie i Obrabotka Metallov,* Oct. 1958, p. 28-32.

Steel gears, when starting to mesh, may produce friction causing white layer formation. Study of phase formation, microhardness and wear resistance. Local pressure and heating produce a secondary hardening of the friction surface. Repeated structure transformations, with increased load cycle, increase the number of microcracks and their distribution in depth. White layers represent a highly strained austenite-martensite structure. (Q9, N8p, T7a; 2-61, 3-68; ST)

134-Q. (Translation—Brutcher, 4397.) Improvement of Mechanical Strength of Steels by Torsion. B. V. Panov. *Metallovedenie i Obrabotka Metallov,* Oct. 1958, p. 50-56.

Cold working increases durability and fatigue limit when cold working strain is tangent and working strain is perpendicular to the surface. Cold working is more effective for soft steels, while for hard steels durability is obtained by heat treating. (Q-general, 2-64, 3-68; ST)

135-Q. (Translation—SLA, ASLIB-GB29.) Deformation Forces in Cold Extrusion of Steel. F. Hdrzdil. *Strojirenstvi,* v. 6, no. 3, 1956, p. 180-184.

(Q24, G5; ST)

136-Q. (Translation—SLA, ASLIB-GB41.) Behavior of High-Temperature Steels During Creep Testing at Temperatures of 500-700°C. Pt. 3. Results of Creep Tests on Ferritic Tube Steels. Eduard Jahn. *Archiv fur das Eisenhuttenwesen,* v. 28, May-June, 1957, p. 259-267.

See item 961-Q, 1957. (Q3, 1-54; ST)

137-Q. (Translation—SLA, ASLIB-GB70.) Causes of Irreversible Temper Brittleness in Steels. B. A. Stetsenko. *Metallovedenie i Obrabotka Metallov,* v. 2, no. 7, 1956, p. 35-38.

See item 818-Q, 1956. (Q26s, J29, N8; ST)

138-Q. (Translation—SLA, ASLIB-GB80.) Investigation of the Structure and Strength Properties of Die Stampings of Al-Cu-Mg and Al-Zn-Cu-Mg Alloys. W. Rosenkrantz. *Zeitschrift fur Metallkunde*, v. 48, no. 2, 1957, p. 41-43.

See item 512-Q, 1957. (Q27a, M28k, F22; Al)

139-Q. (Translation—SLA, R-4461.) Mechanical Properties of E1579 Steel After Prolonged Heating at 550 and 700° C. *Metallovedenie i Obrabotka Metallov*, no. 3, 1956, p. 52-55.

See item 497-Q, 1956. (Q-general, J26, J29; ST)

140-Q. (Translation—SLA, R-4842.) Wear Resistance and Hardness of Electrolytic Chromium Coatings. A. V. Shreyder. *Zhurnal Prikladnoi Khimii*, v. 29, no. 1, 1956, p. 73-82.

See item 347-Q, 1956. (Q29, Q9; Cr, 8-62)

141-Q.* Preliminary Investigations on the Properties of Chromium and Chromium Alloys at Elevated Temperatures. G. R. Wims and T. W. Rea. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 77-78.

Tensile creep tests in air at 950° C. on Cr and alloys with 10% W and with 5% Mo. Structural changes associated with the creep deformation of Cr and Cr alloys are similar to those of other metals. Intercrystalline cavities develop during creep, leading to intercrystalline fractures, although certain differences have been observed between the cavities in the pure metal and those in the alloys. 15 ref. (Q3, 2-62; Cr, *W*, *Mo*)

142-Q.* Cleavage Fracture in Cast Chromium of High Purity. J. F. McNeil and H. R. Limb. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 79-87.

Fractography, goniometry and X-ray diffraction techniques of investigation. Various types of markings on the cleavage surfaces are explained in terms of the fracture process and where possible related to the crystal lattice. Four types of cleavage grain have been distinguished. Cleavage takes place mainly on {001}, to a minor extent on {112}, and, exceptionally, on or close to {111} planes. 30 ref. (Q26n, M26; Cr-a, 5-60)

143-Q.* The Solid Solutions of Gallium in Lead. Neill Greenwood. *Institute of Metals, Journal*, v. 87, Nov. 1958, p. 91-93.

Hardness of the saturated solution increases from 3.5 DPN. (Pb) to 11.0 DPN. (0.15% Ga). The quenched solid solutions exhibit aging characteristics. Hardness determinations were made after quenching and holding at 22 and 100° C. for 100 days and also after quenching and cold rolling and holding at 22° C. 4 ref. (Q29c, 2-65; 14-67, Ga, Pb)

144-Q. Effect of Copper, Nickel, Iron, and Chromium on the Tensile Properties of Preferentially Oriented Beryllium Sheet. F. M. Yans, A. D. Donaldson and A. R. Kaufmann. Nuclear Metals Inc. *U. S. Atomic Energy Commission*, NMI-1192, Feb. 14, 1958, 46 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Be was mixed with Cu, Ni, Fe and Cr to form binary alloys in powder form, then extruded and cross rolled. Effect of each alloying element was determined by tensile testing. In solid solution, small amounts of Fe and Ni had an embrittling effect while Cu in solution increased the strength but had no effect on ductility. 7 ref. (Q27, 2-60; 4-53, Be, *Cu, Ni, Fe, Cr*)

145-Q.* Manganese Joins Aluminum to Give Strong Stainless. J. L. Ham and R. E. Cairns, Jr. *Product Engineering (Design Edition)*, v. 29, Dec. 22, 1958, p. 50-51.

Austenitic Al-Mn-C steel with ductility for forming, and strength at high temperatures. (Q27, Q23p, 2-62; SS, *Al, Mn*)

146-Q. Early Detection of Fatigue in Aluminum Alloys by Ultrasonics. K. Sittel, M. Herman and R. C. Good, Jr. Franklin Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151019, May 1958, 45 p. $1.25.

Effects which occur during early stages in the fatigue life of a specimen, and advantages of using ultrasonic waves in the megacycle frequency range. Possibilities of using the attenuation temperature relationship for detecting dislocation motion and of applying ultrasonic waves to incipient fatigue detection. Design and construction of a resonant-type fatiguing machine and an electro-acoustic driving system for ultrasonic waves. (Q7, M26b, 1-74; Al-b)

147-Q. Role of Subgrains in High-Temperature Creep. L. A. Shepard and J. E.

Dorn. University of California. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151208, May 1958, 38 p. $1.

Contribution of the substructure to high-temperature creep resistance is small relative to other factors. Origin of subgrains; specific deformation modes which produce the variety of observable substructures. Effect of creep variables on subgrain development, size and structure. Manner in which the subgrain structure affects creep rate, recovery and grain-boundary shearing. 72 ref. (Q3m, Q3n, 2-62, 3-71)

148-Q. Compressive Creep Buckling of Metal Columns. Pt. 5. Cyclic Loading. A. Rudnick, R. L. Carlson and G. K. Manning. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151218, June 1958, 68 p. $1.75.

Linear relationship found between time to creep buckling under constant load, and reciprocal of minimum creep deflection rate. Effect of load cycling shown to be dependent upon the properties of the material at the testing temperature. (Q3c, 2-61, 3-66; Al-b, Ti-b)

149-Q. Investigation of the Compressive, Bearing, and Shear Creep-Rupture Properties of Aircraft Structural Metals and Joints at Elevated Temperatures. Pt. 3. L. A. Yerkovich. Cornell Aeronautical Laboratory, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131977, May 1958, 115 p. $2.75.

High-temperature creep strengths of a number of structural aircraft alloys determined under the influence of compression, bearing and shear stresses. Creep behavior of 15 sheet, plate and bar alloys creep tested in tension, compression, bearing and shear. Test alloys had creep characteristics under compression, bearing and shear stresses similar to those obtained in tension creep testing. (Q3, 2-62, 3-66)

150-Q.* (Russian.). Internal Friction in Nickel in Magnetic Field. Karel Misek. *Czechoslovak Journal of Physics*, v. 8, no. 8, 1958, p. 129-130.

Maximum internal friction depends on the amplitude of alternating field in Ni. Lessening of internal friction is due to the fact that in presence of large amplitude the sample is in state of saturation during the entire process. This brings about lessening of interaction of alternating field and eddy current vibrations. (Q22j, P16; Ni)

151-Q. Evaluation of Non-Ferrous Materials. N. E. Promisel. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 16-68.

Failures appear to be primarily due to one or a combination of fatigue, brittle behavior and stress or other special types of corrosion. Alloy systems analyzed are Al, Mg and Ti. Laboratory tests and their relationship to performance. (Q7, Q26s, R1d; Al, Mg, Ti)

152-Q. Plasticity and Fracture. R. Beeuwkes. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 89-153.

Quantitative, macroscopic, semi-empirical treatment of basic engineering plasticity and fracture problems. Basic factors involve form of the stress-strain-fracture diagram (including unloading and cyclic loading anisotropy, temperature and rate of strain change during stressing, stress concentration and hydrostatic stress effects), effect of notches, crack growth. (Q23, Q26)

153-Q. A Survey of the Low-Temperature Brittle Fracture Problem. J. D. Lubahn. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 154-190.

Brittleness and tendency toward brittle crack propagation in mild steel considered as functions of temperature, size, strain rate and part geometry. As the temperature is lowered the ductility and the ability to tear fibrously either remain constant or increase slightly over a certain range of temperature, then begin to drop off rather rapidly with further lowering of temperature. 21 ref. (Q26, 2-61, 3-73, 3-68; CN)

154-Q. Toughness of Titanium Alloy Sheet. S. V. Arnold. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 192-206.

Several thicknesses of sheet are joined to form a laminated blank from which a notched specimen is machined. Thickness of an individual lamina is plotted against the transition temperature of the laminated impact specimen and the minimum energy of the individual lamina in ductile fracture. Materials investigated were alpha-beta alloy sheets. (8% Mn, and 5% Al, 2.5% Sn). (Q26, Q6; Ti, 4-53)

155-Q. Notch-Tension Testing. E. J. Ripling. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 207-233.

Variables influencing the notch properties of steels, including strength level, notch geometry, eccentricity and testing temperature. Notch tensile characteristics of nonferrous metals, both face-centered cubic, as well as hexagonal Zn and Ti alloys. 16 ref. (Q27d; ST, Al-b, Ti-b)

156-Q. Bucket Failure Mechanisms and Problems in Correlation of Laboratory Data With Gas-Turbine Bucket Performance. J. W. Weeton, G. M. Ault and F. B. Garrett. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 235-263.

Life predicted from stress-rupture data is the longest that a turbine bucket material can be expected to run in the engine. Other factors such as vibratory and thermal stresses lower the life below that predicted by stress-rupture alone. Bucket life given for Nimonic 80, Inconel X, N-155, Hastelloy B, cast S-816 and HS 21. 6 ref. (Q3q, Q26, T7h; Ni-b)

157-Q. Material Properties and Their Use in Design. M. J. Manjoine. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 264-278.

Influences of state of stress, strain rate, temperature and time on plastic flow, creep, initiation of fracture and propagation of fracture. Tests include standard mechanical tests under uniaxial stress and constant temperature to determine the strength of materials and its statistical variation. 30 ref. (Q3, Q24, Q26q, 3-66, 3-68, 2-61; ST)

158-Q. Prediction of Creep and Creep Buckling of Thin Symmetrical Shells From Tensile Creep Test Data. C. C. Bigelow. Paper form "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 279-301.

Use of isochronous stress-strain curves in conjunction with the Hencky conditions of plasticity to predict creep deformation of axially symmetrical shells under internal pressure. Creep in both Pb and 1500° F. Inconel shells are compared with computed creep with fair agreement. (Q3, Q3c; Ni-b)

159-Q. Application of Laboratory Test Data to Design of Aircraft Gas Turbine Blade Fastening Models. W. F. Brown, A. J. Meyer and M. H. Jones. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 302-335.

Data obtained from elevated-temperature tensile tests on actual blade roots are compared with results predicted on the basis of plastic models. Creep-rupture strength of S-816 and 16-25-6 was calculated from 1200° F. notch-tensile and shear creep-rupture data. 14 ref. (Q2, Q3m, Q27d, T7h, 2-62; SS)

160-Q. Application of Laboratory Fatigue Data to Gear Design. D. W. Dudley and W. F. Diffin. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 337-354.

Data on type 4340 steels of two different quality levels with strengths in the 180,000 to 210,000-psi. range; carburized and hardened 9310 steel; normalized and tempered 1040 steel; and normal 3% Ni steel. Data analyzed by statistical techniques. 7 ref. (Q7, T7a; AY)

161-Q. Design Aspects of High Speed Rotating Parts. R. G. Anderson. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 355-382.

Effects of geometry on rupture speed of a high-speed rotating part fabricated from Al alloys. Influence of stress concentrations and accompanying strength reduction resulting from materials having different combinations of mechanical properties. The magnitude of the stresses set up by inertia in a rotating part of a given shape is directly proportional to the density of the material. (Q25k, 3-73; Al-b)

162-Q. Development and Testing of Magnesium Alloy Wheels. R. L. Atkin and J. G. Mezoff. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services*, PB 131783, p. 383-440.

Design considerations, static and dynamic testing techniques, fatigue and stress analysis in wheels of AZ80A-F, ZK60A-F and AZ31C-F Mg alloys. 8 ref. (Q7, Q6, T21c; Mg-b, 17-51)

163-Q. High-Temperature Properties in Relation to Design. J. R. Weir, R. V. Meghreblian and D. A. Douglas. Paper from "Materials Evaluation in Relation to Component

Behavior". *U. S. Office of Technical Services,* PB 131783, p. 441-457.

Structural problems arising in high-temperature design involve the creep, relaxation, thermal shock and strain-cycling properties of materials. Coefficient of thermal expansion, thermal conductivity, stress-strain characteristics, geometry, time-rate of change of temperature and time at temperature are correlated. (Q-general, P11g, P11h, 2-62, 17-51)

164-Q. Studies of Hydrogen Embrittlement Produced by Electrolysis. A. Brenner and G. B. Wood. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, p. 476-495.

Embrittlement resulting from the use of hydrogen isotopes. Steel was embrittled by the discharge of deuterium to a slightly less extent than by hydrogen, while the period of electrolysis required by the embrittlement to appear was somewhat longer. 10 ref. (Q26s; ST, 1-59, H)

165-Q. Test Methods for Evaluating Hydrogen Embrittlement. George Sachs. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, p. 496-516.

Comparative advantages of tension, bend and notch-tension tests. General acceptance of the notch-tension test for evaluating hydrogen embrittlement is primarily due to notch strength being a very sensitive measure of ductility, yet the notch-tension test only responds to low ductilities and may not show the existence of little or moderate embrittlement. 10 ref. (Q26s, Q27d; H)

166-Q. Stress-Rupture Behavior of Weldments and Brazed Joints. John G. Sessler. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, p. 582-600.

Stress-rupture data provide a comparison of parent and weld metal strength and ductility at various strength levels, any notable change in the notch properties due to welding, effects of heat treat variations on stress-rupture properties and an appraisal of structural stability. (Q3q, 2-64; 7-51, 7-52)

167-Q. Elevated Temperature Properties of 2024-T3 Aluminum Alloy. Donald R. Adolphson. Sandia Corp. *U. S. Atomic Energy Commission,* SCTM298-58 (16), Sept. 16, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.60.

Effects of time at temperature, rate of loading and rate of heating in relation to thermal conductivity, specific heat, tensile ultimate strength, tensile yield strength, modulus of elasticity, ultimate shear and compression yield strength. (Q-general, P11h, P12r, 2-61, 3-66; Al-b)

168-Q. Tensile Properties of Niobium. H. G. Vaughan and R. G. Rose. *United Kingdom Atomic Energy Authority,* IGR-TN/C-583, July 11, 1958, 22 p.

Effect of surface oxidation on the ultimate tensile strength. Cb retains its strength up to 500° C., while the elongation decreases to a minimum at 500° C. Surface oxidation does not alter the room-temperature tensile strength, while O in solution in Cb increases the ultimate tensile strength and emphasizes the brittle nature of fracture at 500° C. (Q27a, 2-61; Cb)

169-Q. How to Evaluate Formability of Sheet Metal. D. A. Stewart. *Materials in Design Engineering,* v. 48, Dec. 1958, p. 100-102.

Tests available. (Q23q, Q5k, G4; 4-53)

170-Q. (French.) Process of Relaxation at Elevated Temperature. Christian Boulanger. *Revue de Metallurgie,* v. 55, Sept. 1958, p. 889-898.

Hysteresis meter used to study elastic modulus and internal friction as a function of temperature for various metals and alloys. 7 ref. (Q21a, Q22, 1-53, 2-61)

171-Q. (French) Influence of Size on Fatigue of Notched Specimens. P. Kuhn. *Revue de Metallurgie,* v. 55, Sept. 1958, p. 860-864.

Given the fatigue limit of an unnotched specimen, it is possible to calculate fatigue limit of a notched specimen if a constant of the metal is known. Two curves give this constant for steels and Al alloys. Life of alloys can also be calculated. 12 ref. (Q7; ST, Al-b)

172-Q. Various Aspects of the Distribution of Fatigue Lives. E. J. Gumbel. Columbia University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151211, July 1958, 45 p. $1.25.

Asymptotic probability function of limited smallest values used for the representation and interpretation of both constant stress-amplitude and random fatigue tests and for the estimate of minimum fatigue life of structural materials. (Q7b, S12)

173-Q.* (English.) Study on the New Indentation Hardness. Pt. 1. Proposal of the New Hardness. Jun-itiro Hashimoto. *Metropolitan Technical College, Memoirs,* no. 5, 1958, p. 8-16.

New hardness number, which is determined independently of the magnitude of load and the shape of an indentor, is based on indentation hardness test in comparison with other hardness numbers. 10 ref. (Q29; ST)

174-Q. Elevated Temperature Properties of 7075-T6 Aluminum Alloy. Donald R. Adolphson. Sandia Corp. *U. S. Atomic Energy Commission,* SCTM299-58(16), Sept. 16, 1958, 23 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .60.

Effects of time at temperature, rate of loading and rate of heating in relation to thermal conductivity, specific heat, tensile ultimate strength, tensile yield strength, modulus of elasticity, ultimate shear and compression yield strength. (Q-general, P11, 2-62, 3-67; Al-b)

175-Q. Elevated Temperature Properties of 2014-T6 Aluminum Alloy. Donald R. Adolphson. Sandia Corp. *U. S. Atomic Energy Commission,* SCTM300-58(16), Sept. 16, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .60.

Effects of time at temperature, rate of loading and rate of heating in relation to specific heat, thermal conductivity, tensile ultimate strength, tensile yield strength, modulus of elasticity, ultimate shear and compression yield strength. (Q-general, P11, 2-62, 3-67; Al-b)

176-Q.* (Russian.) Impact Fatigue During Concentrated Strain. S. V. Tolkachnik. *Izvestiya Akademii Nauk SSR,* May 1958, p. 63-68.

Properties of impact fatigue are similar to those of ordinary fatigue, whether the tension is concentrated or not. The basic factor determining the order of magnitude of ultimate impact fatigue resistance is ordinary fatigue. (Q7d, Q6; ST)

177-Q.* (Russian.) Mechanical Properties and Weldability of Vacuum Treated Bessemer Steel. A. I. Krasovskii and V. D. Kodolov. *Svarochnoe Proizvodstvo,* Oct. 1958, p. 8-11.

Industrial tests prove feasibility of using bessemer steel vacuum treated in ladle. Nitrogen, oxygen and hydrogen have positive influence on base metal. Vacuum treatment reduced gas content by 2-3 times as compared to ordinary bessemer rimming steel. Greatest effectiveness of vacuum is on steel with more than 1% C. Tests confirm possibility of obtaining very cheap bessemer rimmed steel equal in quality to killed openhearth steels. 4 ref. (Q-general, K9s, D9m, 1-73; ST-d)

178-Q.* MST-881 Holds Properties to 1100° F. *Light Metal Age,* v. 16, Dec. 1958, p. 21.

Properties of new high-temperature Ti alloy. (Q-general, P-general; Ti-b, SGA-h)

179-Q. The Failure of Structural Metals Subjected to Strain-Cycling Conditions. R. W. Swindeman and D. A. Douglas. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2619, Nov. 1958, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Isothermal strain-cycling capacity of Inconel, Hastelloy "B" and Be. Data on Inconel illustrate the effect of grain size, specimen geometry, temperature and frequency. Above 1300° F., grain size and frequency exert a pronounced effect on rupture life. Fine-grained metal survives more cycles before failure than coarse-grained material. (Q7j, 2-59, 2-61, 3-68; Ni-b, Be)

180-Q. V-Notch Charpy Impact Testing Welded Joints. C. E. Hartbower. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, Washington 25, D. C., p. 557-581.

V-notch impact test provides excellent method for evaluating relative toughness of weld, heat affected zone and base metal providing that due consideration is given to selecting a significant criterion of performance and definition of transition temperature. 19 ref. (Q6; 7-51, ST)

181-Q. Effect of Precipitate Particles on Creep of Aluminum-Copper Alloys During Age Hardening. E. E. Underwood, L. L. Marsh and G. K. Manning. *National Advisory Committee for Aeronautics,* NACA TN 4372, Sept. 1958, 56 p.

Effects of controlled size and distribution of particles determined by creep, tensile and hardness measurements, by quantitative metallographic evaluation of particle characteristics and by X-ray and electron-microscope examinations. 37 ref. (Q3n, N7a, 2-66; Al-b, *Cu*)

182-Q.* (Russian.) Dependence of Durability of Ingot Molds on Design and Working Conditions. D. M. Slonim. *Stal'*, v. 18, Oct. 1958, p. 894-899.

The heavy wear on ingot molds when used in single-row arrangement can be reduced by thickening their wide planes. Increased durability of single-row and single-groove mold bottoms may be achieved by using the displaced arrangement of the groove and reinforcing mold bottoms. The molds were 2200 mm. in height, and weighed 12.65 to 16.10 tons. (Q9, W19c; ST)

183-Q.* (Russian.) Influence of Alloying Elements Contained in Metal Within the Limits of Specified Composition on Properties of IXI8H9T and 4X14H14B2M Steels. V. M. Doronin. *Stal'*, v. 18, Oct. 1958, p. 938-942.

Statistical investigation of test data at 20 and 700° C. showed that increase of C, Mn, Ti, W and Mo content (within the limits of specified composition) strengthens the steel. Increasing Si content has little effect on strength. Ni, Mn and Cr improve ductility while C lowers it. All above elements reduce resilience although Ni and Mo do so to lesser extent. 5 ref. (Q-general, 2-60; ST, AD-n)

184-Q.* (Russian.) Influence of Alloying Elements and Calculation of Strength of Low-Alloy Steel. M. S. Mikhalev and M. I. Gol'dshtein. *Stal'*, v. 18, Oct. 1958, p. 942-946.

Empirical formula for calculating ultimate strength and yield point of low-alloy steel according to its chemical composition (with correction based on thickness of part). Tests were made of almost carbonless steel (up to 0.04% C) and low-carbon steel (up to 0.20% C). Exactness of method is proven by fact that in 50% of tests margin of error was only ± 1 kg. per sq. mm. 9 ref. (Q27a, 2-60; AY, AD-n)

185-Q.* Activation Energies for Creep of an Alpha Solid Solution of Magnesium in Aluminum. N. R. Borch, L. A. Shepard and J. E. Dorn. *American Society for Metals, Transactions*, v. 52, Preprint no. 117, 30 p.

Activation energies of Al-3.2% Mg alloy over a temperature range from 78° K. to the melting point. Over the range of 200 to 300° K. activation energies of a 3.2% Mg alloy are greater than those for pure Al. A peak activation energy was obtained at 325° K. This peak is analyzed in terms of Cottrell's mechanism for strain aging and solute atom locking, with further postulate that locking occurs while the dislocation is arrested at a barrier. 29 ref. (Q3, M26b, P13a; Al-b, *Mg*)

186-Q.* Influence of Static Stress and Temperature on Internal Damping. J. W. Clark and W. C. Hagel. *American Society for Metals, Transactions*, v. 52, Preprint no. 118, 30 p.

Internal damping of fixed-beam AISI 403, Ti and ferromagnetic austenitic alloys at vibratory stresses from zero to 35,000 psi at static tension stresses from zero to 19,000 psi in the temperature range of 75 to 1100° F. Ti shows very low internal damping under all test conditions. Although damping of ferromagnetic austenitic alloys decreases less rapidly with increasing temperature than it does in the case of AISI 403, the influence of static stress of magnetic fields causes a more drastic reduction. 12 ref. (Q22, 2-61, 3-66, SS-e, Ti)

187-Q. Development of a Ferromagnetic Cobalt-Base High-Temperature Alloy. A. Cochardt. *American Society for Metals, Transactions*, v. 52, Preprint no. 119, 31 p.

Damping behavior, aging characteristics, creep and fatigue properties and oxidation resistance of precipitation-hardened alloys with Ti and containing 62 to 88% Co. Optimum composition range of these alloys for blade material in steam turbines is 22 to 24% Ni, 1.8 to 2.0% Ti, 0.15 to 0.25% Al and the balance Co. 11 ref. (Q22, Q3, Q7, N7a, R1h, 2-60, 2-62; Co-b, *Ni, Ti, Al*)

188-Q. Fatigue Properties of High-Strength Steels. H. E. Frankel, J. A. Bennett and W. A. Pennington. *American Society for Metals, Transactions*, v. 52, Preprint no. 121, 36 p.

Rotating beam fatigue strengths of four steels with C content ranging from 0.44 to 1.06% determined for a number of quenched and tempered conditions. Fatigue strength is a linear function of hardness up to some liniting value which is a function of C content. Refrigeration prior to tempering improves fatigue properties of steel; amounts of retained austenite up to about 10% lowered fatigue strength. 22 ref. (Q7c; CN, SGB-a)

189-Q.* Properties of Copper-Base Alloy Castings. F. Hudson, D. R. Wood and J. F. Gregg. *British Foundryman*, v. 51, Oct. 1958, p. 469-485.

Step bar and wedge shaped castings were cast from Cu, Sn, Zn, Pb, Ni alloys and Cu-Sn-Zn alloy. Effect of section thickness, Ni and Pb content, on mechanical properties and microstructure. Influence of composition on sensitivity of gunmetal to section thickness. 6 ref. (Q27a, Q29n, M27, 2-60, 3-73; Cu-b, *Ni, Pb, Sn, Zn*, 5-60)

190-Q. Brittle-Ductile Transition in Vanadium. Benny A. Loomis and O. N. Carlson. Iowa State College. *U. S. Atomic Energy Commission*, ISC-1037, Mar. 1958, 99 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.50.

Mechanical tests on two grades of V over a range of temperatures below 25° C. Brittle-ductile transition in V of 99.85% purity at -65 ± 10° C. Effect of small additions of either H, O, N or C is to raise the transition temperature. H is most effective in raising this temperature. Transition is apparently due to the interaction of dislocations with minute amounts of the interstitial solule atoms H, O, N or C. 28 ref. (Q23r; V, 2-60, *H, O, N, C*)

191-Q.* (Czech.) Influence of "F" Fracture on Mechanical Properties of Large Forgings. Vaclav Koudela. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 687-691.

Statistical analysis determining influence of "F" fractures occurring during rupture tests on the mechanical properties of large steel forgings. (Q26r, Q27a, S12; ST, 4-51)

192-Q.* (English.) Creep and Relaxation of Steel at Room Temperature. F. Campus. *Univ. Bruxelles, 9th Congres Interm Mecan. Appl.*, v. 8, 1957, 312-315.

Experiments on mild steel to hard cold drawn steel wire. Steel without yield point, value of the creep after strain for equal stress and for steel with a yield point; yield elongation is the significant quantity and not yield stress. (Q3, 2-61; ST, 4-61)

193-Q.* (German.) Influence of Silicon and Phosphorus on the Temper Brittleness of Blackheart Malleable Iron Castings. Paul Bastien, Pierre Azou and Christiane Winter. *Giesserei*, v. 45, June 5, 1958, p. 325-333.

Tensile tests, impact tests, dielectric measurements and X-ray analysis used to study influence of Si and P on temper brittleness; hypothesis explaining results. (Q26s, 2-60, 2-61; CI-s, *P, Si*)

194-Q.* (German.) Investigations on the Formation of Pits. F. Erdmann-Jesnitzer and K. Weigel. *Werkstatt und Betrieb*, v. 91,

Formation of pits on the end surfaces of two cylindrical steel specimens rapidly struck against one another. Influence of lubricant, material composition, grain size, combination of specimens and surface finish on pitting. Metallographic and electron microscope observations. Avoidance of pitting. 44 ref. (Q9, 2-59, 2-60, 2-66; ST)

195-Q.* (Japanese.) Fracture of Cadmium Plated Bolts. Toshiichi Nakamura and Tetsuo Tanaka. *Metal Finishing Society of Japan, Journal*, v. 9, Sept. 1958, p. 342-346.

Hardness of carburized layer on steel bolts increased due to Cd plating while elongation decreased slightly. Elimination of hydrogen embrittlement by heating at 150° C. Effects of metallurgical properties of base metal, heat treatment conditions and mechanical working on fracture of plated bolts. 7 ref. (Q26s, T7f; CN, *Cd*, 8-62)

196-Q.* (Russian.) Reducing Spoilage From Hardening Cracks. P. P. Zuev. *Metallurg*, v. 3, Nov. 1958, p. 34-37.

Cracks arise during rapid cooling and transformation from martensite to pearlite accompanied by a significant increase in volume and stresses. When the force of the stresses exceeds the strength limit of steel, cracks occur. To eliminate cracks it is necessary to cool slowly. (Q26, F23, 2-61, 9-71; ST)

197-Q.* Importance of the Hydrogen Content of Steel Slabs and Its Determination in Sheet Steel. C. E. A. Shanahan. Paper from "Physical Chemistry of Steelmaking", Technology Press, Massachusetts Institute of Technology, and John Wiley & Sons, Inc., New York, 1958, p. 203-208.

Hydrogen found in sheet arises from atmospheric contamination during preparation of the sample. Effect on ductility of steel with a straining of the steel structure as judged by metallographic examination and load-elongation curves. (Q-general, 2-60, ST, *H*)

198-Q.* Contraction Stresses in Sprayed Metal Deposits. W. E. Stanton. *Metal Industry*, v. 93, Dec. 19, 1958, p. 509-511.

Investigation by deflection measurements on thin mild steel strips. (Q25h; ST, 8-67)

199-Q.* Problems of Brittle Fracture. H. Hains. *Iron and Coal Trades Review*, v. 177, Dec. 12, 1958, p. 1395-1400.

Influence of residual stresses; test methods; crack severity; effect of welding electrodes; limitations of radiography; effects of irradiation. (Q26s, 3-66, 2-67)

200-Q.* Dislocation Model of Low-Temperature Creep. J. Weertman. *Journal of Applied Physics*, v. 29, Dec. 1958, p. 1685-1689.

Low-temperature dislocation creep model of the exhaustion type is proposed to account for the temperature independent activation energies often found. Logarithmic creep can be obtained from the model if a Gaussian distribution function of Frank-Read sources is assumed. The theory can be extended into the liquid He temperature range with the aid of Glen-Mott quantum-mechanical dislocation tunneling. (Q3, M26b, 2-63)

201-Q.* Mechanical Properties of Uranium-Molybdenum Alloys. M. B. Waldron, R. C. Burnett and S. F. Pugh. *Nuclear Power*, v. 3, Dec. 1958, p. 599-600.

U-Mo alloys are susceptible to a wide variety of heat treatments. Three groups of alloys exist in which hardening is due to solid solution of Mo in alpha U; to formation of alpha + gamma dispersions and to solid solution of Mo in gamma U. Effects of irradiation are not clear. (Q-general, 2-64, 2-67; U-b, *Mo*)

202-Q.* Adhesion of Evaporated Aluminum Films. C. Weaver and R. M. Hill. *Philosophical Magazine*, v. 3, Dec. 1958, p. 1402-1410.

Increase in adhesion obtained for Al films by the pre-deposition of films of Cr. Adhesion varies with thickness of Cr film and with time. The variation with time suggests that the nature of the increase in adhesion is primarily one of alloying at the metallic interface and subsequent age hardening. 11 ref. (Q10c; Al, 14-62)

203-Q.* Grain Boundary Extrusion and Deformation During the Fatigue of Lead in a Partial Vacuum. K. U. Snowden. *Philosophical Magazine*, v. 3, Dec. 1958, p. 1411-1413.

Observations of slip, grain-boundary migration and grain-boundary extrusion. Initial effect of cyclic straining caused slip and some grain boundaries to migrate. After about 10^4 to 10^5 cycles migration rate slowed down and almost stopped. (Q24a, Q7, 3-68; Pb)

204-Q.* Elastic Constants of Zinc Between 4.2 and 670° K. G. A. Alers and J. R. Neighbours. *Physics and Chemistry of Solids*, v. 7, Oct. 1958, p. 58-64.

The five adiabatic elastic constants of single crystals of Zn measured from 4.2 to within 20° K. of the melting point, using the ultrasonic-pulse technique. Although the temperature variation is not exactly linear, no very rapid changes occur even as the melting point is approached. 20 ref. (Q21e; 14-61, Zn)

205-Q.* (French.) Fatigue of Nickel-Chromium Alloys at High Temperatures. A. W. Franklin and E. D. Ward. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 927-938.

Fatigue strength found to vary with the tensile strength and to depend on structure resulting from heat treatment. Examination of the fracture allows determination of cause—creep or fatigue. 10 ref. (Q7a, Q3m, Q27a, 2-62, 3-71; Ni, Cr)

206-Q.* (German.) A New Rough Surface Hardness Test for Metals Based Upon Full Indentation of a Ball. G. U. Oppel. *Forschung auf dem Gebiete des Ingenieurwesens*, no. 5, 1958, p. 149-153.

Reliable results are achieved independently of surface condition. Technique permits hardness to be measured by the force required for a ball to make a full indentation to a depth where asperities of the surface do not influence the results. (Q29b)

207-Q.* (Russian.) Load-Deformation Diagrams of Crystal Lattices. B. M. Rovinskii and V. M. Sinaiskii. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1366-1370.

Method of constructing diagrams is based on continuous X-ray exposures of the deformed sample. Permits observance of deformation process of separate crystallites; determination of their degree of perfection. (Q24, M21f)

208-Q.* (Russian.) Determination of Adhesion of Lacquer Coating to Metallic Bases. I. I. Kletchenkov. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1376-1377.

Depends on presence of a solvent in the coating resulting in a lowering of electrostatic interaction between the coating and the metal surface. Metallic

bases used: Al foil, Sn foil and Cu foil; Cu with Ni plate, Cd and Cr. (Q10c; Al, Sn, Cu, Ni, Cd, Cr, 4-56, 8-70)

209-Q.* (Russian.) Linear Interpretations of Accumulated Failure and Resistance Characteristics to a Fatigued and Prolonged Static Breakdown. S. V. Serensen and L. A. Kozlov. *Zavodskaya Laboratoriya,* v. 24, no. 11, 1958, p. 1378-1391.

Characteristics of fatigue resistance and prolonged static durability during cyclic overloads and superheating. (Q7a, Q7j; SS)

210-Q.* (Russian.) Method of Determining Localized and Uniform Plasticity During Elongation. G. I. Pogodin-Alekseev and A. G. Vasil'eva. *Zavodskaya Laboratoriya,* v. 24, no. 11, 1958, p. 1394-1395.

Method for constructing diagrams of deformation distribution during any condition of static testing, including high temperature. (Q27, 2-62)

211-Q.* (Russian.) Determination of Dynamic Error During Bend Tests for Fatigue. M. E. Garf and P. M. Puban. *Zavodskaya Laboratoriya,* v. 24, no. 11, 1958, p. 1403-1406.

In machines used in bend testing, as well as in tension, compression or torsion testing, the magnitude of the dynamic error is independent of the actuating load, or the magnitude of actuating mass. (Q27, Q28, Q1, Q5)

212-Q.* (Russian.) Determinations of Elastic Constants in Materials With Longitudinal Ultrasonics. V. A. Kus'menko. *Zavodskaya Laboratoriya,* v. 24, no. 11, 1958, p. 1407-1408.

Mathematical derivation of Young's modulus of elasticity E; modulus of shear G and Poisson's ratio. (Q21a, Q21c, Q21d)

213-Q.* A High-Temperature, Vacuum, and Controlled-Environment Fatigue Tester. G. J. Danek, Jr., and M. R. Achter. *ASTM Bulletin,* no. 234, Dec. 1958, p. 48-52.

Equipment for reverse bending fatigue testing at elevated temperatures in vacuum using high strain amplitudes at low frequency to produce failures in approximately 10^5 cycles. Construction details; use of magnetic coupling for transmission of motion. Fatigue data for Type-316 stainless steel. 7 ref. (Q7g, 1-53, 1-66, 1-73; SS-e)

214-Q.* A Toric Bending Specimen for Investigation of Geometrical Factors in Fatigue. J. A. Bennett and J. G. Weinberg. *ASTM Bulletin,* no. 234, Dec. 1958, p. 53-56.

Bending fatigue test specimen with an anticlastic surface in the reduced section. Results with annealed 5052 Al alloy indicate lack of restraint at corner of a cross-section does not significantly reduce resistance to fatigue crack initiation. Effects of transverse stress in middle of wide plate and stress amplitudes on crack initiation. 6 ref. (Q7g, 1-60, 3-73; Al-b)

215-Q.* High-Temperature Fatigue Testing With Application to Uranium. Jack R. Bohn and Glenn Murphy. *ASTM Bulletin,* no. 234, Dec. 1958, p. 57-60.

Protection methods to prevent oxidation during high-temperature testing including plating or encasement of specimen in flexible envelope. Equipment for encasement with flexible stainless steel capsule. Results at 600° C. with encapsuled U specimen. (Q7, 2-66, 1-60; U-a)

216-Q.* Fatigue Strength of Magnesium Alloy HK31 as Modified by a Weld Joint. J. E. Breen and Arthur S. Dwyer. *ASTM Bulletin,* no. 234, Dec. 1958, P-6063.

Effects of weld direction and weld bead geometry on fatigue strength of HK31 alloy sheet. (Q7a, 3-73; Mg-b, 7-51)

217-Q.* A Note on the Effect of Pressurization on the Fatigue Life of Metals. L. W. Hu. *ASTM Bulletin,* no. 234, Dec. 1958, p. 63-65.

Change in the fatigue life of carbon steel C1045 and Al alloy 2017-T4 following a period of exposure to hydrostatic pressures of up to 100,000 psi. 6 ref. (Q7b, 3-74; Cn, Al-b)

218-Q.* Fatigue Damage of Plain Carbon Steels. Effect of Reheating. T. Yokobori. *ASTM Bulletin,* no. 234, Dec. 1958, p. 66-67.

Annealed specimens damaged by exposure to cyclic stress beyond their endurance limit. Reheating of overstressed specimens at stress relief temperature failed to increase fatigue life beyond that of damaged specimens which had not been reheated. Repair of fatigue damage by understressing. (Q7, 2-64, 3-66, 3-68; CN)

219-Q.* Designing With Stainless Steel. *Electrical Manufacturing,* v. 62, Dec. 1958, p. 79-86.

Composition, structure, properties, applications of stainless stee. (Q-general, 17-57; SS)

220-Q.* Creep in Steels. J. Glen. *Iron & Steel*, v. 31, Dec. 24, 1958, p. 622-625.

Abstracts of papers presented at autumn meeting of Iron and Steel Institute. Estimating long-time properties of steel using strain-rate method of plotting. Effect of alloy elements on creep behavior of alloy steels, Ti, Ni and Mg alloys. Ductility in high-temperature rupture tests. Recent developments in creep testing by cantilever bending method. (Q3; ST, Ti-b, Ni-b, Mg-b)

221-Q.* Effect of Internal Flaws on the Fatigue Strength of Aluminum Alloy Rolled Plate and Forgings. J. L. Waisman, Leo Soffa, P. W. Kloeris and C. S. Yen. *Nondestructive Testing*, v. 16, Nov-Dec 1958, p. 477-489.

Defect size and defect location versus fatigue effect in 7075-T6 and 7069-T6 Al alloys. Ultrasonic tests for quantitative evaluation of discrete flaws. (Q7, 9; Al-b, 4-51, 4-53)

222-Q.* Velocity of Ultrasound in Molten Tin-Bismuth Alloys and Their Compressibility. I. G. Polotskii and E. L. Khodov. *Soviet Physics Acoustics*, v. 4, no. 2., 1957, p. 185-187.

Concentration dependence of the velocity of ultrasound has a linear character with varying slope relative to the axis of concentrations. Adiabatic compressibility curves and ultrasound velocity intersect in eutectic concentration region. 9 ref. (Q21f, Q28; Sn-b, *Bi*, 14-60)

223-Q.* Lower Airframe Weights With Heat-Treated Titanium Alloys. E. F. Erbin. *Space Aeronautics*, v. 30, Dec. 1958, p. 42-47.

Efficiency versus mechanical properties of Ti alloys improved with heat treating. (Q-general, 2-64, T24, 17-57; Ti-b, *Al, Mo, V*)

224-Q.* Coefficient of Friction of Metals. C. Rubenstein. *Wear*, v. 2, Nov. 1958, p. 85-96.

The coefficient of friction of In is load-dependent at light normal loads. Explanation in terms of the work hardening of In at these loads and of surfaces slipping prior to complete work hardening. This suggests that the coefficient of friction of higher-melting-point, oxide-free metals, when measured at sufficiently high temperatures, will exhibit a load-dependence similar to that shown by clean In at room temperature, provided seizure does not occur. 17 ref. (Q9p; In)

225-Q.* (English.) Creep Tests on Mild Steels at Room Temperature. Ake Josefsson and Goran Lagerberg. *Jernkontorets Annaler*, v. 142, no. 9, 1958, p. 570-584.

Creep properties of steels in which ferrite is the main component. Only if the dissolved C and N in the ferrite is reduced to very low values by the addition of Ti, so as to eliminate the yield point, is a continuous creep observable over long periods. In ferrite in which C and N (or C alone) exists in solid solution, and which therefore exhibits a distinct upper yield point, no creep is observable so long as the stress does not attain the upper yield point determined by normal testing. 14 ref. (Q3; CN, *N*, Ti, 2-60)

226-Q.* (German.) Torsion Testing of Tinned Wires. Ove Flack Holm. *Draht*, v. 9, Nov. 1958, p. 458-459.

Shear ductility expressed by number of revolutions to failure in a length equal to 100 diameters for hot tinned wires shows marked decrease over original base wire. Comprehensive tests on coated steel wires during various stages of manufacture show small decrease in tensile strength and increase in shear ductility after preheating (drying) followed by considerable reduction of shear ductility after hot coating. Removal of coating by acid or mechanically restores original properties. (Q1, Q2, Q27a; ST, *Sn*, 4-60, 8-65)

227-Q.* (German.) Properties of Aluminum Killed Deep Drawing Steel Strip. Karlheinz G. Schmitt-Thomas, Heinz Borchers and Vincens Seul. *Stahl und Eisen*, v. 78, Dec. 11, 1958, p. 1798-1808.

Effect of heat treatment, carbon content, deformation and cooling temperature. 39 ref. (Q27, F23, J-general, 2-60, 2-61, 3-68; ST, 4-53)

228-Q.* Comparison of Parameter Methods for Extrapolating High-Temperature Data. R. M. Goldhoff. *American Society for Mechanical Engineers*, Paper no. 58-A-121, 1958, 15 p.

Materials examined were eight alloys, S-590, A-286, Nimonic 80A and 1 Cr, 1 Mo, 1/4 V steel. Three parameter methods are compared on a statistical basis for their ability to reproduce the isothermal data on which they are based and in particular the longest time data currently available and usable for this purpose. 7 ref. (Q3, 2-62; Ni-b, AY)

229-Q.* The Wear of Abrasives in Grinding. G. J. Goepfert and Josephine L. Williams. *American Society of Mechanical Engineers*, Paper no. 58-A-157, 1958, 5 p.

Chemical reactions between metal and abrasive, their effect on abrasive wear and their modification by grinding fluids. Special attention is paid to the silicon-carbide-ferrous systems since wear rates and chemical reactions are more pronounced. 7 ref. Q9, G18; NM-j)

230-Q.* Multiaxial Creep Studies on Inconel at 1500° F. C. R. Kennedy, W. O. Harms and D. A. Douglas. *American Society of Mechanical Engineers*, Paper no. 58-A-193, 1958, 9 p.

Effecf of multi-axial stresses on creep rate and rupture life. Results of rupture tests appear to support the maximum principal-stress criteria for time-dependent fracture under multi-axial stress conditions. Compensation must be made for the reduction in rupture life caused by changes in the stress rate associated with deformation. 11 ref. (Q3, 3-66; Ni-b)

231-Q.* The Failure of Structural Metals Subjected to Strain-Cycling Conditions. R. W. Swindeman and D. A. Douglas. *American Society of Mechanical Engineers*, Paper no. 58-A-198, 1958, 6 p.

Isothermal strain-cycling of Inconel, Hastelloy B and Be. Data for Inconel on the effect of grain size, specimen geometry, temperature and frequency establish that at temperatures above 1300° F. grain size and frequency exert a pronounced effect on rupture life. Fine-grained metal survives more cycles before failure than coarse grained material. 9 ref. (Q3m; Ni-b, Be, 2-59, 2-61, 3-73)

232-Q.* (Polish.) Inclusions of Martensitic Structure in Drawing Steel Wire. Zygmunt Steininger and Jerzy Binder. *Hutnik*, v. 25, Sept., 1958, p. 357-359.

Martensitic structure found in wire from steel with average or more than average content of carbon. Profiled wires are especially sensitive to such inclusions. (Q26, N8p, 3-71; ST, 4-61, 9-69)

233-Q.* (Polish.) Physical and Mechanical Properties of Tellurium Copper. Z. Misiokek. *Prace Instytutow Ministerstwa Hutnictwa*, v. 9, no. 5, 1957, p. 181-189.

Precipitation and aging resulted in a hardness of H_B=69.5 kg. per sq. mm., which did not change when heated to 400° C. for 2 hr. Good machinability was indicated. 13 ref. (Q29n, G17k, 2-65; Cu-b, *Te*)

234-Q.* (Polish.) X-Ray Method of Stress Determination in Metals. Z. Ziokowski. *Prace Instytutow Ministerstwa Hutnictwa*, v. 9, no. 5, 1957, p. 203-225.

Modified method of "oblique screen photographs" worked out and photographs taken by means of a gap screen. 88 ref. (Q25k, 1-54)

235-Q. (Russian.) Use of a Composite Piezo Resonator for Determining Modulus of Elasticity and Internal Friction of Hard Bodies. B. I. Kisin. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1400-1403. (Q21a, Q22, X28)

236-Q.* Molybdenum Effect on Gray Iron Elevated Temperature Properties. G. K. Turnbull and J. F. Wallace. *Modern Castings*, v. 34, Jan. 1959, p. 81-92.

Stress-rupture and tensile strength measured for fracture times up to 100 hr. at 800, 1000 and 1200° F. Improved high-temperature properties. 20 ref. (Q-general; CI-n, *Mo*, 2-62, 2-60)

237-Q.* (Hungarian.) Influence of Iron and Silicon Impurities on Al-Mg Alloy. Laszlo Fldor, Rezso Herendi, Otto Szermek and Marton Voith. *Kohaszati Lapok* v. 13, Feb-Mar. 1958, p. 145-149.

Experiments with Hidronalium (Al-Mg) to determine plasticity, annealing and recrystallization properties. Diagrams show effect of duration of heat treatment and deformation on hardness. (Q23, N5, J23, Q29n; Al-b, *Mg, Fe, Si*)

238-Q.* (Hungarian.) Mechanical Properties of Gray Cast Iron. Statistical Analysis. Nandor Hajto. *Kohaszati Lapok-Ontode*, v. 9, Feb-Mar. 1958, p. 47-52.

Some 2400 tests performed to determine tensile and bending strengths, as well as hardness of castings, having known chemical composition and produced by different methods. 5 ref. (Q-general, S12; CI-n)

239-Q. (Book.) Elevated Temperature Properties of Chromium Steels. 124 p. Oct. 1958. American Society for Testing Materials, STP 228, 1916 Race St., Philadelphia 3, Pa. $4.25.

Data on tensile strength, yield strength, elongation, rupture and creep properties. Twenty-three alloys are covered ranging from 12 to 27% Cr. (Q-general, 2-62; SS, *Cr*)

240-Q. (Book.) Role of Molybdenum in Steel Castings for Industrial Equipment. John Wallace. 36 p. 1958. Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y.

Hardenability, tensile properties, fatigue, hardness, wear and impact resistance, machinability and weldability of cast steels. 41 ref. (Q-general; ST, *Mo*, 5-60)

241-Q. (Book.) Creep of Engineering Materials. Iain Finnie and William R. Heller. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. $11.50

Combines fundamentals of material behavior with important engineering applications. Creep testing, factors in choosing design stress, engineering calculations. (Q3)

242-Q. (Book.) Materials Evaluation in Relation to Component Behavior. Syracuse University Research Institute. *U. S. Office of Technical Services*, PB 131783, 1958, 613 p. $8.

Papers and Proceedings of Third (1956) Sagamore Ordnance Materials Research Conference held at Duke University, Durham, N. C., Dec. 5-7, 1956. Papers abstracted separately. (Q-general, 17-57)

243-Q. (Translation—BISI, 795) Influence of Cold Hardening of the Edges of Cold Rolled Transformer Sheet Samples on the Electromagnetic Characteristics. A. I. Belyakov. *Stal*, no. 2, 1957, p. 185-187.

See item 1050-Q, 1958. (Q23a, P16, 2-64; ST, SGA-n)

244-Q. (Translation—BISI, 812.) Effect of Hydrogen Content on the Mechanical Properties of Converter Steels Blown With Oxygen and Steam. Alfred Kruger and Eugen Schmidtman. *Stahl und Eisen*, v. 77, Dec. 26, 1957, p. 1868-1873.

See item 246-Q, 1958. (Q-general; ST-g)

245-Q. (Translation-Brutcher, 4429.) Study of Failure of Steel in Creep. I. I. Trunin and I. L. Mirkin. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 25-32.

Continuous rupture at high temperature is preceded by formation of rupture zone with a stepped up concentration of accumulated vacancies in the lattice. This process leads to weakening the interatomic bonds in the more highly strained metal; this in turn creates favorable conditions for formation of micro and macrocracking nucleus. 14 ref. (Q26, Q3; ST)

246-Q. (Translation—Brutcher, 4430.) Effect of Temperature and Preceding Heat Treatment on Rupture Strength of As-Cast and Wrought Alloy. A. A. Bochvar, M. E. Drits, Z. A. Sviderskaya and E. S. Kadaner. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 32-37.

Rupture strength of cast alloys varies linearly with temperature. Wrought alloys are even more sensitive to temperature. Heat treatment of cast alloys increases tendency to creep, while for wrought alloys it improves creep resistance. 4 ref. (Q3q, 2-61, 2-64; ST)

247-Q. (Translation—Brutcher, 4434.) Contact Fatigue of Medium Carbon Noncarburizing Steel Quenched After Induction Heating. T. N. Nazarova. *Metallovedenie i Obrabotka Metallov*, Nov. 1958, p. 57-59.

Contact fatigue occurs when two surfaces are under contacting pressures, such as occur in gears of tractor transmissions, resulting in chipping of metal surface. Studies were made of steel 45 with 0.44% C and of steel 45 kH with 0.43% C. (Q7a, T7a, 2-64; CN)

248-Q. (Translation—Columbia.) Influence of Elastic Stresses and Thermomechanical Treatment on the Magnetic Properties of High-Coercivity Alloys. Ia. S. Shur, M. G. Luzhinskaia and L. A. Shubina. *Academy of Sciences of the USSR, Bulletin*, v. 21, no. 9. 1957, p. 1263-1267.

Experimental data for Vicalloy (12% V, 52% Co, 36% Fe). (P16, 3-66; Co-b, V, Fe, SGA-n)

249-Q.* The Sulphides, Selenides and Tellurides of Titanium, Zirconium, Hafnium and Thorium. Pt. 4. Lubrication Properties of the Graphitic Chalcogenides. F. K. McTaggart and A. Moore. *Australian Journal of Chemistry*, v. 11, Nov. 1958, p. 481-486.

Majority of the chalcogenides of Ti, Zr, Hf and Th having layer lattice structures and/or graphitic nature were tested for possible lubricating properties. Although none of these materials adheres to the common metals, the shearing forces necessary to cause sliding between layers are, in general, low and comparable to those involved in molybdenum disulphide and graphite. 7 ref. (Q9, M26q, Ti, Zr, Hf, Th, *S, Se, Te*, 14-68)

250-Q.* Elastic Constants of Thorium Single Crystals in the Range 77-400° K. P. E. Armstrong, O. N. Carlson and J. F. Smith. *Journal of Applied Physics*, v. 30, Jan. 1959, p. 36-41.

Constants were determined at ultrasonic frequencies employing both resonance and pulse-echo techniques. The anisotropy factor at room temperature is 3.6 which is comparable to the values of Pb and Au. (Q21; Th, 14-61)

251-Q.* (Italian.) Properties of a New Type of Aluminum Bronze Containing Manganese. G. Panseri and M. Leoni. *Alluminio*, v. 27, Nov. 1958, p. 481-493.

Micrographic study of a complex alloy and a ternary alloy containing approx. 8% Mn. Structural changes resulting from heat treatment and influence of these changes on physical and mechanical properties. 18 ref. (Q-general, P-general, M27; Cu-s, *Al, Mn*

252-Q.* (Italian.) Low-Temperature Mechanical Properties of Aluminum Alloys. L. Mori. *Alluminio*, v. 27, Nov. 1958, p. 495-501.

AP 5, Pe 35, Ac 11, Av 24 and Eg 55 alloys were tested at 0, -25, -70, -115, -138 and -195° C. (Q-general, M23p, 2-63; Al)

253-Q.* (Japanese.) Experimental Studies on Temperature Increase in Specimens During Fatigue Test. Kichiro Endo, Seimi Yoshikawa and Atsushi Yamada. *Japan Society of Mechanical Engineers, Transactions*, v. 24, Nov. 1958, p. 767-771.

Temperature increase is a function of the magnitude of cyclic stresses, and a relationship between the increase and life of the specimen is found. Damping constant is influenced by the temperature of the specimen and has no relation to the magnitude or the cyclic number of stresses. 9 ref. (Q7f, Q8k, 2-61, 3-66)

254-Q.* (Japanese.) Fatigue Strength and Stress Distribution. Jun'etsu Niisawa. *Japan Society of Mechanical Engineers, Transactions*, v. 24, Nov. 1958, p. 784-790.

Fatigue strength is influenced by notch effect due to stress concentration. Fatigue failure occurs when the mean stress over a certain depth from the surface reaches the fatigue strength of uniform specimen under alternating load of tension and compression. 10 ref. (Q7a, 3-66)

255-Q.* (Japanese.) Three-Shear Theory of Plasticity. Fujio Nakanishi and Yasuo Sato. *Japan Society of Mechanical Engineers, Transactions*, v. 24, Nov. 1958, p. 791-797.

Plastic deformation can be divided into shearing stress in three directions. A new theory is presented which accounts for the relation between tension and pure shear, hysteresis loops, anisotropy due to plastic deformation, the relation between the yield point of mild steel and plastic deformation. (Q23p, Q24; CN)

256-Q.* (Russian.) Brittle Fracture of Monocrystalline Zinc. V. I. Likhtman, L. A. Koganova and L. S. Bryukhanova. *Doklady Akademii Nauk SSSR*, v. 120, no. 4, 1958, p. 758-760.

Comparative study of regularity in deformation and fracture in strong-surface-active fused metals with an analogous regularity of same metals in brittle state but in non-active conditions. Hg was used as a surface active element and liquid nitrogen as a non-active but brittle producing medium. (Q26s, Q24; Zn, 14-61)

257-Q.* (Russian.) Effect of Polarization on Mechanical Properties of Steel. T. V. Karpenko and R. I. Krpyakevich. *Doklady Akademii Nauk SSSR*, v. 120, no. 4, 1958, p. 827-829.

Ultimate elasticity; ultimate yield point; true tension, relative elongation and relative reduction of area of steel during the polarization process. (Q-general, P15; ST)

258-Q.* (Russian.) Micromechanism of Brittle Fracture of Steel. B. S. Kasatkin. *Izvestiya Akademii Nauk SSSR*, May 1958, p. 63-68.

Analysis of microstructures showed crushing of grains, mutual shifts of grains toward each other and crack formation. (Q26s, M27; ST)

259-Q.* (Russian.) Measurement of Modulus of Elasticity. M. G. Lozinskii and A. E. Fedorovskii. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 20-29.

Survey of dynamic methods to measure modulus of elasticity and internal friction of metals and alloys; specially constructed testing machine to learn temperature relation of these properties. (Q21a, Q22, 2-60, 2-61; ST, Fe, *N, Mo, V, W*)

260-Q.* (Russian.) Effect of Hydrogen on the Structure and Properties of Titanium and Its Alloys. S. G. Glasunov, I. I. Kornilov and A. M. Yakimov. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 30-36.

Review of work in USSR and abroad. Mechanism of brittleness effect determined by alloy structure. Brittleness on Ti and its alloys caused by precipitation of the hydrated phase. (Q26s; Ti-b, H)

261-Q.* (Russian.) Fatigue Strength of I-Beam Butt Joint. P. Z. Manilova. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 9-13.

Butt joints, where flanges are welded first and the web is welded afterwards,

have higher fatigue strength than beams where the web is welded first and the flanges afterwards. 5 ref. (Q7a; 7-51)

262-Q.* (Russian.) Investigation of Mechanical Aging of Steel Through Comparison of Actual Tension Diagrams. L. I. Gladstein, P. I. Sokolovskii and A. V. Rudchenko. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1236-1239.

Mechanical and natural aging of strain hardened steel have different characteristics; rapid quenching of austenitic carbon steel does not diminish its disposition to mechanical aging. (Q27, N7a, N7e; ST)

263-Q.* (Spanish.) Residual Stresses in Metals; Determination of Stresses. Pt. 1. Generalities. Methods of Determination. J. M. Sistiaga. *Revista de Ciencia Aplicada*, v. 12, Sept-Oct. 1958, p. 385-396.

Theoretical and mathematical study. State of stress at a given point; conditions of equilibrium in a body; origin, kinds and effects of residual stresses. Qualitative and quantitative methods of determination in symmetrical cylindrical bodies. (To be continued.) (Q25h)

264-Q. (German.) Resistance to Deformation of Alloy and Plain Steels. H. Meyer. *Werkstattstechnik und Maschinenbau*, v. 48, Dec. 1958, p. 673-676.

4 ref. (Q24; ST)

265-Q. (Russian.) Activating Energy of Diffused Creep of Metallic Solid Solutions. Ia. E. Geguzin. *Doklady Akademii Nauk SSSR*, v. 120, no. 4, 1958, p. 819-822.

(Q3; 14-67)

266-Q. (Russian.) Possibility of Separate Value of Metal Strength and Plasticity During Toughness Tests. Yu. Ya. Voloshenko-Klimovitskii. *Izvestiya Akademii Nauk SSSR*, v. 32, June 1958, p. 42-46.

Materials possessing different resistance to failure and different in their plastic diffusion subjected to the same toughness, failure and plasticity test. Measuring the amplitude and duration of impact impulse of the load, under which the sample fails is suggested. (Q23)

267-Q. (Russian.) Bending Test for Determination of Deformation Properties of Metals. T. L. Danilov, A. P. Ivanov, A. A. Krashkin, I. A. Razov, E. M. Shevandin and I. L. Shimelevich. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1233-1236.

6 ref. (Q5)

268-Q. (Russian.) Tension Diagram of Steel Under Direct Load. A. B. Litvin. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1239-1242.

Oscillograms and tables comparing tests conducted on conventional and direct-load tension machines. (Q27;ST)

269-Q. (Russian.) Investigation of Plastic Flow During Simultaneous Tension and Torsion of Metallic Samples Made Out of Thin-Walled Tubes. Ya. I. Yagn and O. A. Shishmarev. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1243-1245.

Improved method and apparatus. (Q24, 3-66; 4-60)

270-Q. (Russian.) Determination of Strength of Oxide Films. V. N. Gulyaev. *Zavodskaya Laboritoriya*, v. 24, Oct. 1958, p. 1245-1246.

Durability of common oxide film of sample pairs was established by tension, shear, compression and torsion. (Q-general; Fe, *O*, 14-62)

271-Q. (Russian.) Determination of Strength of Parts Pressed From Metallic Powders. G. N. Semenov. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1246-1247.

Pressed samples were radially compressed in a 4-ton hydraulic press. Fracture was in diametric plane. Tear resistance of pressed samples is 2 to 4 times greater than of rolled samples. (Q26; 6-72)

272-Q. (Russian.) Testing Methods for Heat Resistant Materials Under Variable Temperatures and Stresses. L. B. Getsov. *Zavodskaya Laboritoriya*, v. 24, Oct. 1958, p. 1247-1251.

Survey of foreign literature. 21 ref. (Q-general, 2-61, 3-66; SGA-h)

273-Q. (Russian.) Apparatus for Precise Determination of Temperature Dependence of Young's Modulus and Damping Decay. G. I. Kataev. *Zavodskaya Laboritoriya*, v. 24, Oct. 1958, p. 1258-1261.

(Q21a, Q7j, 2-61, 1-53)

274-Q.* The Case Against the Tension Test. John B. Caine. *Foundry*, v. 86, Sept. 1958, p. 78-85.

Various methods of evaluating casting strength and serviceability; validity of tests. 10 ref. (Q-general; CI)

275-Q.* Friction and Wear Properties of Titanium. P. D. Miller and J. W. Holladay. *Wear*, v. 2, Nov. 1958, p. 133-140.

All lubricants, with the possible exception of fluorocarbons, are ineffective in reducing the galling of bare Ti metal, although many of the wear problems can be minimized by coating the surface of the metal and then lubricating this surface. Wear resistance of the metal is improved by oxide, nitride and carbide case hardening and coatings. Chemical conversion coatings such as fluoride, phosphate and anodized coatings help retain the lubricant and improve the resistance to galling. 24 ref. (Q9; Ti, 8, NM-h)

276-Q.* (French.) Hot Deformation of Steel. A. Gueussier and R. Castro. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1023-1041.

Steel samples exposed to tensile and bending deformation up to approximately 1400° C. It was shown that during hot deformation harmful precipitation or desirable recrystallization can occur. 26 ref. (Q24, Q5, Q27, 2-61, 2-60; AY, SS)

277-Q.* (French.) Scattering Observed in Rotary Bending Fatigue Tests. R. Castro and A. Gueussier. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1042-1047.

Scattering within ±8% on both sides of the fatigue limit observed. No significant evidence was found to indicate influence by machining, sampling conditions or inclusions. (Q7; AY)

278-Q.* (French.) Effect of Recrystallization on Fatigue Strength of Aluminum Alloys. F. Gatto. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1079-1084.

Samples not undergoing recrystallization heat treatment showed a higher resistance against fatigue. Alloying elements thought to retard recrystallization. 4 ref. (Q7a, N5, 2-60; Al-b)

279-Q.* (French.) Structural Changes in Al-Cu Alloys During Fatigue. F. Gatto. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1085-1090.

Rotary bending fatigue tests showed diffusion of Cu to zones of highest stress. 16 ref. (Q7, N1e, 2-60; Al-b, *Cu, Sn*)

280-Q.* Product Design for -300°F. P. E. Loveday. *Product Engineering (Design Issue)*, v. 30, Feb. 2, 1959, p. 60-62.

Embrittlement, atmospheric moisture, insulation, conduction, shrinkage, lubricants, vaporized, combustion, and asphyxiation hazards. (Q-general, 2-63; SS, Cu-b, Al-b, Ag-b, 17-51)

281-Q.* Magnesium Forgings Save Weight. Lester E. Wilensky. *Materials in Design Engineering*, v. 49, Jan. 1959, p. 92-94.

Mechanical properties of AZ80A, M1A, AZ31B and AZ61A alloy forgings. Effect of heat treatment on properties of ZK60A alloys. 9 ref. (Q-general, 2-64; Mg-b, 4-51)

282-Q.* How to Select a Stainless Steel. John L. Everhart. *Materials in Design Engineering*, v. 49, Jan. 1959, p. 95-110.

Resistance of different stainless steels to various types of corrosive attack at ordinary and elevated temperatures. Mechanical properties at low, ordinary and elevated temperatures. Hardenability, physical properties, nominal compositions and fabricating processes applicable to stainless steels. Applications and costs. 15 ref. (Q-general, R-general, 17-57; SS)

283-Q.* High Temperature Solid Film Lubricants for Uses Above 1000° F. Ralph E. Crump. *Society of Automotive Engineers*, Preprint 4S, Jan. 1959, 11 p.

Coefficients of friction with ceramic bonded solid film lubricants on several metal combinations at temperatures from 75 to 1100° F. Lead oxide and graphite as lubricants. 6 ref. (Q9p, 1-54, 2-62; SS, Ni-b, NM-h)

284-Q.* Irradiation Creep of Alpha Uranium. *Metal Industry*, v. 93, Dec. 26, 1958, p. 536, 539.

Influence of neutron irradiation at temperatures up to 100° C. on creep and its relation to irradiation growth. Effect of irradiation on thermal creep at 450° C. (Q3m, Q3n, 2-61, 2-67; U-a)

285-Q. Mechanical Properties of Uranium-Molybdenum Alloys. M. B. Waldron, R. C. Burnett and S. F. Pugh. *United Kingdom Atomic Energy Authority*, AERE M/R 2554, 1958. 35 p.

Tensile properties and hardness of U-Mo alloys in the composition range 0.14% Mo at room and elevated temperatures. At lower concentrations the breakdown of the gamma solid solution to unstable microstructures leads to pronounced aging effects. Above 5.5% Mo the gamma solid solution is retained to room temperature and shows enhanced properties as temperatures up to 800° C. (Q-general; U-b, *Mo*)

286-Q.* (Swedish.) Accuracy of the Erichsen Cupping Test. V. Kokkonen and G.

Nygren. *Jernkontorets Annaler*, v. 142, no. 10, 1958, p. 638-660.

Influence of surface roughness and radius of the punch on depth of cup in Erichsen tests and in stretch forming tests made with special tools. Differences between various Erichsen machines would appear to be only partly explainable by variations in depth of cup deriving from differences in surface roughness and radius of the punches. 12 ref. (Q23q, 1-54; ST)

287-Q.* High-Temperature Alloys. Michel Urbain. *Cobalt*, no. 1, Dec. 1958, p. 13-32.

Properties necessary to meet operating conditions in aircraft engines, rocket engines, airframes, marine and land gas turbines. Composition, structure, classification, high-temperature tensile and stress-rupture properties; fatigue resistance, oxidation resistance, thermal shock resistance of heat resisting Fe-Cr-Ni alloys, Fe-Cr-Ni-Co alloys, Ni-base alloys and Co-base alloys. Influence of Co content. 32 ref. (Q-general, 2-60, 2-62; Co-b, Fe-b, Ni-b, SS, SGA-h)

288-Q.* (French.) Properties of Aluminum Alloy A-S7G. Claude Mascre. *Fonderie*, no. 155, Dec. 1958, p. 577-580.

Most favorable mechanical properties observed with a Si content between 6.5 and 7%. Grain size for sand castings was approximately 4 grains per sq. mm. and 8 grains per sq. mm. for permanent mold casting. Permanent mold castings show better mechanical properties than sand castings. 5 ref. (Q-general, M27c; Al-b, 5-60, 5-63)

289-Q.* (Italian.) Influence of Heat Treatment on the Fatigue Behavior of Avional 14 Alloy. D. Morri. *Alluminio*, v. 27, Sept. 1958, p. 387-390.

Fatigue tests on Av 14 alloy in age hardened, over-aged and annealed conditions confirm hypothesis that structural changes caused by fatigue stress are similar to those caused by over-aging at high temperature. 3 ref. (Q7a, 2-64; Al-b)

290-Q.* (Italian.) Nature of the Friction Products of Aluminum Surfaces. M. Paganelli. *Alluminio*, v. 27, Oct. 1958, p. 429-434.

Radiocrystallographic, micrographic and analytical examination of dark powder formed by friction between surfaces of AP-5 alloy showed that this powder consists of tiny particles of metallic Al coated with natural oxide. Particles are produced solely by mechanical wear of areas in contact and by abrasion provoked by products of wear and of the abrasion itself. 10 ref. (Q9p; Al-b)

291-Q.* (Russian.) Peaks of Internal Friction in Chromium-Nickel Base Solid Solutions. Yu.S. Avraamov, L. N. Belyakov and B. G. Livshitz, *Fizika Metallov i Metallovedenie*, v. 6, No. 1, 1958, p. 116-121.

In series of alloys aging confirmed that after hardening a complete change takes place in physical characteristics, although the alloys appear to be single phase according to diagram. For studying this phenomenon the relationship of temperature to internal friction was measured. In Ni-Cr-Ti-Al alloys, development of internal friction is associated with presence of Ti atoms in solid solution. 8 ref. (Q22, 2-61, 2-64; Cr-b, *Ni, Al, Ti*, 14-67)

292-Q.* (Russian.) Effect of Static Distortion of Crystalline Lattice on Mechanical Properties of Aluminium-Magnesium Alloys. Pt. 2. Dependence of Complete and Uniform Deformation on Temperature and Rate of Deformation. A. V. Grin', V. A. Pavlov and I. A. Pereturina. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 110-115.

Complete and uniform deformation investigated in 80 to 700° range while changing rate of deformation 1000 times. Static distortion of crystalline lattice promoted by Mg atoms lowers plasticity. Diffusion process produced under tension within deforming alloys increases plasticity and affects temperature dependence of complete and uniform elongation. 9 ref. (Q23, 2-61, 3-68; Al-b, Mg)

293-Q.* (Russian.) Distribution of Plastic Deformation in Polycrystalline Metals. P. O. Pashkov and V. A. Bratukhina. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 128-134.

Quasi-periodicity in the distribution of residual deformation is consequence of irregular deformation of grains in polycrystalline metals. It is deduced that the deformation of the mass is the result of alternation between weak and strong deforming zones. 6 ref. (Q24, M27c)

294-Q.* (Russian.) Effect of Phase Disintegration of Solid Solutions on Plastic Deformation. Pt. 2. Irregular Deformation. N. F. Syutkin. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 135-140.

Serrated plastic deformation was detected in samples subjected to tension which on the diagram is considerably less than the usual limit of fluidity. Mutual processes of phase disintegration and plastic deformation cause resistance to tension in aging alloys. Internal strains are introduced by formation of new phases. 8 ref. (Q24, 3-68; 14-67)

295-Q. Discontinuity in the Fatigue Curve for Duralumin. P. G. Morgan. *Metal Industry*, v. 94, Jan. 2, 1959, p. 11.

Note on recently recorded Russian work. Stresses within elastic and within elastic-plastic ranges. (Q7a, Q7e, 3-66; Al-b)

296-Q. Structural Vibration. Wilbur Du Bois. *Product Engineering (Design Issue)*, v. 35, Feb. 2, 1959, p. 52-53.

Scope screen shows when resonance occurs, locates trouble spots and indicates what causes them. (Q9, X25j)

297-Q. (French.) Determination of the Fatigue Strength by L. Locati Method. C. Daubertes, M. Renout and R. Cazaud. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1048-1056.

One part of a production series is exposed to three stages of cycling and the fatigue limit is calculated with curves based on the results. (Q7a; ST)

298-Q.* Internal Friction of Annealed Copper at Low Temperature. D. H. Niblett and J. Wilks. *Physical Society, Proceedings*, v. 73, Pt. 1, Jan. 1, 1959, p. 95-99.

Amplitude-dependent and amplitude-independent contributions to the decrement increase with increasing temperature. 16 ref. (Q22, 2-63, 3-66; Cu)

299-Q.* Mechanical Properties of the Ferrite Crystal. N. P. Allen. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 1-18.

Elastic properties of alpha iron crystals. Influence of interstitial atoms; nature of plastic flow; yield point phenomena; dislocation theory; twinning; theoretical consideration of fracture behavior; relation between yield stress and fracture stress; formation and spread of cracks; effect of temperature on fracture stress. 39 ref. (Q-general; Fe)

300-Q.* A Modified Bend Test for Hardened Tool Steels. G. Hoyle and E. Ineson. *Iron and Steel Institute, Journal*, v. 191, Jan. 1959, p. 44-45.

Bend test apparatus designed for testing fully hardened toolsteels at room or elevated temperatures. Calculation of stresses; application of bending formula; relation of experimentally determined properties to "toughness" of toolsteels; effect of temperature and heat treatment on properties of toolsteels of plain carbon, low-alloy or high-speed types. 28 ref. (Q-general, Q5g, 2-61, 2-64, 3-66; TS)

301-Q.* Problems of Brittle Fracture. H. Harris. *Metal Treatment and Drop Forging*, v. 26, Jan. 1959, p. 15-20.

Occurrence of brittle fracture with reference to construction of pressure vessels. Relationships of residual stress, temperature, steel composition, electrode composition and weld defects with brittle fracture. (Q26s, T26q, 2-60, 2-61, 3-66; ST)

302-Q.* Hardness Testing. *Metal Treatment and Drop Forging*, v. 26, Jan. 1959, p. 28-30, 32.

Hardness concepts, elasticity, plasticity, time element, mass defects, strain hardening and other factors influencing indentation. Application of Brinell, Rockwell and 136° diamond pyramid testing method. (Q29)

303-Q. Study of Physical Characteristics of Thin Film Resistance Elements. D. W. Moore. Servomechanisms, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 131703, Dec. 1957, 48 p. $1.25.

Instability of Nichrome films is due to slow oxidation and strain caused by unequal contractions of film and substrate on cooling from the deposition temperature. (Q25h, R1h; Ni-b, Cr, Fe, Ti, 14-62)

304-Q. Delayed Failure and Hydrogen Embrittlement in Titanium. R. D. Daniels, R. J. Quigg and A. R. Troiano. Case Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151139, Feb. 1958, 62 p. $1.75.

Hydrogen-induced failures occurred by a process of crack initiation and controlled crack growth. Delayed failures resulting from creep were encountered, even in notched specimens. At both high and low temperatures, hydrogen-induced delayed failure disappeared and the time required for failure as well as the minimum stress at which failure could occur increased at elevated temperatures. (Q26s, Q3, 2-60, 2-61; Ti-b, H)

305-Q.* (Dutch.) Effect of Residual Stress on the Behavior of Steel Constructions. W. Soete. *Lastechniek*, v. 25, Jan. 1959, p. 15-19.

Residual stress in welded steel constructions. Effect of residual stress on deformation, proportional limit, flow limit and rupture. Stress peaks. Stress relief by heat treatment or adequate design. (Q25h; ST, 7-51)

306-Q.* (German.) Development of High Strength in Castings. Hans Reininger. *Giesserei-Praxis*, Dec. 10, 1958, p. 453-457.

Influence of shaping process, tension, grain structure, tears due to shrinking or tension. (Q23b, Q29, S13; 5-60, 9)

307-Q.* (Russian.) Determination of Residual Stresses Caused by Sudden Cooling in Shafts. A. V. Podzei and G. Z. Serebrennikov. *Stanki i Instrument*, Dec. 1958, p. 18-20.

Formulas for computing residual stresses in solid shafts, spindles, axles and other cylindrical machine parts, subjected to sudden cooling. These formulas may be applied with great accuracy in cooling processes that do not cause change in specific volumes because of phase transformation. Such conditions take place in a dozen of various steels including heat resisting and stainless steels. (Q25h, 2-63; ST, SS)

308-Q. (German.) Stress Measurements Based on Variations in the Conductivity of Thin Wires Under Stress. H. Petrick. *Draht*, v. 9, Dec. 1958, p. 499-504.

Measurement of stresses in built-in construction by means of resin-coated paper strips glued to the surface and containing thin wires carrying current. (Q25h, P15g, 1-54)

309-Q. (Russian.) Resistance of Hardened Steels Under Irregular Volumetric Compression. E. E. Surikova and F. S. Savitskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p.173-175.

6 ref. (Q28, 2-64; ST)

310-Q. (Russian.) Influence of Notch on Bending. Yu. E. Bondarev. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 181-183.

(Q5h)

311-Q. (Russian.) Initial State of Plastic Deformation of Metals. B. A. Sidorov. *Fizika Metallov i Metallovedenie*, v. 6, no. 1, 1958, p. 191-192.

4 ref. (Q24)

312-Q. (French.) Survey on Soviet Research Concerning Rupture Behavior of Metals. J. B. Friedmann. *Revue de la Soudure*, v. 14, no. 4, 1958, p. 188-200.

69 ref. (Q3q)

313-Q.* Mass Effect on Castings Tensile Properties. G. W. Form, P. J. Ahearn and J. F. Wallace. *Modern Castings*, v. 35, Feb. 1959, p. 45-49.

Section-size data were converted to solidification times, and the influence of this latter casting condition on tensile properties was evaluated. Formulation of a hypothesis for predicting the sensitivity of tensile strength to solidification time. 17 ref. (Q27a, E25n; 5)

314-Q. Effect of Prior Creep on Mechanical Properties of Aircraft Structural Metals. Pt. 3. C110M Titanium Alloy. J. V. Gluck, H. R. Voorhees and J. W. Freeman. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151145, May 1958, 96 p. $2.25.

Prior creep exposure had little effect on the fracture strength or ductility in either tensile tests or tension-impact tests. (Q-general, 2-61, 3-68; Ti-b, *Mn*)

315-Q.* (Czech.) Strength Limit States of Steel. Jaroslav Nemec. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1111-1116.

Theoretical studies on imperfections, development of deformation and rupture. 6 ref. (Q-general, M26s, 10-51; ST)

316-Q.* (Czech.) Initial Stages of Fatigue in Carbon Steel. Mirko Klesnil and Premysl Rys. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1116-1123.

Shaped samples heat treated in a vacuum and oven cooled. After cycling cohesion defects were detected by micrographs. They were exclusively on the surface and probably caused by stress concentrations. 19 ref. (Q7, M26s; CN-p)

317-Q.* (Czech.) Wear and Wear Testing. Antonin Benes and Vladimir Vrzal. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1123-1129.

Among the gray cast irons tested, alloy irons proved to be more wear resistant than the unalloyed. In general, a cast iron of 160 Brinell hardness will wear excessively; one of 230 will show good wear resistance. With Brinell values between 160

and 130, wear resistance is also influenced by the structure. 8 ref. (Q9n; CI-n, CI-q, *Cr, Ni,* CN)

318-Q.* (Czech.) Phenomenon of Conchoidal Fracture. Zdenek Eminger. *Hutnicke Listy,* v. 13, Dec. 1958, p. 1141-1152.

Nickel-vanadium steels tested to determine reasons for conchoidal fracture which is observed only with cast steel, not with forged steel. Phenomenon depends on primary crystallization and is retarded in vacuum casting of ingots where the hydrogen content decreases; the column of long-axis dendrites becomes narrower and the formation of a globular structure is favored. 12 ref. (Q26r, N12; ST, *Ni, V*)

319-Q.* (Dutch.) Copper and Copper Alloys. Pt. 18. Hydrogen Embrittlement. W. G. R. de Jager. *Metalen,* v. 14, Jan. 15, 1959, p. 10-14.

Copper 99.40 to 99.90% pure with different amounts of oxygen heated in hydrogen and, for comparison, nitrogen. Electric resistance micrographs and bend tests. 9 ref. (Q26s, 1-54; Cu-b)

320-Q.* (French.) Study of the Friction and Surface Properties of Solids. F. P. Bowden. *Revue de Metallurgie,* v. 55, Dec. 1958, p. 1126-1132.

Friction mechanism of metals and other solids at very high gliding speeds. Use of reflection and scanning electron microscopy to study surface properties of solids. Recent applications of highest resolution electron microscopes to reveal molecular array in crystals and dislocations in metal lattice. 6 ref. (Q9p, M21e)

321-Q.* (French.) Study of Elevated-Temperature Fatigue of Steel. J. de Fouquet. *Revue de Metallurgie,* v. 55, Dec. 1958, p. 1133-1144.

Alternate-torsion fatigue test on dead soft steel, with 0.05% C at temperatures from 20 to 700° C. Character of fracture changes, being in ranges up to 400° C. intercrystalline following slip bands, up to 650° C. intercrystalline at grain boundaries and above 650° C. grain growth causes genuine creep. Micrographs, X-ray diagrams and mechanical tests show preponderant influence of temperature on crystalline behavior of steel when subjected to fatigue. 4 ref. (Q7, Q3, 2-61; ST)

322-Q.* (French.) Brittle Fracture. G. M. Boyd. *Revue de la Soudure,* v. 14, no. 4, 1958, p. 175-186.

Characteristics and mechanism influencing factors; flaws resulting from weldments, residual stress, low temperature, shock, geometric shape. 14 ref. (Q26s, 2-63, 3-66, 3-73; ST)

323-Q.* (French.) Fatigue Rupture. *Revue de la Soudure,* v. 14, no. 4, 1958, p. 222-225.

In a flanged pipe of a compressor, fatigue rupture caused by vibrations of the motor took place in the vicinity of weld between flange and pipe. (Q7a; ST)

324-Q.* (German.) The Crystal Lattice and Metal Forming. E. Schmid. *Metall,* v. 13, Jan. 1959, p. 1-11.

Review of experimental results regarding plastic properties of metals. Theory of molecular transposition as means for understanding plastic behavior. Particle bombing of metals, its importance for the construction of reactors and rockets. 82 ref. (Q24, M25)

325-Q.* (Russian.) Effects of Phosphorus and Arsenic Upon Parameter of Crystallitic Lattice and Hardness of Alpha Iron. V. H. Svechnikov, V. M. Pan and A. K. Shurin. *Fizika Metallov i Metallovedenie,* v. 6, no. 4, 1958, p. 662-664.

P decreases and As increases the lattice parameter in alpha-iron. Both increase the hardness. 12 ref. (Q29n, M26, 3-69; Fe-b, *P, As*)

326-Q.* (Russian.) Relation of Shear Modulus to Temperature in Some Pure Metals, Solid Solutions and Alloys. V. S. Postnikov. *Fizika Metallov i Metallovedenie,* v. 6, no. 4, 1958, p. 707-716.

Shear modulus relation to temperature in Ti, Fe, Co, Ni, Mo. Solutions of Be, B, C, Ti, Cr, Mn, Fe, Zr, Cb, Mo and W in Ni and its alloys investigated by low-frequency rotating vibrations of small amplitudes. Coefficient of shear modulus less in alloys and solid solutions than in pure metals. 22 ref. (Q21d, 2-61; Ni-b, Fe, Co, Ti, Cr, Mo, 14-67)

327-Q.* (Russian.) Mechanical Properties of Nickel-Copper Alloy. V. A. Pavlov and I. A. Pereturnina. *Fizika Metallov i Metallovedenie,* v. 6, no. 4, 1958, p. 717-724.

Effect of temperature and deformation rate of pure Ni and Ni alloy. 30 ref. (Q-general, 2-61, 3-68; Ni-a, Ni-b, *Cu*)

328-Q.* (Russian.) Transverse Deformation of Carbon Steels. A. V. Gur'ev. *Fizika*

Metallov i Metallovedenie, v. 6, no. 4, 1958, p. 725-733.

Explanation as to why with the increase of stress the magnitude of deformation coefficient is increased. 18 ref. (Q21c, 3-66; CN)

329-Q.* (Russian.) Magnesium Iron Crankshafts for Diesel Engines in Tractors. A. A. Gorshkov, A. I. Toropov and M. V. Voloshchenko. *Liteinoe Proizvodstvo*, Nov. 1958, p. 1-3.

Crankshaft of pearlite-ferrite Mg iron was tested from 3 to 5 years under industrial conditions and showed 40% greater wear resistance. Fatigue strength of circular 40-mm. test pieces is 28-30 kg. per sq. mm. (Q21c, Q9n, Q7a; CI-r, Mg)

330-Q.* A Review of Intergranular Fracture Processes in Creep. P. W. Davies and J. P. Dennison. *Institute of Metals, Journal*, v. 87, Dec. 1958, p. 119-125.

Intercrystalline fracture is explained in terms of stress-concentration effects at triple points and transversely stressed boundaries; condensation of vacancies to form cavities at grain boundaries and the subsequent merging of the cavities to form cracks; cavity formation at grain boundaries due to jog formation followed by boundary sliding. 37 ref. (Q26, Q3)

331-Q.* Influence of Annealing Twins on Intergranular Creep Cracking. C. W. Weaver. *Institute of Metals, Journal*, v. 87, Dec. 1958, p. 126-127.

The progress of an intergranular creep crack along a transverse boundary may be delayed by, or even stopped at, the vertical intergranular boundary of an annealing twin. This arrest is ascribed to the lower surface free energy of the coherent twin boundary lying in the path of the crack, which requires larger amounts of shear to propagate the crack than does the normal grain boundary. 4 ref. (Q3, M27e)

332-Q.* Can Fe-Cr-Al Alloys Ever Replace Stainless? P. M. Unterweiser. *Iron Age*, v. 183, Feb. 5, 1959, p. 90-92.

Resistance of Fe-Cr-Al alloys to corrosive attack by fuel oil residues at high temperatures. Hot strength, elongation, drawability and other properties. (Q23p, Q27, R7d, 2-60, 2-62; Fe, *Cr*, *Al*, SGA-g)

333-Q. Creep of Magnesium Alloy AZ80-T5 at Low Temperatures. L. G. Bell. Chalk River, Ontario. *Atomic Energy of Canada Ltd.*, CRMet-794, Sept. 1958, 21 p.

Mg alloy AZ80 in the T5 or age hardened condition creep tested at 50° C. and at various stresses. Creep rates were measured at the termination of tests of 600 to 1000 hr. Extrapolation of results shows that a constant creep rate is obtained at a stress of 10,000 psi. 6 ref. (Q3; Mg-b)

334-Q. Modes of Deformation Leading to Fracture of Metals: a Review of Progress to January 1958. R. Doldon and R. F. Lumb. *United Kingdom Atomic Energy Authority*, IGR-TN/C-919, May 21, 1958, 17 p.

Certain crystals of polycrystalline super-purity Al specimens deformed in tension exhibit a banded slip surface. The stress axis of these crystals is <123>. Microradiography is used for investigating the effect of strain rate and temperature on the formation and initial propagation of cavities instigated by deformation. 9 ref. (Q24a, 2-61, 3-68; Al-a)

335-Q. Design and Materials as Affected by Elevated Temperatures. D. R. Adolphson. Sandia Corp. *U. S. Atomic Energy Commission*, SCTM-225-58(16), Aug. 5, 1958, 32 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Influence of elevated temperature on structural design and mechanical and physical properties of metallic materials. Materials which are commercially applicable for structural use up to 1200° F. include Al, Mg alloys, ferrous alloys, alloy steels, stainless steels, age-hardened stainless steels, and Ti alloys. (Q-general, 2-62, Al, Mg-b, SS, Ti-b)

336-Q. Ductility in Beryllium Related to Grain Orientation and Grain Size. Jacob Greenspan. Nuclear Metals Inc. *U. S. Atomic Energy Commission* NMI-1174, Aug. 9, 1958, 39 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Be with grain orientations resulting from hot working either unidirectionally or bidirectionally is ductile or brittle in directions given by the anisotropy and orientation of the grains. Both texture and fine grain size are required to obtain high-tensile elongation. Ultimate tensile strength and elongation are both correlated with grain diameter. Unusually high tensile elongations of 30 to 40% are obtained when basal planes are oriented to

carry little or no tensile stress. 18 ref. (Q23p, Q27, 2-59; Be)

337-Q. Development of a Weldable Titanium-Base Alloy of Medium Strength. J. P. McAndrew and D. W. Levinson. Illinois Institute of Technology. (Wright Air Development Center.) *U.S. Office of Technical Services*, PB 151214, June 1958, 33 p. $1.

Research to find a Ti-base sheet alloy having a minimum room-temperature tensile yield strength of 130,000 psi, which would be weldable without requiring a post-welding heat treatment to restore ductility or strength. (Q23b, 2-60, 2-61; Ti-b, *Sn, Zr, Al, Mo, Mn, Cr*)

338-Q. Effect of Static Prestrain on the Prot-Fatigue Properties of Unnotched and Notched Materials at Room and Elevated Temperature. F. H. Vitovec. University of Minnesota. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151280, July 1958, 67 p. $1.75.

Main factors influencing the Prot-failure stress were residual stresses, metallurgical reactions and cracks from prestraining. Strain hardening and relaxation of residual stress is reported to be of secondary importance. (Q7, Q3, N7e, 2-62, 3-66; SS, Al-b, Co-b, 9-72)

339-Q. Research on Ferrous Materials Fatigue. H. N. Cummings, F. B. Stulen and W. C. Schulte. Curtiss-Wright Corp. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151243, Aug. 1958, 114 p. $2.50

Effect of fatigue stressing on R. R. Moore rotating-beam steel specimens. Statistical study of laws of propagation of fatigue cracks in SAE 4340 steel, using photographic technique for measuring crack propagation; investigation of the effect on fatigue strength of surface hardening by shot peening and plating, by carburizing and by nitriding; investigation of the transverse strength of SAE 4340 aircraft quality steel. (Q7, Q27, 2-64, 3-68; ST, 9-72)

340-Q.* The Problem of Metal Fatigue. George Sines and J. L. Waisman. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 3-6.

Importance of fatigue, guide to literature. 17 ref. (Q7)

341-Q.* Factors Affecting Fatigue Strength. J. L. Waisman. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 7-35.

Load spectrum of assemblies, principal stress, stress concentrations, mean stress, residual stresses, rest periods, stress frequency and other factors for design predictions. Effect of surface roughness, microstructure, internal defects, corrosive environments, directional characteristics, temperature, cold working, surface finish and coatings on fatigue life. 41 ref. (Q7a, Q7b, 2-61, 2-66, 3-66, 3-67, 3-68, 3-71, 3-72; SS, ST, Al-b)

342-Q.* Basic Concepts of Fatigue Damage in Metals. Thomas J. Dolan. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 39-67.

Microscopic deformation and accumulation localized damage prior to appearance of visible cracks in metals subjected to dynamic stressing. Statistical nature of fatigue strength; relation of grain size, metallurgical structure and temperature with basic fatigue damage. Improvement of fatigue strength. 44 ref. (Q7a, Q7b, 2-59, 2-61, 3-66, 3-68, 3-71, 3-72; ST, Cu-n, Al-b)

343-Q.* Fatigue Cracks and Fracture Surfaces—Mechanics of Development and Visual Appearance. R. E. Peterson. Paper from "Metal Fatigue". McGraw-Hill Book Co. Inc., 1959, New York, p. 68-86.

Formation, direction and distribution of slip bands and relation to applied stress. Development from slip plane separations into gross cracks in metals under tension, torsion or compressive stresses. Types of markings found on surfaces fractured by fatigue. 42 ref. (Q24a, Q26p, Q7a; ST, Al-b)

344-Q.* Laboratory Fatigue Testing of Materials. E. C. Hartmann and F. M. Howell. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 89-111.

Types of machines and specimens; test procedures and techniques; interpretations and significance of results of fatigue tests made on metallurgical specimens or on components. (Q7c, Q7d, Q7h, 1-54)

345-Q.* Statistical Planning and Interpretation of Fatigue Tests. Frank A. McClintock. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 112-141.

Statistical techniques for sorting out sources of variability; estimating linear relations between variables; minimum service life, mean and standard deviation of population, both near and above endurance limits. 17 ref. (Q7k, Q7b, S12j)

346-Q.* Behavior of Metals Under Complex Static and Alternating Stresses. George Sines. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 145-169.

Nature of fatigue stresses; behavior of materials under various combinations of alternating and static stresses and effect on fatigue life. Analysis of combined stress. Stress criterion for fatigue failure, its graphical presentation and comparison with test results. 32 ref. (Q7b, Q7d, Q25k; ST, CI-n, Al-b)

347-Q.* Influence of Residual Stress on Fatigue. Daniel Rosenthal. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 170-196.

Origin of residual stresses and methods of measurement. Relief of residual stress by cyclic loading. Evidence reported in the literature concerning effect of residual stress on fatigue; predicting influence of residual stress on fatigue. (Q7b, Q25h, 3-66; ST, Al-b)

348-Q.* Techniques of Surface Stressing to Avoid Fatigue. Henry O. Fuchs. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 197-231.

Surface nature of fatigue, techniques for compressive stresses of surfaces including overloading, cold forming, hammer peening, shot peening, tumbling, surface rolling, burnishing, heat softening under stress, quenching, welding, quench hardening, carburizing, nitriding and plating. Stresses induced and effect on fatigue resistance. 46 ref. (Q7b, 3-66, 3-68, G23q; ST)

349-Q.* Fatigue of Materials at High Temperatures. Horace J. Grover. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 232-243.

Creep, stress-rupture and fatigue behavior of metals subjected to dynamic loading at elevated temperatures. Effect of stress concentrations and metallurgical changes at elevated temperatures. Combining fatigue data and creep data for use in design evaluation. 11 ref. (Q7a, Q7k, Q3m, Q3q, 1-62; ST, Al-b)

350-Q.* Operational Loads on Aircraft. R. L. McDougal. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 247-277.

Measurement of strains and accelerations in operating aircraft. Statistical analysis of data. Estimation of load spectrum of aircraft from data on atmospheric turbulence and operating conditions. 43 ref. (Q7k, T24a, 1-54)

351-Q.* Estimation of Fatigue Life With Particular Emphasis on Cumulative Damage. Milton A. Miner. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 278-289.

Predicting fatigue life of structures under varying magnitudes of load. Concept of cumulative damage; its graphical presentation and use in predicting life. Modifications of concept. Examples of aircraft dust loading and fatigue analysis. 15 ref. (Q7b, Q7e, Q7k, 3-66; Al-b, ST)

352-Q.* Notch-Sensitivity. R. E. Peterson. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 293-306.

Effect of notches on fatigue behavior, notch sensitivity of oil-quenched and tempered steels, normalized and annealed steels and Al alloys. Variation with notched radius. Design formulas for notch sensitivity. 21 ref. (Q7a, Q23s, 3-73; ST, Al-b)

353-Q.* Estimation of Fatigue Life of Welded, Riveted, and Bolted Structures. Horace J. Grover. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, 307-324.

Available data on fatigue behavior of various types of joints and connections including continuous fusion welds, riveted joints, spot welded joints, bolted joints and composite structures. Factors affecting fatigue. 63 ref. (Q7b; Al-b, ST, 7-51, 7-53, 7-54, 7-55, 7-59)

354-Q.* Detail Design for Fatigue in Aircraft Wing Structures. E. H. Spaulding. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 325-354.

Importance of design detail on fatigue life of airplanes. Load distribution, factors affecting stress concentration. 15 ref. (Q7k, T24a, 17-51; Al-b)

355-Q.* Fatigue in Rotary-Wing Aircraft. Clay C. Boswell, Jr., and R. A. Wagner. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 355-375.

Source of fatigue; determination of stress levels; fatigue test programs; examples of fatigue failures. (Q7k, T24a, T24b; Al-b, Mg-b, ST)

356-Q.* Fatigue Cracking, Fatigue Damage, and Their Detection. R. H. Christensen. Paper from "Metal Fatigue". McGraw-Hill Book Co., Inc., 1959, New York, p. 376-412.

Initiation and propagation of fatigue cracks. Effect of stress gradient on crack growth; measuring fatigue damage and structures; effect of fatigue cracks on residual strength of structures. Stress and crack area relationship for fast fracture. Techniques for crack detection including use of fatigue monitors. 18 ref. (Q7k, Q26p, Q26q, S13; Al-b)

357-Q.* (Japanese.) Effect of Mean Stress on the Flexural Fatigue Properties of Titanium Sheet Specimens With a Central Hole. Shoji Shimamura, Tetsuo Suda, Keinosuke Ooshima and Yoshitane Shindo. *Journal of Mechanical Laboratory*, v. 12, Nov. 1958, p. 177-183.

Ultimate tensile strength, flexural fatigue limit, fatigue strength reduction factor, stress concentration factor and notch sensitivity. 20 ref. (Q7, 3-66; Ti-b, 4-53)

358-Q. (Pamphlet.) Effect of Shot Peening Prior to Electroplating on the Fatigue Properties of an Alloy Steel. N. B. Brown. *Dept. of Mines and Technical Surveys, Ottawa, Canada, Mines Branch Research Report, R3*, Sept. 18, 1958, 12 p. $.25.

Fatigue strength of a modified SAE 3140 alloy steel. Eight S-N curves are given for steel with the following surface conditions: machined, shot-peened, electroplated on a machined surface, and electroplated on a shot-peened surface. Curves show that specimens shot-peened prior to electroplating with Cr, Ni and Cd have higher fatigue properties than specimens not previously peened. 4 ref. (Q7a, G23n; 8-62, AY, *Cr, Ni, Cd*)

359-Q. (Book.) Metal Fatigue. George Sines and J. L. Waisman, Editors. 415 p. 1959. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $12.50.

Fatigue failure mechanisms; analysis of load and influencing factors; fatigue in structures and machines. Papers abstracted separately. (Q7)

360-Q. (Translation—AIP.) Effect of Rate of Deformation and Relaxation on Internal Friction in Aluminum. Chen Khun-i, Bao Sen-ke and L. I. Vasil'ev. *Soviet Physics Doklady*, v. 3, Jan-Feb. 1958, p. 163-165.

Increase in plastic deformation rate leads to increase of internal friction. Relaxation at various temperatures. 27 ref. (Q22, 3-68; Al)

361-Q. (Translation—AIP.) Diagram of the Fatigue Failure of Metals. V. S. Ivanova. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 378-381.

First, second and third fatigue periods and diagram for Armco iron and Cu. 10 ref. (Q7a, Q7b; Fe, Cu)

362-Q. (Translation—AIP.) Mechanism of Plastic Flow of Lead and Tin in Conditions of Simple Shear. V. I. Likhtman and V. S. Ostrovski. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 406-408.

Maximum absorption effect in facilitating flow for Sn and Pb is at stresses corresponding to upper limit of region of constant viscosity. (Q24, 3-66; Sn, Pb)

363-Q. (Translation—AIP.) Investigation of the Temperature Stability of Strain Distortions and the Kinetics of the Softening of Friction Surfaces. K. V. Savitskii and M. P. Zagrebennikova. *Soviet Physics Doklady*, v. 3, no. 2, 1958, p. 411-414.

Variations in external parameters of friction result in a variation in the distribution of strain distortions according to degree of their temperature stability. (Q9p, J23, 2-61, 3-68; Cu)

364-Q. (Translation—AIP.) Some Results of an Investigation of Elastic State Limits of Plastically Drawn Ni Samples. Iu. I. Iagan and O. A. Shishmarev. *Soviet Physics Doklady*, v. 3, no. 2., 1958, p. 431-433.

Magnitudes of plastic flow on annealed Ni tubes. 6 ref. (Q21, Q24; Ni, 4-60)

365-Q. (Translation—AIP.) Brittle Fracture of Single Crystals of Zinc. V. I. Likhtman, L. A. Kochanova and L. S. Brinkhanova. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 599-602.

Deformation and fracture in mercury melt with liquid nitrogen used as embrittling but inactive medium. 15 ref. (Q26s, Q24; Zn, 14-61)

366-Q. (Translation—AIP.) Distortion of the Crystal Structure of Copper and Its Solid Solutions on Deformation. L. N.

Guseva and A. A. Babareko. *Soviet Physics Doklady*, v. 3, no. 3, 1958, p. 643-645.

Study of influence of concentrations and dimensions of dissolved atoms on development of distorted fine structure of alloys and what influence filing has on distortion compared with rolling. 8 ref. (Q24; Cu-b, *Zn*, *Al*, 14-67)

367-Q. (Translation—BISI, no. 1093.) Observations on the Bauschinger Effect on Mild and Medium-Hard Steels. H. Hoff and G. Fischer. *Stahl und Eisen*, v. 78, Sept. 18, 1958, p. 1313-1320.

See item 1246-Q, 1958. (Q27a, 2-64, 3-66; ST)

368-Q. (Translation—BISI, no. 1104.) Use, Manufacture, and Heat Treatment of Alloy Cast Steel Rolls. Pt. 1-2. Heinz Uhlitzsch and Gerhard Radomski. *Neue Hutte*, v. 2, Nov. 1957, p. 655-664, Jan. 1958, p. 10-20.

See item 315-Q, 1958. (Q25m, J-general, W23k; ST, 5-60)

369-Q. (Translation—BISI, no. 1160.) Problem of the Formation of Longitudinal Cracks in Rail Flanges After Straightening. S. Horejs. *Hutnicke Listy*, June 1958, p. 517-526.

See item 974-Q, 1958. (Q26q, T23q; ST)

370-Q. (Translation—Brutcher, no. 4442.) Mechanical Properties of Tool Steels. Ya. B. Fridman and V. P. Konoplenko. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 2-9.

Methods for durability testing of low temper toolsteels and mechanical properties during static and cyclic loads. (Q-general; TS)

371-Q. (Translation—Brutcher, no. 4443.) High-Temperature Properties of Multi-Alloy Ferrite. A. M. Borzdyka and A. B. Merlina. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 10-16.

Characteristic steels with ferrite structure, containing Cr, W, Mo and Cb. Multiple alloy ferrite steel possess high mechanical properties at room as well as elevated temperatures. Heat stability is excellent but ferrite steel enriched with Cb loses impact strength at lowered temperatures, as well as plasticity during prolong stressing at elevated temperatures. (Q-general; 2-62; SS-d, SGA-h)

372-Q. (Translation—Brutcher, no. 4445.) Residual Stresses Set Up in Surface Hardening. V. V. Abramov. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 21-28.

Attempt to generalize and define the system of residual stress formation. Calculation of stresses in a membrane, taking into the effect of the modulus of elasticity change and coefficient of expansion thru the membrane section along the internal strain distribution. 10 ref. (Q25h, 2-64)

373-Q. (Translation—Brutcher, no. 4451.) Frictional Wear Resistance of Steel to Caprone Fiber. P. T. Basxo. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 56-57.

Wear resistance tested by mooring a caprone fiber over hardened steel. Wear resistance is proportional to the magnitude of fiber tension and the length that passes over the steel surface. (Q9; ST)

374-Q. (Translation—Brutcher, no. 4452.) Study of Boron-Alloyed Sormait-Type (Cast) Hard Metal. G. S. Kachalkin. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 58-61.

Optimum content of elements in alloy of "Sormait" type to assure a higher degree of wear resistance. 4 ref. (Q9; SS, *B*, 5)

375-Q.* Effect of Specimen Form on the Tensile Strength of Cast Iron. C. N. J. Gilbert. *British Foundryman*, v. 52, Jan. 1959, p. 28-42.

Tensile tests on specimens with substantial parallel gage length and on specimens with notches of varying severity. Results indicate a need for parallel gage length in cast iron test bars. 8 ref. (Q27a, Q27d, 1-60, 3-73; CI)

376-Q.* Mill Sampling of Ship Plate Steel. Charles L. Staugaitis. Digest from "Mill Sampling Techniques for Quality Determination of Ship Plate Steel." Report No. SSC-106, Ship Structure Committee, Jan. 31, 1958, 44 p. *Metal Progress*, v. 75, Feb. 1959, p. 152, 154, 156.

Data on the variations among plates, ingots and heats from the point of view of notch toughness characteristics, static tensile properties, ferrite grain size, chemical composition, severity and extent of segregation. (Q23s, Q27, S12h, F-general; 4-53, ST)

377-Q.* Notch Sensitivity and Directionality in Fatigue in Light Alloy Extrusions as Shown by Endurance and Progressive Loading Tests. J. McKeown. *Metallurgia*, v. 59, Jan. 1959, p. 31-38.

Progressive loading fatigue test could, with considerable saving of time, replace conventional endurance testing in assessment of such factors as notch sensitivity, changes in design and suitability of materials used in components and structures. (Q7, Q23s, 3-72; Al-b)

378-Q.* (English.) Studies on Surface Layer of Polished Metals by Means of Electron Diffraction and Electrical Contact Resistance Measurements. Masahisa Matsunaga. *University of Tokyo, Institute of Science, Report,* v. 7, March 1958, 28 p.

Surface changes due to polishing; measurement of film resistance using a graphite slider; electrical properties of the oxidized surface. 41 ref. (Q9, P15, M22g; SS, Al, Cu)

379-Q.* (Japanese.) Strain Age Embrittlement in Mild Steels. Shigeo Hasebe. *Sumitomo Metals,* v. 10, July 1958, p. 155-166.

Effect of room-temperature aging after cold working is studied by flattening, flaring and bending tests on steel pipes. Low-carbon Al-killed steels of various Al content are examined after forging, normalizing and aging by Charpy impact, impulsive and static test is achieved by adding 0.012 to about 0.0015% and 0.04 to about 0.06% Al respectively. The effect due to slow cooling from above the A_2 point is alike both for low-C killed and rimmed steel. (Q26s, 2-60, 2-61, 2-64, 3-68; CN, *Al*)

380-Q. Fracture Mechanism of Semi-Brittle Steels in Torsion. J. B. Hunt. *Journal of Mechanics and Physics of Solids,* v. 6, July 1958, p. 321-326.

With increasing twist a local plastic zone first appeared and plastic strain increased until microcracks formed at the surface. Separation at that time did not take place as the core offered too high a resistance but the stress distribution was affected. At fracture primary tensile failure appeared at the core and surface, followed by separation by shear in between. (Q1; CN)

381-Q. Effect of Environment on Creep-Rupture Properties of Metals. P. Shahinian and M. R. Achter. *Naval Research Laboratory Report,* Apr. 1958, p. 18-24.

Metals are stronger in air than in vacuum at high temperatures and low stresses but the reverse is true at low temperatures and high stresses, in that they are stronger in vacuum. Factors which modify this atmosphere effect are oxidation resistance and ductility of the material. (Q3q, 2-61, 2-66, 3-66; Ni-b)

382-Q. (Russian.) Structural Changes in Nickel-Chromium Alloys During Creep. G. Ya. Kozyrskii and V. A. Kononenko. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* Aug. 1958, p. 90-92.

Speed of creep is dependent not only on temperature and stress but also on state of deformed alloy. Speed of creep proceeds most rapidly in metastable state at low temperatures. 6 ref. (Q3, 2-61, 3-67, 3-68, Ni, Cr)

383-Q. (Russian.) Hydrogen Embrittlement of Steel Exposed to Hydrogen Sulphide. *Zhurnal Prikladnoi Khimii,* v. 31, Aug. 1958, p. 1181.

Etching with aqueous H_2S solution shows possibility of hydrogen embrittlement, due to sulphide film formation on surface of metal. 24 ref. (Q26s; ST, *H*)

384-Q.* (German.) Wear Resistant Castings With Acicular Structure. Walter Feicke and Peter Rack. *Freiberger Forschungshefte,* no. B31, 1958, p. 129-159.

Heat treatment of Mo cast iron, Cu-Mo iron and Mn iron with nodular graphite in salt baths, providing homogeneous acicular structure, hardness and wear resistance. 9 ref. (Q29n, Q9n, J2j; CI-q)

385-Q.* (German-French.) Experiences With Welded Railroad Bridges. Pt. 1. R. Becker. *Zeitschrift fur Schweisstechnik,* v. 48, Dec. 10, 1958, p. 318-322.

Material used, thickness of welded joints, prevention of accumulation of tension, failures. Requirements are steel with resistance to cohesion ruptures; influence of rolling, structure, weldability; importance of size. (Q-general, T26p, 3-66, 3-71; ST, 7-51)

386-Q.* (Japanese.) Study on Wear Resisting Properties of Deoxidized High-Grade Cast Iron. Pt. 1. Wear of Flake Graphite Cast Iron. Masao Homma and Hiroshi Meguro. *Japan Foundrymen's Society, Journal,* v. 30, Nov. 1958, p. 859-866.

Properties due to pearlitic matrix which is made resistant by deoxidation or desulphurization; flake graphite or spheroidal graphite being created, which acts as lubricant. Eutectic graphite cast iron does not have the resistivity under heavy load. (Q9; CI)

387-Q.* (Japanese.) Effect of Ferrite in the Matrix on Wear Resistance of Spheroidal

Graphite Cast Iron. Kunio Okabayasi, Seizo Saito and Fumitosi Nakamura. *Japan Foundrymen's Society, Journal*, v. 30, Nov. 1958, p. 866-873.

Tested by sliding friction, spheroidal graphite cast iron being in contact with ordinary cast iron or carbon steel with no lubrication. Pearlitic matrix has the best resistivity, and increasing amounts of ferrite reduces it. (Q9, 2-60, 3-74; CI-r)

388-Q.* (Japanese.) Investigation of Plastic Deformation of Aluminum and Aluminum-Copper (3%) Alloys by Extrusion. Yoshikazu Hosoi. *Light Metals*, v. 8, Nov. 1958, p. 11-23.

Four kinds of specimens extruded at various temperatures were studied by micrography and X-ray photographs. For 99.80% Al forged billets, at 550° C., crystalline grains are separated into small domains and slip is observed. At 325° C. slip deformation exceeds the formation of fine grain domains. (Q24, F24; Al-b, Cu)

389-Q.* (Japanese.) Properties of Titanium Welded Tubing. Hidetake Kusamichi, Toru Yukawa, Kazuo Miyamoto, Masaaki Teragaki and Ryosuke Kuramoto. *Light Metals*, v. 8, Nov. 1958, p. 74-81.

Mechanical properties and microstructure of KS-50 Ti which is welded in an inert gas chamber. Deviation of wall thickness and concentricity of the tube are very small and the tube has good appearance. Microstructure and hardness of the tube are uniform in welded and unwelded zones after cold drawing and annealing. (Q-general, M27; Ti-b, 4-60, 7-51)

390-Q.* (Russian.) Effect of the Condition of Steel Surface Upon Its Wear Resistance. P. I. Igntenko and Yu. S. Terminasov. *Vestnik Mashinostroeniya*, Dec. 1958, p. 10-12.

The main factor in wear resistance is the degree of prior cold working; however, the initial condition of the surface is a factor. (Q9n, 3-68, 3-71; ST)

391-Q.* (Russian.) Bend Tests of Forgings Used in Turbines and Turbo-Compressors. I. G. Generson. *Vestnik Mashinostroeniya*, Dec. 1958, p. 35-37.

Names of parts tested, type of steel and angle bends. (Q5, T7h; ST, 4-51)

392-Q.* (Russian.) Determination of the Degree of Local Deformation by Microhardness Tests. V. D. Lisitsyn. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1490-1494.

A more accurate functional relationship obtained between microhardness and deformation intensity. Mathematical formulas. 5 ref. (Q25, Q24, Q29q)

393-Q.* (Russian.) Parameter Methods to Evaluate Ultimate Strength of Heat Resisting Alloys. L. Ya. Liberman. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1501-1509.

Review of investigations using parameter methods to determine ultimate strength of steel. Comparative results of actual tests and those calculated by parameter methods. 17 ref. (Q27a, 1-54; ST, SGA-h)

394-Q.* (Russian.) Mechanical Properties of Uranium. G. Ya. Sergeev, V.V. Tyumova and E.M. Savitskii. *Atomnaya Energiya, Akademiya Nauk, SSSR*, v. 5, Dec. 1958, p. 618-623.

Allotropic transformations and difference in modified crystal structure of U sharply affect mechanical properties. (Q-general, N-general; U)

395-Q. (German-French.) Permissible Tensions for Steel Structures Exposed to Dynamic Stresses. A. Neumann and H. Ziethe. *Zeitschrift fur Schweisstechnik*, v. 48, Dec. 10, 1958, p. 323-329.

Standard practice for using steel ST37 in Switzerland, Germany, Austria, Soviet Union, Poland and Czechoslovakia. (Q27, S22, T26; ST)

396-Q. (Russian.) Comparison of Brinell and Meyer Scales of Hardness. P.A. Gorezko. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1496.

(Q29e)

397-Q. (Russian.) Machine to Test Metals for Friction and Impact Wear. M.P. Prishchepa, V.I. Karpov and A.F. Kolesnikov. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1512.

Machine tests metals for friction wear under dynamic load, thus reproducing actual conditions of machine elements in motion under load. (Q9p, 1-53)

398-Q. (Russian.) Machine to Test Ultimate Strength of Pipes. B.V. Zver'kov. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1514-1516.

Produces simultaneous internal static pressure and cyclic bending moment, thus simulating pipelines and boilers. (Q27a, Q5, 1-53, T26q; 4-60)

399-Q. (Swedish.) Bend Testing of Gray Cast Iron. *Gjuteriet*, v. 48, Dec. 1958, p. 195-197.

Testing method with standard test pieces. Formula for computing bending strength and directions for the casting of test pieces. (Q5, 1-54, CI-n)

400-Q. A Comparison of the Properties of Titanium-5% Aluminum-2½% Tin Alloys in the Recovered and Recrystallized Conditions. R. Haynes and G.F. Bidmead. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 136-140.

Metallographic and X-ray diffraction examination and room-temperature tensile and Izod tests on production rolled rod after annealing at 500-950° C. Specimens in stress relief and recrystallized conditions compared in short-time tensile and creep tests at 300 and 400° C. and in Wohler fatigue tests at room temperature using both notched and unnotched specimens. (Q-general, M22g, 2-64; Ti, *Al, Sn*)

401-Q.* The Damping of Quench-Aging Duralumin Vibrating at About 1 Cycle Per Second. K.J. Williams and K.M. Entwistle. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 141-145.

Damping changes during quench-aging at constant temperatures. Damping of freshly quenched specimens during heating at constant rate. Experimental evidence establishing existence of two distinct damping contributions in quench aging duralumin and suggestions on their origin. 5 ref. (Q8g, 2-61, 2-65; Al, *Cu*)

402-Q.* The Dependence of Microcreep Properties on the Development of Fatigue in Lead. A.J. Kennedy. *Institute of Metals, Journal*, v. 87, Jan. 1959, p. 145-149.

Torsional microcreep measurements on Pb wires subjected to tensile fatigue stresses. Strain amplitude of microcreep measured at different stages in fatigue life with fatigue stress superimposed and with fatigue stress absent. Activation energy of microcreep process. 19 ref. (Q3m, Q7b, 3-68, 3-70; Pb-a)

403-Q.* Fatigue of Metals Caused by a Relatively Few Cycles of High Load or Strain Amplitude. P.P. Benham. *Metallurgical Reviews*, v. 3, no. 11, 1958, p. 203-234.

Aspects of low endurance fatigue in carbon steel, alloy steel and Al alloys. Behavior under constant load or constant strain cycling. Relationships between stress-cycle and strain-cycle curves. Types of fracture at low endurance; effect of speed, stress concentration, temperature and corrosion. Changes in ductility, energy, hysteresis and other properties caused by plastic cycling. Effect of prior cycling on stress-strain curves to failure. 51 ref. (Q7b, Q7d, 3-66; Al-b, ST, SS)

404-Q.* Research on the Mechanical Properties of Metals at Liquid-Helium Temperatures. H. M Rosenberg. *Metallurgical Reviews*, v. 3, no. 12, 1958, p. 357-379.

Elastic moduli, work hardening, strength, brittle fracture, stress-strain relationships, creep, fatigue and internal friction of metals at temperatures down to 4.2° K. Fundamental mechanisms involved. 62 ref. (Q-general, 2-63)

405-Q.* Structure of Metals and the Strength of Structures. Maxwell Gensamer. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 2-18.

Brittle fracture in Zn crystals, rheotropic embrittlement, low-temperature stress-strain curves, mechanical twinning, low-temperature tensile tests, Charpy test, transition temperature and Griffith theory. 34 ref. (Q-general, Q26s, M26, 2-63; ST, Fe-b, *Ni*, Zn, 14-61)

406-Q.* Effects of Solid Solution Alloying on the Creep Rupture Strength of Alpha and Beta Titanium. L. S. Richardson and N. J. Grant. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 18-23.

Effect of Al or O in Ti structure at high temperature. Strength of hexagonal vs. bcc. phase. 6 ref. (Q3m, 2-60, 2-62; Ti-b, *Al, O*, 14-67)

407-Q.* Comparison of the Creep Rupture Properties of Nickel in Air and in Vacuum. P. Shahinian and M. R. Achter. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 37-41.

Reversal in relative strengths with variations in stress. Mechanism involving two competing processes in terms of oxidation strengthening and weakening by surface-energy reduction explains reversal. 12 ref. (Q3q, 1-73; Ni)

408-Q.* Deformation Characteristics of Certain Dilute Copper Base Solid Solution Alloys. N. G. Ainslie, R. W. Guard and W. R. Hibbard, Jr. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 42-48.

Solid solutions having equal grain sizes, no preferred crystallographic orientation, equal electron atom ratios and close initial yield strength, need not have identical

stress-strain curves at strains greater than 0.04. 15 ref. (Q25, Q24; Cu-B, *Zn, Al, Si,* 14-67)

409-Q.* Deformation Resulting From Grain Boundary Sliding. H. Brunner and N. J. Grant. *Metallurgical Society of AIME, Transactions,* v. 215, Feb. 1959, p. 48-56.

Equations relate elongation to the amount of shear taking place both along grain boundaries and in slip planes of polycrystalline aggregates during creep of an Al-Mg alloy. 17 ref. (Q24, Q3, M24f; Al-b, *Mg*)

410-Q.* Effect of Changes in Slip Direction on the Creep of Magnesium Crystals. H. Conrad. *Metallurgical Society of AIME, Transactions,* v. 215 Feb. 1959, p. 58-63.

Strain hardening, associated with creep at room temperature, investigated by shear tests proved to be anisotropic. 22 ref. (Q3m, Q24a, N7e; Mg)

411-Q.* Magnetostrictive Contribution to Endurance Life. K. Winterton. *Metallurgical Society of AIME, Transactions,* v. 215, Feb. 1959, p. 72-74.

Near saturation unidirectional magnetic field decreased the endurance of annealed Armco iron. (Q7a, P16b; Fe-a)

412-Q.* Effect of High Temperature Strain on Crack Formation and Ductility in Commercially Pure Nickel. D. Krammer and E. S. Machlin. *Metallurgical Society of AIME, Transactions,* v. 215, Feb. 1959, p. 112-114.

Low-temperature (-196° C.) ductility decreases linearly with an increase in prior high-temperature (920° C.) creep strain. Effect correlated with intercrystalline crack and void formation at 920° C. strain. Magnitude of effect as a function of notch sensitivity. 4 ref. (Q26p, Q23p, Q3n, 2-62, 2-63, 3-70, 3-68; Ni-a)

413-Q.* (Swedish.) Properties of Gray Cast Iron. *Gjuteriet,* v. 48, Dec. 1958, p. 185-190.

Strength, hardness, wear, heat resistance, corrosion, machinability and weldability of the Swedish cast irons SIS 0115, SIS 0125, SIS 0130 and SIS 0135. Effects of wall thickness and heat treatment on strength; optimum heat and surface treatments. (Q-general, R-general, G17k, K9s, 2-64, 3-73; CI)

414-Q.* Flow, Fracture and Twinning of Commercially Pure Vanadium. W. R. Clough and A. S. Pavlovic. *American Society for Metals, Transactions,* v. 52, Preprint no. 125, 1958, 36 p.

Specimens prepared directly from massive V reguli and from hot work and annealed rods were subjected to tensile tests at temperatures from -196 to +200° C., to Charpy V-notch impact test, to metallographic and X-ray diffraction examinations. Temperature of ductile to brittle transition. Relation of tensile properties to temperature. Fracture characteristics and mechanisms; mechanical twinning and existence of second phase, V_2C. 32 ref. (Q24, Q27, Q26, Q23, 2-63; V-a)

415-Q.* A Study on the Relationship Between State of Aging and Notch-Fatigue Performance of a High-Strength Aluminum Alloy. G. W. Form. *American Society for Metals, Transactions,* v. 52, Preprint no. 126, 1958, 20 p.

Fatigue tests carried out on duralumin (2014 alloy) in an axial-loading-type vibrator under a nominal stress of 28,500 psi at room temperature and -110° F. 13 ref. (Q7b, 2-65; Al-b)

416-Q.* Effect of Uranium Hydride Distribution and Recrystallization on the Tensile Properties of Uranium. H. R. Gardner and J. W. Riches. *American Society for Metals, Transactions,* v. 52, Preprint no. 127, 1958, 26 p.

Effects of hydrogen concentration, beta-U hydride formation, hydride particle size and cooling rate from recrystallization temperature on tensile properties of U over a temperature range of -20 to 200° C. 7 ref. (Q27a, N5, 2-64, 3-69; U-a)

417-Q.* Effect of Interstitial Carbon Plus Nitrogen and Precipitation Reactions on the Properties of Austenitic Cr-Mn-C-N Steels. C. M. Hsiao and E. J. Dulis. *American Society for Metals, Transactions,* v. 52, Preprint no. 128, 1958, 40 p.

Effects of interstitial solid solution elements and types of precipitation reaction on creep-rupture properties, hardness, lattice parameter, room and elevated-temperature tensile properties for steels containing 0.09 to 0.79% C, 10 to 28% Mn, 12 to 25% Cr and 0.09 to 0.84% N. 22 ref. (Q3m, Q29, Q27a, 2-60, 2-65; SS, *Cr, Mn*)

418-Q.* Effect of Deformation Prior to Transformation on the Mechanical Properties of 4340 Steel. Eric B. Kula and Joseph M.

Dhosi. *American Society for Metals, Transactions,* v. 52, Preprint no. 129, 1958, 35 p.

Change in tensile and impact properties of 4340 steel resulting from rolling in the austenitic state at 1000 and 1550° F. prior to transformation to martensite. 10 ref. (Q27a, Q6n, N8p, 3-70, 3-68; AY)

419-Q.* Historical Development of Research on the Fatigue of Materials and Structures. J. Y. Mann. *Australian Institute of Metals, Journal,* v. 3, Nov. 1958, p. 222-241.

Summary of past and present research activity devoted to effects of influencing factors, mechanical and metallurgical, theories of fatigue, testing techniques, service failures, service load measurement, crack detection. 148 ref. (Q7)

420-Q.* Metallurgical Function Stability of Arc Welded Connections in Unalloyed and Low-Alloy Structural Steels. T. M. Noren. *Jernkontorets Annaler,* v. 142, no. 11, 1958, p. 661-719.

"Functional stability" signifies the stability of welded joints and of a welded construction as a whole in relation to application and calculated lifetime. Factors influencing functional stability during the various phases of the development of a welded construction are discussed in connection with the risk of brittle fracture failure. 36 ref. (Q26s; AY, SGB-s, 7-51)

421-Q.* Determination of the Transition Temperature and the Notch Brittleness of Steels by Static Tensile Tests. C. Pfeiffer. *Jernkontorets Annaler,* v. 142, no. 11, 1958, p. 720-730.

Pressing of a very sharp notch (without subsequent tempering) gives rise to sufficient embrittlement under the notch to cause a brittle fracture to start. The temperature at which notch brittleness occurs can be determined by measuring the lateral contraction of the test bar as a function of the temperature and by calculation of the yield strength and nominal tensile strength. These values plotted against temperature give curves, which intersect at the transition temperature. 11 ref. (Q26s, Q23s, Q23r, Q27; ST)

422-Q.* Wrought Magnesium-Thorium Alloys for Elevated Temperature Applications. *Magnesium,* Feb. 1959, p. 8-9.

Tensile strength, yield strength and elongation of HM21A and HK31A alloys at temperatures ranging up to 800° F. Physical properties of alloys. (Q27a, P-general, 2-62; Mg-b, *Th,* SGA-h)

423-Q.* Vibration Damping Capacity of Magnesium Alloys. D. F. Walsh, J. W. Jensen and J. A. Rowland. *Magnesium,* Feb. 1959, p. 10-11.

Damping and mechanical property data for wrought alloy in the extruded or hot rolled condition and for heat treated alloys. (Q8g, 3-66; Mg-b)

424-Q.* Pressure Required for Transformation Twinning in Explosively Loaded Low Carbon Steel. D. R. Curran, S. Katz, J. J. Kelly, and M. E. Nicholson. *Metallurgical Society of AIME, Transactions,* v. 215, Feb. 1959, p. 151-153.

Two-dimensional oblique shock produced on surface of wedges of 1020 steel. 7 ref. (Q24b, Q24m, 3-74; CN-g)

425-Q.* Ductility in Beryllium Related to Grain Orientation and Grain Size. J. Greenspan. *Metallurgical Society of AIME, Transactions,* v. 215, Feb. 1959, p. 153-163.

Texture and fine grain size needed for high tensile elongation. Basal plane orientation function of rolling direction, reduction and temperature. 18 ref. (Q23p, M27c, 3-72, 2-59; Be)

426-Q.* (English.) Heat Resisting Steels and Alloys. *Aciers Fins & Speciaux Francais,* no. 30, Dec. 1958, p. 24-28.

Resistance of Fe-Cr and Fe-Ni-Cr alloys to oxidation and creep at elevated temperatures. Applications and maximum temperature of usefulness for various heat resisting alloy steels. (Q3m, R1h, 2-62; SS, SGA-h, Fe-b, *Cr, Ni*)

427-Q.* (German.) Tensile Strength of Patented and Cold Drawn Steel Wire. L Mankher. *Acta Technica,* v. 22, no. 3-4, 1958, p. 265-283.

Tensile strength as determined by patenting and by degree of cold deformation during drawing. Mathematical data presented to facilitate process control. 22 ref. (Q27a, J25, G4, 1-67; ST, 4-61)

428-Q.* (German.) Structural Stability of Weld Deposited Sealing Alloys Used in Steam Power Plants. K. Lobl, J. Jezek and H. Tuma. *Neue Hutte,* v. 4, Jan. 1959, p. 46-50.

Influence of the carbide-producing elements Zr, Cb, Ti and W on the structure of Ni-Fe Stellite and related alloys on Co-Cr-W base, exposed to high temperatures. 4 ref. (Q9n, 2-62, 2-60; Co-b, *Ni, Fe, Zr, Cb, Ti, W,* AD-p)

429-Q.* (German.) Fatigue Strength of Flame Cut Specimens After Weld Repair of

the Cut Edge. A. Matting, H. Wolf and H. D. Steffens. *Schweissen und Schneiden*, v. 11, Jan. 1959, p. 8-16.

Samples of low-carbon steel sheet 15 mm. thick were flame cut, and resulting grooves on the edges filled by arc welding in order to avoid stress concentration. After cycling tests weld-repaired edges were found to be of the same strength as flame cut edges without defects. 20 ref. (Q7a, G22g, K1a; CN-g, 4-53)

430-Q.* (Russian.) Melting and Deoxidizing Processes Affecting Distribution of Sulphide Inclusions in Openhearth Steel. S. I. Levin and I. P. Kazachkov. *Liteinoe Proizvodstvo*, Dec. 1958, p. 7-8.

Mechanical properties of steel as affected by iron oxide, Fe-Si, Fe-Mn and Al in the melt. (Q-general, D2c, D2d, 3-69; ST, *Al, Si, Mn*, 5-59, AD-r, 9-69)

431-Q.* (Russian) Evaluating Plasticity of Heat Resisting Alloys When Testing for Rupture. V. Z. Tseitlin. *Zavodskaya Laboratoriya*, v. 25, Jan 1959, p. 87-90.

It is more correct to determine deformation by evaluating the reduced area of the sample neck since it characterizes the degree of deformation of the most deformed part. 4 ref. (Q21, Q26, Q27a; SGA-h)

432-Q.* (Russian.) Determination of True Strength Characteristics of Plastic Metals. P. S. Sokolov. *Zavodskaya Laboratoriya* v. 25, Jan. 1959, p. 95-99.

Method of constructing true stress curves, without measuring the curvature of the neck's profile. Formulas derived enabling construction from ordinary mechanical properties of a curve of monoaxial elongation of plastic metals up to point of rupture. (Q27a, F2)

433-Q.* Effect of a Ceramic Coating on the Creep Behavior of Some High-Temperature Alloys. John R. Cuthill, Joseph C. Richmond and Nancy J. Tighe. *American Ceramic Society Bulletin*, v. 38, Jan. 15, 1959, p. 4-12.

Ceramic coating was found to markedly decrease the creep or extension in most cases but the coating appeared to have a detrimental effect at certain combinations of temperature and stress. 14 ref. (Q3, 2-61, 3-66; SS, SGA-h, 8-71)

434-Q.* Brittle Fracture. *Automobile Engineer*, v. 49, Jan. 1959, p. 8-9.

Failure of iron and mild and low-alloy steels, without measurable deformation, under relatively light load. (Q26s; Fe, CN, AY)

435-Q.* Creep, Stress-Relaxation, and Metallurgical Properties of Steels for Steam Power Plant Operating With Steam Temperatures Above 950°F. (510°C.) A. I. Smith, E. A. Jenkinson, D. J. Armstrong and M. F. Day. *Institution of Mechanical Engineers, Proceedings*, v. 171, no. 34, 1957, p. 918-942.

Long-time tests on alloy and stainless steels suitable for high-temperature service as turbine casing bolts, steam pipes, superheater tubes and turbine casings. 11 ref. (Q3, 2-60, 2-62, 2-64; AY, SS)

436-Q.* Internal Friction of Copper and Copper Alloys. Daniel N. Beshers. *Journal of Applied Physics*, v. 30, Feb. 1959, p. 252-258.

Effect of adding small amounts of Au to Cu on dislocation damping at 37 kc. in longitudinal resonance. Damping strain amplitude and time are related to temperature and composition. 23 ref. (Q22, 2-61, 2-60; Cu-b, *Au*)

437-Q.* Cast Iron Research and Development: Where the Search for Ductility Is Leading. *Mechnical World and Engineering Record*, v. 139, Jan. 1959, p. 17-18.

Notch ductility of nodular iron, properties of nodular iron at high temperatures, heat treatment of nodular iron. Notch ductility of malleable iron, rupture of gray iron, dry wear of cast iron. (Q-general, J-general, 2-62; CI-n, CI-r, CI-s, AD-p36)

438-Q. Research on Heat Resistant Alloys Strengthened at Elevated Temperatures by Incorporation of Fine Particulate Substances. Sintercast Corp. of America. *U. S. Office of Technical Services*, PB 131846, Dec. 1956, 26 p. $1.

Production of materials of high density consisting of an 80-20 Ni-Cr alloy matrix containing uniform dispersions of hard phase addition agents. At 1500°F. the stress-rupture properties of this matrix material were increased considerably. The most favorable results were obtained with additions of Ti carbide and Linde B alumina. (Q3q, 2-62; Ni-b, Cr, *Ti, C, Al, O*)

439-Q.* (German.) Testing Ductility of Sheet Metals. W. Engelhardt. *Fertigungstechnik*, v. 8, Dec. 1958, p. 530-537.

Reproducibility of deep drawing tests requires special equipment. Comparative accuracy of various types of equipment. 23 ref. (Q23p, 1-54; 4-53)

440-Q.* (German.) Influence of Impurities on the Properties of Aluminum. P. Brenner. *Metall*, v. 12, Dec. 1958, p. 1075-1084.

Influence of Fe, Si, Ti, Cu, Zn and trace impurities of Na, Ga, Ca, Ba, Sn, K, Li, P, S, C and O on crystal structure, texture, electrical conductivity, resistance to corrosion, Brinell hardness, ultimate strength elongation of pure Al and Al alloys. 58 ref. (Q-general, P-general, M26, 3-69; A1-a, A1-b, *Fe, Si, Ti, Cu, Zn, Na, Ga, Ca, Ba, Sn, K, Li, P, S, C, O*)

441-Q.* (German.) Tabulated Properties of Bearing Metals. R. Kuhnel. *Metall*, v. 12, Dec. 1958, p. 1101-1107.

Physical and mechanical properties of white metals, Cd alloys, Zn alloys, Al alloys, Pb bronze, Sn bronze, special brass, Al bronze. (Q-general, P-general; Al-b, Cd-b, Cu-b, Cu-n, Cu-s, Pb-b, Zn-b, SGA-c)

442-Q. Measuring Machine Tool Wear. Eli I. Goodman. *Atomic World*, v. 10, Jan. 1959, p. 28-30.

The use of radioactivity gives a sensitive and rapid method for the determination of machine tool erosion under different conditions of cutting speed, feed rate and lubrication. 5 ref. (Q9, W25, 1-59)

443-Q. Compression and the Alpha-Beta Phase Transition of Plutonium. P. W. Bridgeman. *Journal of Applied Physics*, v. 30, Feb. 1959, p. 214-217.

(Q24m, N6p, 3-74; Pu)

444-Q. Magnesium Alloy Properties: Titanium Alloy Properties. *Magnesium*, Feb. 1959, 2 p.

(Q-general; Mg-b, Ti-b)

445-Q. (Japanese.) Adhesiveness and Thermal Shock Properties of Flame Sprayed Porcelain Enamel. Hideo Nagasaka and Takeshi Takei. *Metal Finishing Society of Japan, Journal*, v. 9, Oct. 1958, p. 365-370.

Internal stress is larger than that found in ordinary baked coating. This defect is avoided by spraying at high temperature, 650-750° C., so that a moderately thick intermediate layer is formed between the base and the coating. Adhesion and shock resistance are comparable to ordinary baked coatings. (Q10a, Q25p, L27; 8-71)

446-Q. Internal Stresses and Fatigue in Metals. A. M. Freudenthal. *Physics Today*, v. 12, Feb. 1959, p. 16-19.

Report of the symposium held at the General Motors Laboratories, Sept. 3-5, 1958. (Q7, Q25h)

447-Q. Evaluating Tool Life. D. Peckner and H. Ginsburg. *Tool Engineer*, v. 42, Mar. 1959, p. 75-79.

Principles of statistical analysis illustrated in a study on form cutters used to machine slots. (Q9, T6n; TS)

448-Q. (Russian.) Estimation of Dislodged Grain Boundary in General Deformation During Creep. V. M. Rosenberg. *Zavodskaya Laboratoriya*, v. 25, Jan. 1959, p. 53-57.

8 ref. (Q24, M27f, Q3)

449-Q. (Russian.) Estimating Duration of Relaxation Stability at High Temperature. E. A. Khein. *Zavodskaya Laboratoriya*, v. 25, Jan. 1959, p. 83-87.

Methods for extrapolation of relaxation curves. (Q3; ST; Cr-b, Ni-b)

450-Q.* Probing the Causes of Piston-Ring Wear by the Radiotracer Technique. Richard Abowd, Jr. *Society of Automotive Engineers*, Preprint no. 8U, Jan. 1959, 15 p.

Continuous pre-ignition was found to cause extremely high adhesive wear of top piston rings. 33 ref. (Q9, T21b, 1-59; Fe, Cr)

451-Q.* (German.) Hot Strength of Compacts. I. N. Franzewitsch. *Neue Hutte*, v. 3, Dec. 1958, p. 732-739.

Hot strength, resistance to thermal shock and oxidation, are dependent on the strength of the atomic binding forces in the crystal lattice. Hot strength of metals, metal carbides and bromides. 12 ref. (Q27a, Q10a, M25h, R1h, 2-62; 6-72, Fe-b, *Cu*)

452-Q.* (German.) Behavior of Cast Iron Guideways Influenced by the Treatment and Condition of Surface. K. Muller. *Werkstatt und Betrieb*, v. 92, Jan. 1959, p. 17-26.

Mechanism of friction and attrition wear. Friction and wear measurements on various materials selected as matching pairs, submitted to different methods of heat treatment. 41 ref. (Q9n, Q9p, 2-64; CI)

453-Q.* (Spanish.) Determination of Residual Stresses in Metals. Pt. 2. Jose M. Sistiaga. *Revista de Ciencia Aplicada*, v. 12, Nov-Dec. 1958, p. 496-507.

Quantitative methods of determination of stress in plane elements. Stresses in

electrodeposits, disks and rings. Semi-destructive methods; X-ray diffraction methods; determination of tri-axial stresses. 115 ref. (Q25h, 1-54, F2, G25)

454-Q.* Metallographic Changes Associated With Fatigue Deformation in the Interior of Aged Ternary Aluminum-Zinc-Magnesium Alloys. I. J. Polmear and I. F. Bainbridge. *Australian Defense Scientific Service Aeronautical Research Laboratories, Report, ARL/MET 31,* Oct. 1958, 34 p.

With alloys in which the Zn:Mg ratios were high the fatigue process was essentially a grain-boundary phenomenon and cracking was completely intercrystalline. Little or no evidence of deformation was found associated with the fatigue process in alloys with a low Zn:Mg ratio. This is attributed to the relatively high Mg content. These alloys had the best fatigue properties. 29 ref. (Q7, M27f, Q24a, 2-60; Al-b, *Zn, Mg,* 9-72)

455-Q.* Creep Properties of Austenitic Nickel-Chromium Steels Containing Niobium. W. H. Bailey, M. G. Gemmill, H. W. Kirkby, J. D. Murrary, E. A. Jenkinson and A. I. Smith. *Institution of Mechanical Engineers, Proceedings,* v. 171, no. 34, 1957, p. 911-917.

Compilation of data on rupture and 1% plastic strain. Recommendation for the determination of stresses in steam pipe service. (Q3m; SS, *Ni, Cr,* 4-60)

456-Q.* Embrittlement of Alloy Steels. *Mechanical World and Engineering Record,* v. 139, Feb. 1959, p. 61-62.

Types of embrittlement, causes, suggested remedies. (Q26s, 2-60, AY)

457-Q.* Radioisotope Study of the Effect of Surface Conditions During Wear of Tungsten Carbide. J. Golden and G. W. Rowe. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 343-361.

Wear of W carbide sliders which were activated to produce predominantly W^{187} Active fragments are detached by the sliding process and can be quantitatively assessed by a scintillation counter or by autoradiography. 5 ref. (Q29n; 1-59; Cu, W, 6-69)

458-Q.* On the Structure and Wear Resistance of Case-Hardened Steel. L. S. Palatnik, I. M. Ljubarsky and A. P. Ljubchenko. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 375-387.

Wear testing of gears after heat treatment under various conditions. Besides carbon diffusion, the case-hardening process involves a "back" diffusion of metal atoms to the surface of the specimen resulting in an elevated vacancy concentration in the crystal lattice. 8 ref. (Q9r, M27, J28, T7a, 1-59; ST)

459-Q. The Elevated Temperature Characteristics of Internally Oxidized Titanium-Cerium Alloys. R. H. Hiltz, Jr. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131788, n.d., 15 p. $.50.

Solid solution Ti-Ce alloys cold rolled to 0.010-in. thickness and annealed were internally oxidized to produce a fine dispersion of CeO_2 in the Ti matrix. An improvement in strength was noted over that of pure Ti. (Q3m, R2s, 2-62, 2-64, 3-68; Ti-b, Ce)

460-Q.* (French.) Improvement of Part Life by Hardening and Prestressing of Necked Areas. J. Pomey, J. P. Georges and A. Royez. *Revue de Metallurgie,* v. 56, Jan. 1959, p. 2-10.

Service life of machine components is limited by notch effect caused by changes in diameter. Life can be lengthened appreciably by appropriate design and local mechanical and heat treatments which set up residual compressive stresses in zones subject to notch effect. Effects of different types of heat treatment and mechanical working on the fatigue limit of specimens of steel and on necked components such as crankshafts. (Q7, G23q, T7, 2-64; ST)

461-Q.* (French.) Relation Between the Distance of an Inclusion From the Surface and Its Influence on Fatigue Cracking. H. de Leiris and E. Frappier. *Revue de Metallurgie,* v. 56, Jan. 1959, p. 11-24.

Fatigue cracks in steel appear to start from inclusions located just below the surface itself. Phenomenon was investigated by a photoelastic study of the influence of the distance between a circular hole in a steel plate and the edge of the plate on concentration of stresses around hole. In a certain area greater stresses are, in fact, found around hole than around a circular notch at edge of plate. 11 ref. (Q26, Q7; ST, 9-69)

462-Q.* (French.) Fatigue Micromachine for Tension-Compression Tests at 92,000 Cycles Per Second. G. F. Girard and G. Vidal. *Revue de Metallurgie,* v. 56, Jan. 1959, p. 25-39.

Vibrating system consisting of piezoelectric exciter and amplifiers producing alternate stresses capable of causing specimen rupture. Only alloys with low damping capacity can be broken by this machine. 16 ref. (Q7, 1-53)

463-Q.* (French.) Creep of Hard, Prestressed Steels in the So-Called "Ordinary" Temperature Range. Influence of Temperature and of Variations in Stress. Robert de Strycker. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 49-54.

Study of steel wire in various heat treated conditions. Stress variations at normal temperature do not greatly influence creep during short periods of time. Influence of temperature is significant, but not the same for all varieties of hard steel. 6 ref. (Q3, 2-61, 2-64, 3-66; ST, 4-61)

464-Q.* (French.) The Problem of the Ductility of Beryllium and Its Use in Reactors. G. C. Ellis. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 75-82.

Lack of ductility of Be causes fabrication and joining difficulties and results in unfavorable properties for reactor use. Pure Be has not yet been produced, and embrittlement apparently results from impurities in form of interstitial atoms. Ductility might be improved by control of grain structure and orientation during fabrication, or by improvement in purity. (Q23p, T11, K-general, 3-69, 3-72; Be, 17-57)

465-Q.* (French.) Contribution to the Physical Study of Fatigue Damage. M. Weisz. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 83-105.

Influence of prior damage on average fatigue limit of steels. Influence of damage on low-temperature rupture properties. Evolution during damage of energy released per cycle and per unit of volume, and of maximum stress at deformation; relationship to damage. 22 ref. (Q7, Q26, Q24; ST)

466-Q.* Crystals That Bend. *Advanced Materials Technology*, v. 1, Dec. 1958, p. 2-3.

Fused MgO as ductile ceramic refractory. Applications include crucibles where low contamination is needed and in missiles. (Q5g, Q23p; Mg-b, 17-57, 6-70)

467-Q.* Test Bar and Casting Properties. W. J. Reichenecker. *Foundry*, v. 87, Mar. 1959, p. 64-68.

Minimum values for separately cast test bar properties are shown along with average values in relation to section size for aluminum bronze, tin bronze and an Al alloy. (Q-general, 1-60; Al-b, Sn, Cu-s, 5-60)

468-Q. High-Temperature Mechanical Properties of Hastelloy B and Hastelloy W. C. R. Kennedy and D. A. Douglas. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission, ORNL-2402*, Nov. 28, 1958, 81 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.25.

Both alloys exhibit a severe loss of hot ductility at temperatures where the beta transformation occurs. The change in composition found in Hastelloy W results in a suppression of the beta and gamma transformation. (Q-general, N-general, 2-62; Ni-b)

469-Q. (Russian.) Study of Cracks in Cast Steel Anvils. N. I. Kon, G. A. Maksimenko and P. G. Novikov. *Liteinoe Proizvodstvo*, Jan. 1959, p. 44-46.

Following isothermal annealing vertically distributed cracks were formed as a result of thermal pressures in the cast block during heat treatment. (Q26q, Q22c; 9-72, ST, 5-60)

470-Q.* Steels' Fatigue Strength Loss Linked to Retained Austenite. P. M. Unterweiser. *Iron Age* v. 183, Mar. 19, 1959, p. 115-118.

Under severe stress, retained austenite transforms into untempered martensite, causing microcracks. Rotating beam fatigue tests on SAE 4340, two low-alloy toolsteels, and SAE 52100 after various heat treatments, and refrigeration. (Q24m, Q7, N8n; ST)

471-Q.* Six Precautions in Using High Strength Steels. Edward A. Loria. *Materials in Design Engineering*, v. 49, Feb. 1959, p. 90-93.

Limitations in tensile properties, fatigue and stress-rupture properties of 422, 218, 56, 17-7 PH, PH 15-7 Mo, AM 350, AM 355, HNM and A-286 steels. (Q27, Q3, Q7; SS)

472-Q.* AM350 and AM355—Properties and Heat Treatment. R. A. Lula. *Metal Progress*, v. 75, Mar. 1959, p. 116-120.

Two new high-strength stainless steels have similar compositions but different properties. Chromium and carbon are adjusted so that one grade contains delta

ferrite while the other is completely martensitic. Both steels are readily formed when annealed; heat treatment imparts high strength with good ductility at room and elevated temperatures. (Q-general, 2-62; SS)

473-Q.* PH15-7 Mo: More Strength at Elevated Temperatures. M. W. Marshall and Harry Tanczyn. *Metal Progress,* v. 75, Mar. 1959, p. 121-125.

Addition of 2% Mo to 17-7 Ph greatly enhances the mechanical properties of the original stainless steel. The new stainless, known as PH 15-7 Mo, can withstand up to 1000° F. in jet airframes and missiles. (Q-general, 2-62, 2-60; SS, *Mo*)

474-Q.* Processing Variables and M-252 Properties. R. G. Stuligross, J. Luchok and D. S. Chambers. Digest from paper presented at A.I.M.E. Meeting, Feb. 20, 1958. *Metal Progress,* v. 75, Mar. 1959, p. 170, 172, 174.

Finish rolling temperatures, solution temperatures and boron content influence the grain size and mechanical properties of M-252. (Q-general, M27c, 2-60, 2-61, 2-64, 3-68; Ni-b, *B*)

475-Q.* Hardness Testing. *Metal Treatment and Drop Forging,* v. 26, Feb. 1959, p. 60-62.

Comparison between Rockwell, Brinell, Vickers and Shore rebound tests. Possibilities for achieving comparability of measured hardness values on the basis of these hardness testing methods. (Q29e)

476-Q.* Metal Fatigue. N. Thompson and N. J. Wadsworth. *Philosophical Magazine Supplement, Advances in Physics,* v. 7, Jan. 1958, p. 72-170 + 13 plates.

Crack initiation, crack growth, relation of slip to fatigue cracking; temperature dependence of fatigue hardening; motion of dislocations. 140 ref. (Q7, Q26a, M26b)

477-Q.* Residual Stresses Resulting From the Forming of High Strength Aluminum Alloys. G. A. Hawkes. *Royal Aeronautical Society, Journal,* v. 63, Feb. 1959, p. 90-94.

Apart from the degree of straining, the residual stresses are affected by the heat treatment (cold or hot quench) and the amount (if any) of controlled stretching that the alloy receives between solution treatment and precipitation. (Q25h, 2-64, 3-68; Al-b)

478-Q.* Hardness Testing of Titanium Sponge: Equipment and Procedure. D. H. Baker, Jr. *U. S. Bureau of Mines, Report of Investigations,* no. 5440, 1959, 18 p.

Methods used in preparing test samples for chemical analysis and hardness testing, method of melting and surfacing test ingots, technique of reading Brinell hardness impressions. (Q29, 1-52, Ti, 6-74)

479-Q.* Surface Damage Caused by Polyvinyl Chloride Sliding on Steel. D. I. James. *Wear,* v. 2, Feb. 1959, p. 183-194.

Various types of debris and surface damage encountered during friction experiments. The most prominent feature is the formation of rolls which lie at right angles to the direction of motion. A critical temperature exists below which rolls do not form. Above this temperature rolls form very freely and frequently the coefficient of friction falls. (Q9p; ST)

480-Q.* The Interactions of Wear Debris With Fatty Additives in Lubrication. Yasukatsu Tamai. *Wear,* v. 2, Feb. 1959, p. 228-236.

Interaction between the worn oxide debris of rubbing steel and certain fatty additives in hydrocarbon lubricants. The coefficient of friction and the electrical contact resistance were measured simultaneously, and the latter found to be very sensitive to the presence of wear debris between the sliding surfaces. The influence of smooth and damaged surfaces and of various surrounding atmospheres was compared experimentally. 11 ref. (Q9; ST, NM-h)

481-Q.* (French.) Behavior of Siliconated and Hypersiliconated Al Alloys Under Thermal Stress. *Revue de l'Aluminium,* v. 36, Jan. 1959, p. 69.

Eutectic and hypereutectic alloys of Al-Si, containing 12.73 to 20.22% Si, 1.11 to 4.87% Cu, 0.85 to 3.79% Ni and 0.80 to 1.01% Mg subjected to temperature changes from room temperature up to 200° C. to determine resistance to fatigue. (Q7; Al-b, *Si, Cu, Ni,* Mg)

482-Q.* (German.) Structure and Tensile Strength of Iron Whiskers. H. Weik. *Metall,* v. 13, Feb. 1959, p. 114-119.

Tensile strength testing; surface examination; whisker cross sections; measurement of Ni plated whiskers. 29 ref. (Q27, M26b; 14-61, Fe)

483-Q.* (Russian.) Mechanical Properties of Welded and Soldered Butt Joints of Copper and Copper-Nickel Alloys. V. P. Abramovich. *Svarochnoe Proizvodstvo,* Feb. 1959, p. 31-33.

Tensile strength of Cu and Cu-Ni alloy depends on the quality of the metal surface. Tensile strength of machined welds of Cu-Ni alloys is about 8% lower than machined base metal but 5% higher than nonmachined base metal. Butt soldered joints of Cu fail on static and fatigue testing at small stresses. (Q27a, Q7; Cu-b, *Ni,* 7-51, 7-52)

484-Q. (Pamphlet.) Role of Molybdenum in Abrasion-Resistant Materials. 36 p. 1959. Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y. Free.

Types of wear, examples of gouging abrasion, grinding or high-stress abrasion, and scratching or low-stress abrasion in mining and mineral benefication. Performance of various wear resistant alloys. Production, treatment and properties of 12% Mn, 2% Mo alloy steel; 7% Cr, 1% Mo steel, 15% Cr, 3% Mo high-alloy iron and 3% Ni, 2% Cr, 1% Mo alloy iron. (Q9n, T28, W12, W15, 17-57; AY, *Mn, Mo, Cr, Ni,* SS, CI, SGA-m)

485-Q. (Book.) Creep of Engineering Materials. Iain Finnie and William R. Heller. 341 p. 1959. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. $11.50.

Creep testing and measurement of creep variables such as temperature, strain and load; creep of nonmetallic materials; mechanisms of creep and behavior of specific metals. Stress analysis under creep conditions for one strain variable for steady state multi-axial stress and for nonsteady state multi-axial stress; choice of design stress; specific design applications. 500 ref. (Q3, Q24, Q25, 17-51; CN, AY, SS, Ni-b, Al-b, Mg-b, Cu-b, Ti-b, Zr-b)

486-Q. (Translation—AIP.) X-Ray Diffraction Study of the Structural Distortion of Metals Under Static and Dynamic Compression at Room Temperature and Low Temperature. Iu. S. Terminasov and V. F. Mindukshev. *Soviet Physics, Crystallography,* v. 2, no. 4, 1958, p. 510-514.

The deformation of metals at low temperatures produces a considerable reduction in the effect of thermal rest. With deformation in low-temperature conditions, there is a more pronounced fragmentation of the crystalline blocks and higher crystallite stresses in comparison with the deformation of metals at room temperature. 15 ref. (Q24, 2-61, 3-66; Cu, Al-b, 9-74)

487-Q. (Translation—BISI no. 808.) Influence of Arsenic on the Properties of Steel. F. Benes. *Hutnicke Listy,* v. 12, no. 1, 1957, p. 85-96.

See item 1282-Q, 1958. (Q-general, 2-60; AY, *As*)

488-Q. (Translation—BISI no. 825.) Study of Internal Friction in Gamma and Alpha Phases of High Chromium Steel. V. Piguzov. *Doklady Adademii Nauk SSSR,* v. 112, 1957, p. 636-639.

See item 1217-Q, 1958, (Q22; AY, *Cr*)

489-Q. (Translation—BISI no. 842.) Behavior of Heat-Resisting Steels During Creep Testing at 500-700° C. Pt. 4. Results of Long-Time Creep Tests on Ferritic and Austenitic Steels. Andre Constant. *Archiv fur das Eisenhuttenwesen,* v. 28, Nov. 1957, p. 695-715.

See item 408-Q, 1958. (Q3, 2-62; ST)

490-Q. (Translation—BISI no. 1034.) Development of Thick-Walled Steel Castings With High Mechanical Properties. Hans Buhler. *Giesserei,* v. 45, Feb. 1958, p. 87-92.

See item 366-Q, 1958. (Q23s, Q23b, 3-71; AY, *Cr*)

491-Q. (Translation—Brutcher no. 4453.) Effect of Ingot Weight Upon Quality of Structural Steels. M. I. Kolosov. *Stal',* v. 18, May 1958, p. 411-414.

See item 764-Q, 1958. (Q-general, M28, AY)

492-Q. (Translation—Brutcher no. 4475.) High-Strength Austenitic Steels. A. P. Gulyaev, C. V. Lepnev and Ya, M. Potak. *Metallovedenie i Termicheskaya Obrabotka Metallov,* Jan. 1959, p. 10-15.

Transition steels possess singular combinations of mechanical properties not encountered in other types of steels. Mechanical properties of transition steels depend mainly upon the capacity of the austenite to be converted into martensite during deformation, and on their rupture resistance. 4 ref. (Q3m, Q24m, 2-62; SS-e)

493-Q.* Properties of Extruded Alloys. Table 7. Comparative Properties of Extrudable Copper-Base Alloys. *Precision Metal Molding,* v. 17, Mar. 1959, p. 36.

Mechanical properties of pure Cu and 17 alloys. (Q-general; 4-58, Cu-b)

494-Q.* (Russian.) Reversible Temper Brittleness Affected by the Temperature of Re-Austenitization. B. Rotenshtein and N. Dregan. *Revue de Metallurgie (Bucharest)*, v. 3, no. 3, 1958, p. 5-31.

The brittleness observed after tempering (with slow cooling) following a prior tempering of a hardened steel with rapid cooling is influenced by the temperature of the second austenitization. 22 ref. (Q26s, N8; AY)

495-Q.* Effects of High Strain Rates and Rapid Heating on the Tensile Properties of Titanium Alloys. F. R. Schwartzberg. *Light Metal Age*, v. 17, Feb. 1959, p. 11-12.

Increasing strain causes an increase in strength, most pronounced at high temperatures, a general decrease in ductility and no appreciable change in modulus of elasticity. Effect of increasing temperature decreases strength and elasticity. 7 ref. (Q27a, Q23p, Q21a, 2-60, 2-61, 3-66; Ti-b)

496-Q.* Fatigue Life as Influenced by Short Periods of Overstress. G. M. Sinclair and H. T. Corten. *University of Illinois (Office of Naval Research)*, T. & A.M. Report no. 85, June 1955, 19 p.

Application of a 50,000 psi. alternating stress for as little as 100 cycles out of every 10,000 cycles, seriously reduces the mean fatigue life of the material at a test stress of 30,000 psi. 6 ref. (Q7b, 3-66; Al-b)

497-Q.* Shape as a Factor in Flexural Fatigue Strength. H. T. Corten and T. J. Dolan. *University of Illinois (Office of Naval Research)*, T. & A. M. Report no. 84, May 1955, 22 p.

Sharp edges decreased the fatigue strength approximately 10% as compared to $\frac{1}{8}$-in. radius rounded edges, and the fatigue strength decreased approximately as the logarithm of the area of material exposed to peak stress. 12 ref. (Q7a, 3-73; Al-b)

498-Q.* Investigation of the Behavior of Materials Under Repeated Stress. T. J. Dolan. *University of Illinois (Office of Naval Research)*, T. & A. M. Report no. 89, June 1955, 32 p.

Influence of size and shape, stress, amplitude, structure, prior plastic deformation, and strain aging. (Q7, 3-66)

499-Q. Theory of High Temperature Deformation of Metals. Gunther Schoeck. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services Washington 25, D. C., p. 3-21.

Processes which occur during creep and which contribute to the deformation are crystallographic slip, subgrain formation, grain-boundary flow and diffusion of vacancies. Equations are formulated to explain how the movement of dislocations is controlled by a thermally activated process. 10 ref. (Q3, Q24a, M26b, 2-62)

500-Q. A Survey of Recent Results on Experimental Determinations of Activation Energies for Creep. John E. Dorn. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 30-68.

Typical creep curve for high-purity Al at constant stress with an initial plastic strain that is obtained immediately upon stressing reveals three different time-dependent ranges of creep. Over the primary stage creep rate decreases with increasing time or strain as a result of the production of a more creep resistant substructure. Rate of recovery in the secondary stage equals the rate of strengthening leading to a steady state secondary creep rate, while over the tertiary range creep rate increases as a result of microfracturing which finally terminates in rupture. 51 ref. (Q3, 3-67; Al-a)

501-Q. The Relation of Microstructure and High Temperature Strength. A Synopsis. Ray W. Guard. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 90-104.

Bend tests on ternary Ni-base alloys reveal that ductility is highest if the compound is finely dispersed and the matrix is continuous; more compound can be present if there are pro-eutectic particles of solid solution; "strength" of alloys containing large volumes of intermetallic compound is limited by the ductility. Optimum strength is obtained from a fine dispersion of intermetallic compound in a solid solution matrix. (Q5g, M27, 2-62; Ni-b, 14-67)

502-Q. Tensile Properties of Some Structural Sheet Materials Under Rapid-Heating Conditions. George J. Heimerl. Paper from "High Strength Materials, Their

Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington, 25, D.C., p. 112-145.

Materials were heated to failure at temperature rates from 0.2 to 100° F. per sec. under constant load conditions. Yield and rupture stresses obtained under rapid-heating conditions are compared with the results of conventional elevated-temperature tensile tests. Relation between rapid-heating tests, short-time creep tests and conventional creep tests. 10 ref. (Q27, Q3, 2-62; SGB-s; 4-53)

503-Q. Mechanical Properties of Structural Materials Under Conditions of Rapid Heating and Rapid Loading. J. R. Kattus and J. B. Preston. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 146-172.

Strength of metals tends to increase with increasing heating rates under constant load and with increasing loading rates. Data for short-time tensile, high heating-rate and short-time creep tests. (Q3, Q27; SGB-s)

504-Q. Thermal Fatigue of Ductile Materials. Francis J. Clauss. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 174-192.

Effect of the cyclic temperature variables—maximum cycle temperature, temperature difference and time of holding at the maximum cycle temperature on the thermal fatigue life; extent of changes in the stress-rupture strength and ductility caused by varying amounts and conditions of thermal fatigue prior to fracture; experimental observations on specimens of S-816 and Inconel 550 alloys heated and cooled through various temperature cycles. (Q7j, Q3q; Ni-b, SS)

505-Q. Plastic Strain Absorption as a Criterion for High Temperature Design. C. R. Kennedy. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 193-218.

Isothermal strain-cycle properties for Inconel at elevated temperatures. Variables studied in relation to strain-cycling criteria were temperature, grain size, specimen geometry and fabrication history. Total plastic strain per cycle can be used to predict the number of cycles to failure. (Q7e, Q25p, 2-62; Ni-b)

506-Q. Strain Cycling and Thermal Stress Fatigue. L. F. Coffin, Jr. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 219-256.

Relationship between the behavior of materials to cyclic strain-constant temperature condition vs. cyclic strain-cyclic temperature conditions. The two modes of testing are compared by examining the effects of cyclic temperature on materials in the absence of external stress. Various effects exist, depending on the particular nature of the structure, including change of shape, as in U, or crystalline distortion as in certain other noncubic metals. 12 ref. (Q7j, Q3q, 3-73)

507-Q. An Approach to Design Under Conditions of Relaxing Complex Stress Concentrations. Howard R. Voorhees. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 263-280.

Investigation of variables affecting rupture-life response to a stress concentration indicates that all influences are exerted through yield, creep, rupture and ductility properties or through an effect on the stability of these properties during service or test. Experimental results are given for relative rupture life of notched and unnotched specimens of aircraft engine alloys. (Q3, Q24h, 17-51; SGA-h)

508-Q. A Survey of the Effects on Nonsteady Load and Temperature Conditions on the Creep of Metals. S. S. Manson and W. F. Brown, Jr. Paper from "High Strength Materials, Their Strength Potential and Limitations". PB 131834, 1958. U. S. Office of Technical Services, Washington 25, D.C., p. 281-338.

Material behavior under nonsteady creep conditions is complex and dependent on anelastic effects on the creep flow, loss in strain hardening, changes in the microstructure, thermal stresses arising from nonuniform heating of the body, intergranular oxidation or corrosion and thermally induced internal distortions. 38 ref. (Q3, Q25p)

509-Q.* (Japanese.) Dynamic Strength of Steel Wire. Pt. 1. Fatigue Strength Under Pulsating Plane Bending. Shigeki Aoki and

Kitaro Iijima. *Nagoya Government Industrial Research Institute, Reports,* v. 8, Feb. 1959, p. 69-73.

Dynamic strengths of steel wires studied by a fatigue testing machine of buckling type. Several experiments on pulsating plane bending fatigue strengths of drawn steel wires. Static stress under buckling based on the measurement of strain at the middle point of a wire is nearly equal to the theoretical value calculated for a wire fixed at both ends. 4 ref. (Q7a, 1-54; ST, 4-61)

510-Q.* (Rumanian.) Effect of Heat Treatment on the Susceptibility of Manganese Alloy Construction Steels to Reversible Temper Brittleness. N. Dragan and B. Rotenstein. *Studii si Cercetari de Metalurgie,* v. 3, no. 4, 1958, p. 465-476.

After holding at 500, 550 and 700° C. the susceptibility decreased when the holding time was prolonged, while it increased with the holding time at 450° C. 14 ref. (Q26s, 2-64; AY, *Mn*)

511-Q.* (Russian.) Fatigue Strength of Electroslag Welds in Large Steel Castings. I. V. Kudryabtsev and N. E. Naumchenkov. *Svarochnoe Proizvodstvo,* Jan. 1959, p. 4-9.

Resistance to rupture of electroslag welded joints under fluctuating loads, in medium-carbon cast steel 35L. Ultimate strength of welded joints is not lower than the corresponding value of the base steel. 7 ref. (Q7a; CN-p, 7-51)

512-Q.* (Russian.) Properties of Type 1KH15N25M5 Austenite Welds at High Temperatures. V. A. Toropov. *Svarochnoe Proizvodstvo,* Jan. 1959, p. 12-16.

Electrodes with a basic composition of 1KH15N25M5, (Ni-Mo-Cr) assure stable properties and structure for prolonged service at 650° C. 7 ref. (Q-general, 2-62, W29h; SS-e, *Ni, Mo, Cr,* 7-51)

513-Q.* Recent Developments in Centrispinning High-Alloy Steels and Other Materials. A. E. Thornton. *British Foundryman,* v. 52, Feb. 1959, p. 80-90.

Mechanical properties and metallurgical characteristics of a range of heavy-duty components produced by centrifugal casting process in Cr steels, Cr-Ni steels and Ni-base alloys. (Q27a; SS, Ni-b, 5-65)

514-Q.* Wire Fatigue Machine for Investigation of the Influence of Complex Stress Histories. H. T. Corten and G. M. Sinclair. *University of Illinois (Office of Naval Research),* T. & A. M. Report. no. 81, Apr. 1955, 27 p.

Equipment for investigation of fatigue life for complex stress histories, particularly those consisting of repeated blocks of cycles. Results for constant stress amplitude tests of steel wire. 6 ref. (Q7b, Q7c; ST, 4-61, 1-52)

515-Q.* Why and How to Use Malleable Iron Castings. Hans J. Heine. *Modern Castings,* v. 35, Mar. 1959, p. 27-29.

Mechanical properties. 8 ref. (Q-general; CI-s, 17-57)

516-Q.* Why and How to Use Nonferrous Castings. Herbert F. Scobie. *Modern Castings,* v. 35, Mar. 1959, p. 36-38.

Mechanical properties of Al, Cu, Mg, and Zn castings. (Q-general; Al-b, Cu-b, Mg-b, Ni-b, Zn-b, 5-60)

517-Q.* Ductile Iron-As-Cast and Annealed Tensile Properties. A. H. Rauch, J. B. Peck and E. M. McCullough. *Modern Castings,* v. 35, Mar. 1959, p. 111-116.

Accurate prediction of tensile properties requires knowledge of both hardness and composition. 7 ref. (Q27, Q29n, 2-60; CI-r)

518-Q.* Properties of Zircaloy-2. L. S. Rubenstein. *Nucleonics,* v. 17, Mar. 1959, p. 72-76.

Corrosion, mechanical and physical properties. 18 ref. (Q-general, P-general, R-general; Zr-b)

519-Q.* Factors Influencing Fretting Fatigue Strength. H. T. Corten. *University of Illinois (Office of Naval Research),* T. & A. M. Rept., no. 88, June 1955, 31 p.

Strength reduced to approximately 50% of the unfretted fatigue strength due to clamping between Al clamping pads at a nominal pressure of 4000 psi. 17 ref. (Q7a, Q9q; ST, Al, Cu-n)

520-Q.* Influence of Strain Aging on the Shape of the S-N Diagram. F. C. Rally and G. M. Sinclair. *University of Illinois (Office of Naval Research),* T. & A. M. Report, no. 87, June 1955, 34 p.

Position of the knee in the S-N diagram was influenced by the carbon and nitrogen content of the steel and also by the temperature at which the tests were conducted. 16 ref. (Q7b, 3-66; ST)

521-Q.* (French.) Copper Alloys for Springs. André Roos. *Cuivre, Laitons, Alliages,* v. 46, Nov-Dec. 1958, p. 21-30.

Beryllium bronzes and their mechanical properties at room and high temperatures; effects of heat treatment and composition on spring properties of bronzes. Physical and mechanical properties of Cr-Cu and Cd-Cu. Some characteristics of special brasses and efforts to improve their usefulness as spring materials. (Q-general, 2-60, 2-64; Cu-b, Cu-s, Cu-n, *Be, Cr,* Cd, SGA-b, 17-57)

522-Q.* (Italian.) Determination of the Mechanical and Technological Properties of Thin Aluminum Sheet. L. Mori. *Alluminio,* v. 27, Dec. 1958, p. 541-545.

Amount of elongation at rupture was determined by tensile and deep drawing tests on specimens of Al sheet under 0.5 mm. thick. Influence of heat treat condition, thickness of specimen and diameter of die. 7 ref. (Q-general, 2-64; Al, 4-53)

523-Q.* (Italian.) Nickel Steels for Low-Temperature Applications. E. T. Gill. *Metallurgia Italiana,* v. 50, Dec. 1958, p. 522-528.

Effects of low temperature on mechanical properties; influence of various alloying elements; effects of heat treatment. Production and working of semiwrought steels containing 3.5% to 9% Ni; heat treatments in relation to mechanical properties obtainable. 6 ref. (Q-general, J-general. 2-63, 2-64; AY, *Ni*)

524-Q.* (Russian.) Creep Calculations in the Design of Machine Components. N. N. Malinin. *Vestnik Mashinostroeniya,* v. 39, Jan. 1959, p. 6-13.

In creep caused by cyclic tension changes, fatigue rupture proceeds simultaneously with fatigue cracking. Creep deformation is the sum of elastic and plastic deformations when it is caused by forces less then the metals proportional limit. 21 ref. (Q3, Q7a, Q24, 17-51)

525-Q.* (Russian.) Brittle Failure of Welded Structures. V. V. Shevernitskii and F. V. Zhemchuzhikov. *Vestnik Mashinostroeniya,* v. 39, Jan. 1959, p. 24-28.

Effects of stress concentrations and residual stresses upon weld strength of mild carbon steel M165 at a temperature of -60° C. 4 ref. (Q25h, Q26s, 2-63; CN-p, 7-51)

526-Q.* (Russian.) Notch Sensitivity of Cyclically Loaded Steels. I. A. Oding and S. E. Gurevich. *Vestnik Mashinostroeniya,* v. 39, Jan. 1959, p. 30-35.

Knowing the magnitude of the effective coefficient of stress concentration at ultimate fatigue and the magnitude of the overloading coefficient, permits the determination of the effective coefficient of concentration stresses for stress overloading. 4 ref. (Q25h, Q23s, Q7; ST)

527-Q.* (Russian.) Fatigue Strength Influenced by Stress Concentration and Absolute Dimensions. V. P. Kogaev. *Vestnik Mashinostroeniya,* v. 39, Jan. 1959 p. 35-42.

Reduction of steel or cast iron quality as the forging or casting component increases in size; mechanical treatment; defects and grain stresses in large components affect strength. 20 ref. (Q5m, Q7k, 3-68, 3-73; CI, ST)

528-Q.* (Russian.) Fatigue Strength of Large Components. E. V. Kudryavtsev and N. M Savina. *Vestnik Mashinostroeniya,* v. 39, Jan. 1959, p. 42-47.

Effect of absolute size on strength of low-carbon rolled steel. Surface cold working in presence of concentration stresses is very effective in raising fatigue strength in small as well as in large components. (Q7a, Q25k, 3-73; CN-g)

529-Q.* Thermal Fracture Resistance of Ceramic Coatings Applied to Metal. Pt. 1. Elastic Deformation. J. H. Lauchner and D. G. Bennett. *American Ceramic Society, Journal,* v. 42, Mar. 1959, p. 146-150.

Elastic characteristics of the coating-metal composites, effective coefficient of linear expansion, temperature at which the coating and base metal were at dimensional equilibrium, temperature differential sufficient to induce coating fracture when water quenched. 15 ref. (Q26, Q21; Fe, 8-71)

530-Q.* Ductility and Strength of High-Carbon Gray Irons. E. M. Stein and H. O. McIntire. *Modern Castings,* v. 35, Mar. 1959, p. 103-110.

Ductility decreased with increasing Mn contents above 0.5%. Inoculation of low-Mn (0.3-0.5%) irons produced up to 50% increase in elongation, but the effect of inoculation decreased with increasing Mn content. 9 ref. (Q23p, Q27a, 2-60; CI; Mn, AD-q40)

531-Q.* Significance of Residual Stress in Fatigue. Jodean Morrow. *University of Illinois (Office of Naval Research),* T. & A. M. Report no. 96, Apr. 1956, 34 p.

For members with a hard surface layer residual tension on the surface was detrimental and residual compression beneficial. Literature review. 65 ref. (Q7, 3-66)

532-Q.* Study of the Mechanism of Fracture in Torsion. P. G. Jones and T. J. Dolan. *University of Illinois (Office of Naval Research)*, T. & A. M. Report no. 97, May 1956, 41 p.

Influence of amount of available elastic strain energy on the shear fracture characteristics of several metals. Torsion tests were made on solid $\frac{1}{2}$-in. cylindrical specimens. 9 ref. (Q1, Q26)

533-Q.* (Rumanian.) Effect of Phosphorus on the Mechanical Properties of Nodular Cast Iron. Iulian Cazacu and Alexandru Fechete. *Studii si Cercetari de Metalurgie*, v. 3, no. 3, 1958, p. 397-401.

Samples with various amounts of phosphorus tested for tensile strength, Brinell hardness and elongation. (Q-general, 2-60; CI-r, ADq-40, *P*)

534-Q. (German-French.) Data on Welded Railroad Bridges. Pt. 2. R. Becker. *Zeitschrift fur Schweisstechnik*, v. 49, Jan. 1959, p. 17-23.

Stress and design considerations. (Q25, T26p, 17-51)

535-Q.* Fretting of Hardened Steel in Oil. J. R. McDowell. Paper from "Lubrication Science and Technology". v. 1, no. 2. Pergamon Press, Inc., New York, 1958, p. 287-295.

To determine effect of hardness on fretting wear AISI 4340 was tested in oil bath using new machine. Wear tests measuring depth of pit and height of deposit of galled areas showed small defects due to hardness, whereas nitrided specimens produced smaller fretted areas and roughening of surfaces was shallow. 11 ref. (Q9q, Q29; ST)

536-Q.* Wear and Frictional Characteristics of Some Nickel-Base Alloys. R. A. Kozlik. Paper from "Lubrication Science and Technology". v. 1, no. 2. Pergamon Press, Inc., New York, 1958, p. 296-303.

Relative resistance to wear and galling of variety of wrought and cast Ni-base alloys. Chromium, molybdenum disulphide or sulphurized protective coatings and their limitations. 5 ref. (Q9; Ni-b)

537-Q.* Investigation of Wear by Electron Diffraction. L. M. Niebylski, M. Antler and L. O. Brockway. Paper from "Lubrication Science and Technology". v. 1, no. 2. Pergamon Press, Inc., New York, 1958, p. 304-311.

Electron diffraction theory and technique with its scope and limitations in study of lubrication. Results of wear studies of molybdenum isobutylxanthate on ring and bore wear with respect to fuel and fuel additives. 32 ref. (Q9, M22h)

538-Q.* Study of the Effect of Wear Particles and Adhesive Wear at High Contact Pressures. E. B. Sciulli and G. M. Robinson. Paper from "Lubrication Science and Technology". v. 1, no. 2, Pergamon Press, Inc., New York, 1958, p. 312-318.

Wear rate curves and coefficients of friction for combination of Co alloys and stainless steel under pressures up to 300,000 psi. in demineralized water at room temperature and in the presence and absence of wear particles. Defects of sliding-surface geometry in trapping wear particles. (Q9, 3-74; Co-b, SS)

539-Q.* Wear of Cobalt Base and Stainless Materials in High Purity Water. N. B. Dewees. Paper from "Lubrication Science and Technology". v. 1, no. 2. Pergamon Press, Inc., New York, 1958, p. 319-328.

Wear tests were performed by various methods and machines at room temperature and at 500° F., with velocity of machine stress pressure, and size of contact areas considered. These tests were compared in terms of "specific wear". 4 ref. (Q9; Co-b, SS)

540-Q.* Cross-Rolled Plate Vs. Hand Forgings of Similar Section. W. H. Meyer. *Western Machinery and Steel World*, v. 50, Mar. 1959, p. 66-68.

Mechanical properties of cross rolled plate and hand forgings of 4300 series steels. Degree of isotropy obtainable by each process. (Q27a, 3-72; AY, 4-51, 4-53)

541-Q.* (French.) Brittle Fracture of Steel. J. B. Lean. *Metaux Corrosion-Industries*, v. 34, Jan. 1959, p. 1-13.

Steel transition temperature as influenced by loading rate, cold working, aging, grain size, rolling conditions, heat treatment and alloying elements. Brittle fracture in relation to dislocation theory. 143 ref. (Q26s, Q24, M26b, 2-59, 2-64; ST)

542-Q.* (Polish.) Deformation of Metals With Face-Centered Cubic Structure. Aleksander Krupkowski. *Archiwum Hutnictwa*, v. 3, no. 4, 1958, p. 241-254.

Deformation of round test pieces with various orientation while maintaining circular cross-section in relation to multiple slip in single crystals of fcc. structure. (Q24a; 14-61)

543-Q.* Propagation of Sound in Liquid Metals: the Velocity in Lead and Tin. R. S. Gordon. *Acta Metallurgica*, v. 7, Jan. 1959, p. 1-7.

Constant linear decrease of sonic velocity with increasing temperature. Acoustic data used to evaluate diffusion phenomena and simple hole theory. 12 ref. (Q21f, N1, 2-62; Pb, Sn, 14-60)

544-Q.* Overshooting in Quenched Aluminum Crystals. L. E. Tanner and R. Maddin. *Acta Metallurgica*, v. 7, Feb. 1959, p. 76-82.

Single crystal quenched from annealing treatments at 600° C. and strained in tension exhibited effects in deformation process. Overshooting due to hardening of conjugate slip system. 25 ref. (Q24, Q23a; Al, 14-61)

545-Q.* AM-355: High-Strength Stainless. G. N. Aggen. *Iron Age*, v. 183, Apr. 2, 1959, p. 74-77.

Recommended primarily for applications requiring high strength-to-weight ratios and good corrosion and oxidation resistance up to about 900° F. (Q-general, R-general; SS)

546-Q.* Metals Under High Speed Loading. John S. Rinehart. *Mines Magazine*, v. 49, Feb. 1959, p. 19-25, 40.

Failure under impulsive loading, duration of the load being a few microseconds and its intensity as high as several hundred pounds per square inch. 11 ref. (Q26, Q6; ST, Fe)

547-Q.* High Temperature Metals Target. Nat Wood, Editor. *Western Metalworking*, v. 17, Mar. 1959, p. 40-45.

Development in steels, aluminum alloys, titanium and molybdenum. (Q-general, 2-62; ST, SS, Al-b, Mo, Ti)

548-Q.* (Czech.) Effect of Deformation and Subsequent Heating on Tantalum. Jiri Vacek. *Hutnicke Listy*, v. 14, Feb. 1959, p. 127-132.

Samples were exposed to deformation of 40 and 70% by rolling and then heat treated at various temperatures. Effects on hardness, tensile strength, ductility and electrical resistance. 11 ref. (Q29n, Q27a, P15g, 3-68, 2-64; Ta)

549-Q.* (German.) Work Hardening of Aluminum Single Crystals (99.99%). W. Staubwasser. *Acta Metallurgica*, v. 7, Jan. 1959, p. 43-50.

Orientation and temperature dependence of work hardening. Orientation dependence is related to the amount of slip in additional glide systems. 26 ref. (Q23a, 2-63, 2-61, 3-72; Al, 14-61)

550-Q.* (German.) Slip Planes in the Plastic Deformation of High-Purity Aluminum of Medium Grain Size. R. J. Hartmann and E. Macherauch. *Naturwissenschaften*, v. 45, Nov. 1958, p. 540-541.

In samples of grain size 0.04 to 0.25 sq.mm. and 99.99% purity about 40% of slip planes are not {111} - planes, after elongation of 8%. Technique used combined optical microscopy with X-ray diffraction. (Q24, 2-59; Al-a)

551-Q.* (Japanese.) Photoelastic Examination of Stress Concentration Factor for U-Notched Tension Bar. Yosio Ohasi. *Japan Society of Mechanical Engineers, Transactions*, v. 24, Nov. 1958, p. 798-803.

Stress concentration factor does not always increase with an increase of notch depth, but is larger for notches of medium depth than for very deep notches, the base radius of the notch and minimum section of the bar being kept constant. (Q25k)

552-Q. Bending Techniques for Evaluation of Cast Materials and Structures. J. C. Graddy. *Modern Castings*, v. 35, Mar. 1959, p. 90-96.

(Q5, Q27; Al, Mg, 5)

553-Q.* Early Stages of Plastic Deformation in Copper. D. A. Thomas and B. L. Averbach. *Acta Metallurgica*, v. 7, Feb. 1959, p. 69-75.

Plastic extension observed at stresses above 1000 psi. and plastic strain at given stress depend on third power of grain size. 25 ref. (Q24, 2-59; Cu)

554-Q.* Metallography of Deformed Iron. D. G. Brandon and J. Nutting. *Acta Metallurgica*, v. 7, Feb. 1959, p. 101-110.

Slip lines produced on polycrystalline surface examined by electron microscope and carbon replica. Passage of dislocations disperses small segregated regions and so changes the rate of chemical attack. 27 ref. (Q24a, M27, Fe)

555-Q.* Cobalt in Steels. L. Habraken and D. Coutsouradis. *Cobalt*, no. 2, Mar. 1959, p. 11-22.

Effect on hardenability, brittleness and other mechanical properties. 31 ref. (Q-general, 2-60; ST, *Co*)

556-Q. Crystal Plasticity. Pt. 1. Theory of Glide in Metal Crystals. D. A. Aboav. University of Palermo, Italy. (Office of Scientific Research.) *U. S. Office of Technical Services,* PB 131759, Dec. 1957, 61 p. $1.75.

Accounts qualitatively for the main glide phenomena such as the existence of a critical shear stress, work-hardening and recovery. (Q24a, N4)

557-Q. Fundamental Mechanism of Wear and Friction of Unlubricated Metallic Surfaces at High Sliding Speeds. F. M. Sauer. Stanford Research Institute. *U. S. Office of Technical Services,* PB 131963, Apr. 1957, 62 p. $1.75.

Study aimed at determining mechanisms which would permit accurate prediction of wear and friction of metals under extreme pressure and velocity. (Q9, 3-74; Mo, SS)

558-Q. Fracture Strengths Relative to Onset and Arrest of Crack Propagation. G. R. Irwin, J. A. Kies and H. L. Smith. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 151131, Nov. 1958, 26 p. $.75.

Methods developed for duplicating both the plane-strain and plane-stress conditions in laboratory measurements of fracture strength. (Q26, Q26q, 1-54)

559-Q. Study of Beta Embrittlement in High-Strength Titanium Alloys. A. J. Griest, A. P. Young, H. A. Robinson and P. D. Frost. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services* PB 151278, Aug. 1958, 114 p. $2.25.

Primary cause of beta embrittlement in Ti alloys and the characteristic loss of ductility is the large grain size obtained rapidly in many alpha-beta alloys when heated into the beta field. (Q26s; Ti-b)

560-Q.* (German.) Ultrasonic Investigation of the Plasticity of Metal Crystals. F. Blaha and B. Langenecker. *Acta Metallurgica,* v. 7, Feb. 1959, p. 93-100.

Decrease in shearing stress caused by ultrasonic irradiation is same order of magnitude for plastic deformation of Al, Cd and Zn crystals, temperature constant. 18 ref. (Q24, Q2, 1-74; Al, Cd, Zn)

561-Q.* (Italian.) Influence of Microstructure on the Fatigue Resistance of Nodular Cast Iron Crankshafts. D. Fortino. *Fonderia Italiana,* v. 8, Jan. 1959, p. 3-8.

Formation of pseudo-lamellar graphite improves static and fatigue properties as compared with those of gray cast iron with normal lamellar graphite. A further linear improvement occurs when degree of spheroidization increases. 4 ref. (Q7a, M27, T7j; CI-r)

562-Q.* Fracturing Under Explosive Loading. John S. Rinehart. *Chemical Engineering Progress,* v. 55, Feb. 1959, p. 59-64.

Significant features of the fracture process. 11 ref. (Q26)

563-Q.* Special Report on 9% Nickel Alloy Steel. *Design News,* v. 14, Mar. 2, 1959, p. 14-15.

Moderate strength alloy for low-temperature service reduces material cost up to 40%. (Q-general, 2-63; SS, *Ni*)

564-Q.* New Look at the Refractory Metals. *Fansteel Metallurgy,* Mar. 1959, p. 1-8.

Properties of Cb, Mo, Ta and W. (Q-general, 2-62; Cb, Mo, Ta, W, EG-d37)

565-Q. Research and Development on Determination of Coefficients of Friction Between Dry Metallic Surfaces. E. W. Gaylord and H. Shu. Carnegie Institute of Technology. (Watertown Arsenal.) *U. S. Office of Technical Services,* PB 131943, Oct. 1957, 49 p. $1.50.

Coefficients of static friction between dry metallic surfaces under high normal pressures, and coefficients of kinetic friction under high normal pressures and high sliding velocities. (Q9p, 3-74; ST, U, Ti, Be)

566-Q. Metallurgical Investigation of Aluminum Alloy X2219-T6. P. L. Hendricks. Wright Air Development Center. *U. S. Office of Technical Services,* PB 151235, June 1958, 27 p. $.75.

New alloy exhibited tensile properties of 20,000 psi ultimate tensile strength, 15,000 psi. tensile yield strength and 25% elongation. (Q27a, 2-62; Al-b)

567-Q.* (French.) Comparisons Between the Damping Capacity of Electrolytic Iron and Zone Melted Iron. F. Dabosi, B. Migaud and J. Talbot. *Comptes Rendus,* v. 248, Jan. 26, 1959, p. 553-555.

Higher damping capacity of zone melted iron is attributed to its very high purity. 6 ref. (Q8g; Fe-a)

568-Q.* (Russian.) Effect of Phosphorus on Wear of Metalworking Equipment. A. V.

Portugeis. *Liteinoe Proizvodstvo*, Feb. 1959, p. 38-39.

Least satisfactory results were achieved in cast iron with 0.359% phosphorus. Hardness and wear resistance depends very little upon the sum of C and Si content. A higher phosphorus content is indicated in many cases. 8 ref. (Q9, W25n, 2-60; CI, *C*, *Si*, *P*)

569-Q.* (Russian.) Steel Endurance Increased as a Result of Carburizing. D. C. Elenevskii. *Vestnik Mashinostroeniya*, v. 39, Feb. 1959, p. 20-24.

Resistance to fatigue is determined basically by high fatigue resistance of the carburized layer while the compressive residual stresses that take place after hardening have a subordinate effect. 18 ref. (Q7a, Q25h, J28g)

570-Q. Timken 17-22-AV (High-Temperature Constructional Steel). *Alloy Digest* SA-82, Apr. 1959, 2 p.

Composition and mechanical properties of new low-alloy steel. (Q-general, 2-62; AY)

571-Q.* (Russian.) Impact Strength at Low Temperatures and Formation of Flaws. L. S. Livshits and A. S. Rakhmanov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 190-192.

Mechanical testing of a killed low-carbon steel at low temperatures. (Q6n, 2-63; CN-g)

572-Q.* (Russian.) Effect of Deformation Speed in the Tension Testing of the Mechanical Properties of Nonferrous Metals. G. M. Volkonov and L. V. Primatova. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 196-197.

Experiments with sheets of Cu, brass, Ni and NiAg. 5 ref. (Q27, 3-67; *Ag*, Cu, Cu-n, Cu-b, Ni)

573-Q.* (Russian.) Effects of Loading Rate and Testing Temperature on the Plasticity of Steel. I. A. Razov and E. M. Shevandin. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 198-202.

Bending tests under static load and impact tests performed at temperatures from +20° to -196° C. If the material shows no cold brittleness, the loading velocity has no remarkable influence on plasticity. 5 ref. (Q23p, Q5, Q6, 2-61; ST)

574-Q. (Russian.) Delay in the Yielding of Steel Under Dynamic Loading. A. I. Golubkov and V. M. Panov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 209.

Steel samples exposed to dynamic tensile loading. Yield delay time is influenced by the degree of loading, but does not change remarkably with loading velocity. (Q27b; ST)

575-Q.* (Slovakian.) Fatigue Strength of Automobile Parts. Vladimir Gregor and Oskar Izdinsky. *Zvaranie*, v. 8, Jan. 1959, p. 2-6.

Riveted and welded wheels, axles with V-welds and fillet welds exposed to torsional cycling. (Q7h, T21; ST, 7-51)

576-Q.* Fatigue Tests of Joints of High Strength Steels. Norman G. Hansen. *American Society of Civil Engineers, Proceedings, Structural Division, Journal*, v. 85, ST3-Pt. 1, Mar. 1959, p. 51-69.

The most important variable governing the fatigue strength of a joint is clamping force. In riveted joints, as tested, the variations and the distribution within a joint of those variations of clamping force, subordinate whatever superiority one steel has over another. Joints having uniformly high clamping force, such as the bolted joints, have high fatigue strength. (Q7a; ST, 7-53, 7-54)

577-Q.* Selection Guide to Heat-Resistant Cast High Alloys. E. A. Schoefer. *Machine Design*, v. 31, Apr. 2, 1959, p. 118-125.

Surface stability, structural stability, mechanical properties, design considerations. 6 ref. (Q-general; SS, Ni-b, SGA-h, 17-51)

578-Q.* New Precipitation-Hardening Stainless Steel. Allen C. Gilbraith. *Metal Treatment and Drop Forging*, v. 25, Mar. 1959, p. 91-94.

Mechanical properties of PH 15-7 Mo, a material suitable for honeycomb structures. (Q-general, J27; SS, Mo, 7-59)

579-Q.* Production Aids in the Use of Malleable Iron. William E. Hoffman. *Tooling & Production*, v. 25, Apr. 1959, p. 44-46.

Mechanical properties, design. (Q-general; CI-s, 17-51)

580-Q. Deflection and Rupture of Zircaloy-2 Plate Compartments Under Internal Pressure. R. D. Leggett. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 73-92. U. S. Office of Technical Services, Washington 25, D. C.

Deformation of compartments in plate-type fuel elements. Elastic and plastic

behavior of five compartment sizes pressurized at room temperature with measurements made on one compartment size pressurized at 600° F. (Q3q, 3-74, T11g; Zr-b)

581-Q. The Torsional Properties of Zircaloy-2 and Zircaloy-3. R. E. Johnson. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct, 1958, p. 49-56. U. S. Office of Technical Services, Washington 25, D. C.

Mechanical properties under shearing stress. The elastic torsional properties of base-annealed and hot rolled specimens were determined from SR-4 strain gage measurements. For both materials the torsional yield strength is near 30,000 psi. 4 ref. (Q1; Zr-b)

582-Q.* (Russian.) Damping Decrement Influenced by the Order of Transverse Vibration. A. P. Yakovlev. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 206-208.

Rods of cermet or steel were vibrated by electromagnets. The logarithmic damping decrement is diminished with a higher order of vibrations. (Q8; 6-70, ST)

583-Q. A Simple Bend Test to Measure Uniformity of Ductility in Sheet Metal. S. V. Arnold. Watertown Arsenal. *U. S. Office of Technical Services*, PB 131947, n.d., 6 p. $.50.

Correlates bend angle with the first visible evidence of rupture. (Q5; Ti, 4-53)

584-Q. Analysis of a One-Dimensional Nonlinear Mechanical Model and Its Application to the Qualitative Explanation of the Visco-Elastic Behavior of Aluminum From Sonic Tests. John A. Mital and Tien S. Chang. *Virginia Polytechnic Institute, Bulletin*, v. 51, Oct. 1958, 44 p.

Analysis of the visco-elastic behavior of Al as observed from sonic tests. 128 ref. (Q21; Al)

585-Q. (Russian.) Testing Apparatus for Thermal Cycling. A. A. Zuikova. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 170-172.

5 ref. (Q7j, 1-53)

586-Q. (Russian.) The Oscilloscope in the Impact Testing of Weldments. M. H. Gapchenko. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 193-195.

9 ref. (Q6, X25j; 7-51)

587-Q. (Russian.) Removal of Thin Layers From Samples to Determine Residual Stress. V. Ya. Sevast'yanov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 202-203.

Stress is determined by measuring thickness and deformation. 6 ref. (Q25h, 1-54)

588-Q. (Russian.) Device for Testing Fracture in Metals. N. N. Popova. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 230. (Q26, 1-53)

589-Q.* Tough Ship Plate. William J. Harris Jr., and Clyde Williams. *Metal Progress*, v. 75, Apr. 1959, p. 66-71.

A review of the enormous amount of work done since 1946 by the Ship Structure Committee leads to the conclusion that a vanishing number of failures need be expected in normal service of welded ships properly designed and constructed of steels meeting the revised specifications of the American Bureau of Shipping. (Q26s, T22g; ST, 4-53, 7-51)

590-Q.* Surface Fatigue of Carbo-Nitrided Steel. G. W. Powell, M. B. Bever and C. F. Floe. *Metal Progress*, v. 75, Apr. 1959, p. 88-90.

Carbo-nitrided cases must be thick enough to withstand service-induced stresses and to possess maximum resistance to surface fatigue. Otherwise, fatigue life is determined mainly by the core properties rather than those of the case. (Q7, J28m; ST)

591-Q.* Titanium Alloys Today—How Commercial Alloys Compare. Paul D. Frost. *Metal Progress*, v. 75, Apr. 1959, p. 91-96.

Divided into alpha, alpha-beta and beta types, commercial Ti alloys have widely varying properties. Alpha alloys have high strength and good oxidation resistance at elevated temperatures but cannot be heat treated readily. Alpha-beta and beta alloys respond to heat treatment and are more formable than alpha alloys. Research and development programs will broaden applications. (Q-general, 17-57; Ti-b)

592-Q.* Fabricating and Finishing Toolsteels for Aircraft Parts. P. E. Ruff. *Metal Progress*, v. 75, Apr. 1959, p. 97-102.

H-11 maintains high strength at elevated temperatures. Formability is similar to that of 4130, and weldability is like that of 4340. Parts are limited to a 4-in. thick section to obtain through hardening on air cooling. Most parts require coatings for corrosion protection. Procedures for processing H-11. (Q-general, J-general, G17k, K9s; TS, SGA-h)

593-Q.* Aircraft Quality Steels. Digest of Aircraft Quality Steels-Medium and Low-Alloy Type". L. F. Barnhardt and P. Adams. Paper presented at the A.I.M.E. Electric Furnace Steel Conference, Pittsburgh, Dec. 1957. *Metal Progress*, v. 75, Apr. 1959, p. 135-136, 138, 140.

Factors necessary for toughness at high strength levels are a temperad martensitic structure, low carbon content, consistent with desired strength; avoidance of brittle-range tempering temperatures; careful control of melting and pouring operations. (Q-general; AY, SGB-a)

594-Q.* Pressure Equipment for Low Temperature Service. C. R. Soderberg, Jr. *Welding Journal*, v. 38, Jan. 1959, p. 39s-44s.

From information on brittle fracture, design basis for ferritic material in atmospheric and low-temperature work is given. 12 ref. (Q26s, 2-63, 2-74; CN, Fe-b, SS, 7-51)

595-Q.* Effect of Residual Stress on Fatigue Strength. D. S. Dugdale. *Welding Journal*, v. 38, Jan. 1959, p. 45s-48s.

Rotating tests reported on notched bars preloaded to introduce residual stress. Effect depends on material and notched sharpness. (Q7a, Q25, 2-60, 3-68; CN, AY, *Ni*)

596-Q.* (German.) High-Quality Copper Wire. Karl Robert Vassel. *Zeitschrift fur Metallkunde*, v. 50, Feb. 1959, p. 112-117.

Effect of various elements, drawing conditions and cold deformation on mechanical properties and conductivity. 12 ref. (Q-general, P15g; Cu, 4-61)

597-Q.* (Spanish.) Behavior of Ultrasonic Vibrations When Penetrating Metallic Media. Jose Ors. *Instituto del Hierro y del Acero*, v. 11, Oct-Dec. 1958, p. 263-281.

Determination of speed of propagation of vibrations and elastic constants in gray cast iron and steels of different structures. Coefficient of damping of vibrations in Fe is high due to presence of graphite. Compared with cast iron, variations of longitudinal and transverse speed of propagation are generally minor in steel. 8 ref. (Q21f; CI-n, ST)

598-Q.* Complex Stress Creep Relaxation of Metallic Alloys at Elevated Temperatures. A. E. Johnson and J. Henderson. *Aircraft Engineering*, v. 31, Mar. 1959, p. 76-79.

Nature of relation between complex stress creep under conditions of relaxation and complex stress creep under conditions of steady stress. (To be continued.) (Q3a; Al-b, Mg-b)

599-Q.* Why Metals Fail. *Australasian Engineer*, v. 51, Feb. 7, 1959, p. 45-53.

Embrittlement, fatigue, creep and other mechanical characteristics. (Q-general, A9)

600-Q.* Radiography, Microstructure and Mechanical Properties of Cast Magnesium-Thorium-Zirconium Alloy HK-31A. T. R. Bergstrom and R. G. Bassett. *Modern Castings*, v. 35, Apr. 1959, p. 79-87.

Autoradiographic, radiographic, metallographic and spectrographic investigation of segregation of alloying elements. Effect of segregation on mechanical properties at room temperature and at 500° F. (Q27, S13e, M27c, M28h; Mb-b, *Th, Zr*, 9-69)

601-Q.* Martensitic White Irons for Abrasion-Resistant Castings. T. E. Norman, A. Solomon and D. V. Doane. *Modern Castings*, v. 35, Apr. 1959, p. 104-118.

Composition, structure, mechanical properties and relative resistance to gouging abrasion, high-stress or grinding abrasion and scratching abrasion or erosion of martensitic white irons. Comparison with pearlitic white irons. Effect of solidification rate, heat treatment and carbon, Si, Mo, Cr, Mn, Ni and Cu additions on the suppression of pearlite. Control of retained austenite. 20 ref. (Q9n, Q27, Q29, 3-71, 2-64, 2-60; CI-p, Si, Mo, Cr, Mn, Ni, Cu)

602-Q.* Thermal and Elastic Properties of Eight Cast Irons. D. Fitzgeorge and J. A. Pope. *North East Coast Institution of Engineers and Shipbuilders*, Preprint, Mar. 23, 1959, p. 285-330.

"Quality factor" in investigating materials for marine engine combustion chambers. 14 ref. (Q-general, P11g, T22h, 2-61; CI)

603-Q. (Book.) High Temperature Materials, Their Strength Potentials and Limitations. Syracuse University Research Institute, *U. S. Office of Technical Services*, 3PB 131834, 1958, 353 p. Washington 25, D. C. $5.

Proceedings of the Fourth Sagamore Ordnance Materials Research Conference, Raquette Lake, N. Y., Aug. 21-23, 1957. Papers abstracted separately. (Q-general; SGA-h)

604-Q. (Translation.) Life of Ingot Molds and Stools. D. M. Slonim. *Iron & Coal Trades*

Review, v. 178, Feb. 27, 1959, p. 487-492. (From *Stal'*, v. 18, Oct. 1958)

See item 182-Q, 1959. (Q9, W19c; ST)

605-Q. (Translation—BWRA.) Impact Strengths of Standard Doors for Open Rail Wagons. A. A. Kazimirov, V. P. Morgun, G. E. Olifer, G. Ya. Ivanushkin, E. V. Kapustyanov, I. T. Svinarenko and A. A. Tyagun. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 45-56.

Number of impacts to fracture on arc spot welded and resistance spot welded doors fabricated from 09G2D high-tensile steel. The use of low-alloy, high-tensile, corrosion resistant steel enables the weight to be substantially reduced with increases in stiffness and strength. (Q6, Q26, T23p; 7-51, AY)

606-Q. (Translation—BWRA.) Some Fatigue Strengths of Type St 3 Rimming Steel Under Vibrating Load. A. A. Bat. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 60-65.

Single-value fluctuating stress tests on beams of hardened rimming steel, Type ST 3 in crane gantry girders. Hardened steel is less sensitive to stress raisers than Type NL2 steel. Stress concentrations discussed in relation to fatigue cracking. 4 ref. (Q25k, Q26q, Q7a; ST-d)

607-Q. (Translation—BWRA.) Influence on Residual Stresses of Local Heat Treatment of Transverse Butt Welds in Tubes. V. V. Shevernitskii and V. A. Kovtunenko. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 78-82.

Specimens composed of seamless steel tubing (0.21% C, 0.63% Mn, 0.22% Si, 0.11% Ni, 0.66% Cr). Local heating to 600-650° C. results in considerable reduction of stresses and their more even distribution along the weld; no essential difference exists between the stresses acting along the welds for heated zones of different extent. (Q25h, 2-64; ST, 7-51, 4-60)

608-Q.* Effect of Various Factors on the Mechanical Properties of Magnesium Alloy Castings. J. W. Meier. *Canadian Dept. of Mines and Technical Surveys, Mines Branch Research, Report*, no. R38, 1958, p. 225-240. $.25.

Procedure for evaluating strength of castings. 10 ref. (Q-general, 1-54; Mg, 5)

609-Q. Clad Steels for Nuclear Applications. Digest of "Applicability of Clad Steels to Heavy Wall Piping". J. H. Proctor. A.S.M.E. Paper no. 57, NESC-108, Mar. 1957, *Metal Progress*, v. 75, Apr. 1959, p. 178, 180, 182.

Serviceability of clad steels in which the bond is produced during rolling by the combination of heat and pressure. Experiments were conducted on flat plates and cylinders to test the strength of the bond against the stresses caused by the differential expansion of the cladding and the backing material under severe temperature fluctuations. (Q-general, T11, 2-62; AY, 8-66)

610-Q.* Investigation Into the Creep Properties of Two Cast Irons. C. Wheatley and J. A. Pope. *North-East Coast Institution of Engineers and Shipbuilders*, Preprint, Mar. 23, 1959, p. 331-354.

4 ref. (Q3; CI)

611-Q.* Ultrasonic Wave Propagation in a Nickel Single Crystal. J. de Klerk. *Physical Society, Proceedings*, v. 73, pt. 3, Mar. 1, 1959, p. 337-344.

Behavior of the dynamic elastic constants and the energy losses with and without an applied magnetic field. 15 ref. (Q21f, Ni, 14-61)

612-Q.* Brittle Fracture Tests of Steel Plates Containing Residual Compressive Strain. S. T. Rolfe, W. J. Hall and N. M. Newmark. *Welding Journal*, v. 38, Apr. 1959, p. 169s-175s.

Methods for producing a residual compressive strain field in the center of a 2-ft. wide plate, and propagation of brittle fractures. 4 ref. (Q26s, Q25h, Q28k; ST, 4-53, 7-51)

613-Q.* The Role of the Basis Metal in the Production of Stressed Electrodeposits. Joseph B. Kushner. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 28-32.

The early layers of a depositing metal reproduce the crystal structure of the underlying metal provided the substrate is clean and both metals are not too dissimilar in crystal structure. The forces controlling the isomorphic growth or epitaxing of the deposit are atomic in nature and do not act over distances larger than about ten atom layers or so. Lattice constants are discussed in relation to stress. 14 ref. (Q25, M26; 8-62)

614-Q.* Effect of Shot-Peening Prior to Chromium Plating on the Fatigue Strength of High Strength Steel. Bennie Cohen. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 33-36.

Shot peening is very effective in overcoming the harmful effect of Cr plating on fatigue. High-strength steel specimens showed only a slight decrease in fatigue strength due to plating. Shot peening of medium-strength steel specimens not only counteracts the harmful effects of Cr plating but results in an increase in fatigue strength. 5 ref. (Q7a, L17, G23n; ST, *Cr*)

615-Q.* Heavy Electrodeposited Metallic and Flame-Sprayed Ceramic Coatings in a High Heat Transfer Aerothermal Environment. Stanley Zirinsky and Dodd S. Carr. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 97-104.

Behavior of Ni, Ni + Pt, Ni + Pd, Ni + Rd, Ni + Cr, Ni + aluminum oxide, Cr, aluminum oxide coatings on Ni and Cu heat sink materials. (Q-general, 2-62; Ni, Pt, Pd, Rh, Cr, Cu, 8-71, 8-62)

616-Q.* (Dutch.) Copper and Copper Alloys. W. G. R. de Jager. *Metalen*, v. 14, Mar. 14, 1959, p. 70-71.

Copper with and without various oxygen contents was tested by alternating bending after heating through $\frac{1}{2}$ hr. in a hydrogen or, for comparison, in a nitrogen atmosphere and at temperatures from 400-800°C. When the sample contained oxygen, even after heating at 400°C. hydrogen unsoundness was observed. (Q26s, Q5; Cu, *H, O*)

617-Q.* (German.) Cracking and Fracture Phenomena in Steels in the Presence of Hydrogen. Paul Bastien. *Bergakademie*, v. 11, Feb. 1959, p. 70-81.

The formability of steel with alpha structure is reduced by hydrogen absorption. Brittleness is increased if deformation speed is slow enough for hydrogen diffusion. Location of the hydrogen atoms is mainly in the {122} planes. New explanation for hydrogen brittleness is presented. 41 ref. (Q23q, Q26; ST, 2-66, *H*)

618-Q.* (German.) Influence of Flame-Cutting on Fatigue Strength. H. D. Steffens. *Schweissen und Schneiden*, v. 11, Mar. 1959, p. 93-97.

Materials and shapes of test specimens; factors influencing fatigue strength; geometric and mechanical factors; changes in crystalline structure. (Q7, G22g; ST, CN, AY, Cr, *Ni*)

619-Q.* Classifying the Precipitation Hardening Stainless Steels. *Industrial Heating*, v. 26, Mar. 1959, p. 532, 534, 536, 538.

Classification arranged according to microstructure. Group I, martensitic as solution treated and as aged, includes stainless W and 17-4 PH; group II, austenitic as solution treated and martensitic as transformed and aged, includes 17-7 PH, PH 15-7 Mo, AM-350, AM-355; group III, austenitic as solution treated and as aged includes 17-10 P and HNM steels. 6 ref. (Q-general, M27; SS)

620-Q. Effect of Backup Variables on Series Spot Welding of Steel. E. F. Nippes, W. F. Savage and K. E. Dorschu. *Welding Journal*, v. 38, Feb. 1959, p. 49s-56s.

Effect of backup bar and stool combinations of varying electrical conductivity upon the shunting current and tensile-shear strength of spot welded joints. (Q27a, Q2g, K3n; ST, 7-51)

621-Q. Properties Affecting Suitability of 9% Nickel Steel for Low Temperature Service. T. N. Armstrong, J. H. Gross and R. E. Brien. *Welding Journal*, v. 38, Feb. 1959, p. 57s-65s.

Double normalized and stress-relieved steel retains notch toughness at liquid nitrogen temperature. Welds, resistant to low-temperature embrittlement and design stress, made by metal-arc or inert-gas metal-arc process. 6 ref. (Q-general, K1, 2-63; SS, *Ni*)

622-Q. Effects of Martensite, Bainite and Residual Stresses on Fatigue of Welds. R. E. Keith. *Welding Journal*, v. 38, Mar. 1959, p. 142s-143s.

Dislocation theory and plasticity applied to welds. Martensite and bainite do not constitute internal notches. Residual stresses are important in fatigue depending on material and conditions. 12 ref. (Q7a, Q25h, Q24; ST, 7-51)

623-Q. Internal Stress Distribution of Single Spot Welds in Relation to Their Fatigue Life. G. Welter and A. Choquet. *Welding Journal*, v. 38, Apr. 1959, p. 145s-158s.

Strain-gage measurements of internal strains in spot welds on stainless steel. Improvement in fatigue resistance of welds by hydrodynamic treatment. 11 ref. (Q25, Q7b, K3n; SS, 7-51)

624-Q. Effect of Residual Stress on Brittle Fracture. Hiroshi Kihara and Koichi Masubuchi. *Welding Journal*, v. 38, Apr. 1959, p. 159s-168s.

Residual welding stress, having no effect on ductile fracture of carbon steel, may affect brittle fracture. Fracture at low stress level when materials have low notch toughness, sharp notch and high tensile residual stress. Preloading at high temperature investigated. 10 ref. (Q26s, (Q25h; CN, 7-51)

625-Q. Effect of Heat Treatment and Fabrication on Heavy-Section Pressure Vessel Steels. A. I. Rubin, J. H. Gross and R. D. Stout. *Welding Journal*, v. 38, Apr. 1959, p. 182s-187s.

Notch toughness, strength and ductility in carbon and alloy steel affected by stress relief. Steels susceptible to strain aging. (Q23s, Q23p, Q27, 2-64, 2-65; CN, AY)

626-Q. Effects of Hydrogen Brazing on Properties of High-Temperature Alloys. G. A. Hoppen and E. N. Bamberger. *Welding Journal*, v. 38, Apr. 1959, p. 194s-201s.

Eight alloys used for fabricated jet-engine components subjected to brazing thermal cycles and then tested for tensile and stress-rupture properties. (Q27a, Q3q, K8, 2-64; Fe-b, Ni-b, Co-b, SGA-h)

627-Q.* (English.) Effect of Shot-Peening on Fatigue Strength of Metals. Pt. 1. Effects on Polished State. Sakae Takeuchi and Tsuneo Homma. *Tohoku University, Science Reports of the Research Institutes*, v. 10A, no. 6, 1958, p. 426-434.

Endurance life of all the materials tested was prolonged by several times, and the fatigue strength at 10^7 cycles was increased by 3 to 13% by shot-peening. 4 ref. (Q7a, G23n; Fe, Al-b, Cu-b, Cu-n, ST, *Si, Mn*)

628-Q.* (Russian.) Relief of Lattice Distortions and Its Effect on the Kinetics of Initial Creep. Ya. E. Geguzin. *Fizika, Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 825-831.

Investigations aimed to discover correlations between initial creep and diffusion processes occurring in metals under load, and to study the effect of lattice distortions caused by plastic deformation or the preparation of a metal from an electrolyte. (Q3, 3-68, N1, M26s)

629-Q.* (Russian.) Internal Friction of Pure Nickel in Relation to Temperature. O. I. Datsko and V. A. Pavlov. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 900-904.

Maximum internal friction of pure recrystallized Ni in the 440-460° C. range depends upon stress relaxation along grain boundary. With increase of annealing temperature the maximum friction is reduced and is not displaced noticeably from the high-temperature region. 14 ref. (Q22, Ni-a, 2-64, 2-61)

630-Q. (Russian.) Yield Point in Metallic Crystals. P. I. Kuleshov. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 924-928.

Analysis under complex loading. 9 ref. (Q24c; 14-61)

631-Q. Welded Cantilever Wedge Beams. W. J. Krefeld, D. J. Butler and G. B. Anderson. *Welding Journal*, v. 38, Mar. 1959, p. 97s-112s.

Experimental determination of critical stresses at which steel beams buckle elastically. Tests conducted on beams having both I and channel sections, with various dimensions, span lengths and degrees of taper. (Q23b, 3-73, 1-54; ST, 7-51)

632-Q. Elastic Constants of Vanadium Single Crystals. E. Sandor and W. A. Wooster. *Acta Crystallographica*, v. 12, Apr. 10, 1959, p. 332-336.

Elastic constants of single crystals of 99.7% pure V studied using diffuse X-ray reflections. 14 ref. (Q21; V, 14-61)

633-Q. Which Method for Extrapolating Stress-Rupture Data? R. M. Goldhoff. *Materials in Design Engineering*, v. 49, Apr. 1959, p. 93-97.

Comparison of three different parameters and master curves. (Q3q)

634-Q. Wear of Lubricated Surfaces. Nicholas Chironis. *Product Engineering (Design Edition)*, v. 30, Apr. 13, 1959, p. 74-75.

Report on ASME symposium covering gear wear. (Q9n, T7a, 18-73)

635-Q. Cast-Pin Tear Test for Susceptibility to Hot Cracking. F. C. Hull. *Welding Journal*, v. 38, Apr. 1959, p. 176s-181s.

Hot cracking during freezing of weld bead, or solidification of a casting evaluated by new test. 10 ref. (Q27, 1-54; SS, 9-72, 7-51)

636-Q. (German.) H. M. Schnadt's Strength Hypothesis for Metallic Materials. Alfred Krisch. *Archiv fur das Eisenhuttenwesen*, v. 30, Mar. 1959, p. 169-185.

33 ref. (Q3m, 10-51)

637-Q.* Influence of Sulphur and Oxygen in Causing Red-Shortness in Steel. A. Josefsson, J. Koeneman and G. Lagerberg. *Iron and Steel Institute, Journal*, v. 191, Mar. 1959, p. 240-250.

Influence of thermal history on red shortness in steels containing 0.02-0.08% S, <0.02-0.09% Mn, and high carbon content (up to 0.8%) studied by impact testing. Sulphur causes red shortness by hardening the austenite and forming intergranular sulphide precipitates. Both phenomena lead to intercrystalline fracture and may be eliminated by heat treatment. 23 ref. (Q26s, 2-64; CN, *Mn, C, S*)

638-Q.* Longitudinal Panel Cracking in Ingots. S. C. Desai. *Iron and Steel Institute, Journal*, v. 191, Mar. 1959, p. 250-256.

Cracks are largely confined to steels of a composition range such that the pearlite grains are enveloped in a more or less continuous thin boundary of ferrite. Within this range, the susceptibility of any particular steel to panel cracking is greatly influenced by its Al and nitrogen contents. 3 ref. (Q26q, 2-60; ST, 5-59, Al, N)

639-Q.* (German-French.) Properties and Weldability of New Metals and Alloys. C. G. Keel *Zeitschrift fur Schweisstechnik (Journal de la Soudure)*, v. 49, Mar. 10, 1959, p. 70-78.

Heat resistant alloys with Fe, Co, Ni, Cu, Cr and Ti as base metal used in nuclear reactors, gas turbines, jet engines, pumps, heat exchangers and valves. Use of pure Cu, Ni alloys, Inconel 702, R-235, L-605 and N-155 alloys as brazing materials for high-temperature steels. (Q-general, 2-62, K9s, T11; SGA-h, Fe-b, Co-b, Ni-b, Cr-b, Ti-b, SGA-f)

640-Q.* (Russian.) Structural Changes in Metals at a Very Slow Rate of Deformation. L. M. Rybakova and B. M. Rovinskii. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 874-878.

Technically pure Ni and steel were studied under tensile deformation both at a normal and a very slow rate. On the basis of radiographs a process of mutual transfer of crystal grains and elements of their substructures is assumed. 9 ref. (Q3, 3-68, M26; Ni, ST)

641-Q.* (Russian.) Modulus of Elasticity and Hardness of Copper-Beryllium Aging Alloys. I. N. Frahtsevitch and P. I. Mel'nichuk. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 912-918.

Be has a weakening effect on the interatomic bond of Cu-Be Alloys. The aging effect is intensified in alloys with a weakened atomic bond. 8 ref. (Q21, Q29, N7a, M25h; Cu-b, *Be*)

642-Q.* (Russian.) Mechanical Properties of 10G2SD Steel Weldments. V. Yu. Shishkin, V. A. Makurin, D. I. Navrotskii and V. N. Savel'ev. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 12-15.

Weld joints tested for elongation by cyclic loading at 300 cycles per min. Failure occurred in base metal, away from weld. Weld strength compares favorably with steel 3 and high -Cr steel 15KHSND. (Q-general, AY, 7-51)

643-Q.* (Russian.) Effect of Impurities on Development of Hot (Intercrystalline) Cracks in Weld Deposited Metal. M. V. Pridantsev and A. S. Astaf'ev. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 18-22.

Presence of B up to 0.014% increases the development of intercrystalline tears in the weld deposit. Ca in the amount 0.042-0.4% does not depress the formation of intercrystalline tears. Increase of Ca concentration, depending on type of flux used, may either reduce or increase the intensity of intercrystalline tear formation. Ba has no effect. 8 ref. (Q26p, 3-69; ST, 7-51, *B, Cu, Ba, Ca*)

644-Q.* (Russian.) Effect of Spacing on Fatigue Strength on Spot Welds. M. A. El'yashev. *Svarochnoe Prozvodstvo*, Mar. 1959, p. 22-23.

The fatigue strength of a weldment decreases nonproportionally as the distance between spots is increased. Tabular survey on tensile strength, fatigue limit and strength coefficient for various materials. (Q7a, Q27a; 7-51)

645-Q.* (Ukrainian.) Effect of Preheating Temperature on Residual Stresses of the First and Second Kinds and on Fatigue Strength of Rolled Steel. A. I. Yatsyuk and M. M. Shved. *Dopovidi Akademii Nauk-Ukrainskii RSR*, Jan. 1959, p. 18-20.

A rise in preheating temperature of rolled steel 45 (pearlite and ferrite) up to 300° C. causes an increase in the residual compression stresses of the second kind. A further rise in the preheating temperature leads to a decrease in their magnitude and at 500° C. residual stresses vanish. 5 ref. (Q25h, Q7a, 2-61)

646-Q.* Unified Interpretation of Room-Temperature Strength of Notched Specimens as Influenced by Their Size. B. M. Wundt. *American Society of Mechanical Engineers*, Paper no. 59-MET-9, May 1959, 13 p.

Relationship derived between notch strength and relative notch depth for cylindrical tension bars with different outside diameters. (Q23s)

647-Q.* Delayed Failure of High Strength Steels. Alexander R. Troiano. *Corrosion*, v. 15, Apr. 1959, p. 207t-212t.

Influence of applied stress, hydrogen concentration and notch radius on time to fracture of statically loaded specimens of cadmium plated AISI 4340 steel. Kinetics of crack initiation and propagation. Effect of thickness of Cd plate, time and temperature on hydrogen removal by baking treatments. 14 ref. (Q26s, Q26q, Q27d; AY, *Cd*, 8-62, SGB-a)

648-Q.* Some Observations on the Portevin-LeChatelier Phenomenon. R. Tamhankar. *Indian Institute of Metals, Transactions*, v. 11, Dec. 1958, p. 37-53.

Mechanical instabilities of Armco iron and 35 Ni, 10 Cr austenitic steel occurring during tensile tests at 2 to 700° C. Effect of grain size, temperature and strain rate on occurrence and nature of serrations in load-elongation curves. 25 ref. (Q24j, Q27a, 2-61, 2-59; SS-e, CI)

649-Q.* Friction and Frictional Wear. B. N. Das and R. Choubey. *Indian Institute of Metals, Transactions*, v. 11, Dec. 1958, p. 67-77.

Wear of rail and wheel steels during laboratory tests. Variation of rate of wear with load, time and surface hardness. Effect of load on dynamic frictional torque. 14 ref. (Q9n, Q9p; CN)

650-Q.* Four New Stainless Alloys. Norman S. Mott. *Iron Age*, v. 183, Apr. 16, 1959, p. 118-121.

Composition of precipitation hardening PH 55 stainless steels. Mechanical properties of castings at room and elevated temperatures. Wrought forms. Corrosion rates in calcium hypochlorite, ferric chloride and sulphuric, hydrochloric, nitric, acetic and phosphoric acids. (Q-general, R6g, R6p; SS)

651-Q.* Design With Non-Ferrous Sinterings. *Precision Metal Molding*, v. 17, Apr. 1959, p. 32-33.

Density, tensile properties and hardness of sintered copper-base powdered compacts. Nonferrous metal powders. (Q27a, Q29n, P10a; Cu, 6-72, EG-a38)

652-Q.* Properties of Die Casting Alloys. *Precision Metal Molding*, v. 17, Apr. 1959, p. 36-38.

Chemical composition, mechanical and physical properties of Zn, Al and Mg-base die-casting alloys. Tensile properties of Al alloys at 75 to 500° F. (Q-general, P-general; Al-b, Zn-b, Mg-b, 5-61)

653-Q.* Designing for Investment Casting. *Precision Metal Molding*, v. 17, Apr. 1959, p. 39-41.

Chemical composition and typical mechanical properties of standard investment casting alloys. Carbon steel, low-alloy steel, stainless steel, Co, Al, Mg and Cu alloys. (Q27; Al-b, Mg-b, Co-b, Cu-b, ST, SS, 5-62, 17-51)

654-Q.* Properties of Permanent Mold Casting Alloys. *Precision Metal Molding*, v. 17, Apr. 1959, p. 42-45.

Composition, mechanical and physical properties of Al and Mg permanent mold casting alloys. Tensile properties of Al alloys at 75 to 700° F. (Q-general, P-general, 2-62; Al-b, Mg-b, 5-63)

655-Q. Annealing in Slip Bands in Copper Fatigued at 90° K. D. Hull. *United Kingdom Atomic Energy Authority*, AERE M/R 2306A, Jan. 1958, 6 p.

When specimens are fatigued at 90° K., and heated to room temperature at intermediate stages, the rate of increase of slip bands is much smaller than for specimens kept entirely at 90° K. The intermediate heating effectively makes the slip bands softer than the surrounding regions so that on further fatiguing more slip occurs near or within the slip band. Results are attributed to movement of point defects formed in the slip bands by the fatigue deformation. 11 ref. (Q24c, Q7; Cu)

656-Q. The Effect of Neutron Irradiation on the Impact Properties of En2 Mild Steel. I. L. Mogford, A. T. Churchman and D. Hull. *United Kingdom Atomic Energy Authority*, AERE M/R 2485, Feb. 1958, 9 p.

An increase in the transition temperature exists which is approximately proportional to the cube root of the irradiation dose. At the maximum dose the rise in transition temperature is 75° C. There

exists a reduction in the energy absorbed in the ductile fracture after irradiation which is approximately 50% for specimens given higher doses. 16 ref. (Q6, Q26, 2-67; CN)

657-Q. The Effect of Cadmium Plating on SAE 4340 Steel in the Presence of Stress Concentrations at Elevated Temperatures. E. M. Kennedy, Jr. Wright Air Development Center. *U. S. Atomic Energy Commission,* WADC-TR-58-108 (Pt. 1), Dec. 1957, 40 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.) $1.25.

SAE 4340 investigated in the annealed and heat treated conditions. The annealed material was investigated at 600 and 611° F., and effects on the properties of the heat treated material observed at 500, 600 and 611° F. The properties of Cd plated steel in both conditions, annealed and heat treated, were compared with the properties of unplated steel subjected to the same test conditions. (Q25k, 2-64; ST, 8-62, *Cd*)

658-Q. A Preliminary Study of High-Strength Zirconium-Base Alloys. S. R. Maloof. Nuclear Metals Inc. *U. S. Atomic Energy Commission,* NMI-1205, Aug. 1, 1958, 36 p. (Available from U.S. Office of Technical Services, Washington 25, D.C.) $1.

Tensile tests at room temperature and at 500° C. on five experimental Zr-base alloys indicate that ultimate tensile strengths of around 190,000 psi. and elongations of 3 to 9% are possible at room temperature, and at 500° C. tensile strengths greater than 100,00 psi. High-strength Zr-base alloy claddings restrain the growth of unalloyed U during thermal cycling. (Q27, Q7j; Zr-b, SGB-a)

659-Q.* (German.) Influence of Grain Structure on the Fatigue Strength of Nitrided Steels. H. Wiegand. *Draht,* v. 10, Mar. 1959, p. 94-95.

Grain structure has strong influence on fatigue strength but little effect on surface hardness. (Q7a, J28k, 2-59; ST)

660-Q.* (German.) Influence of Nitriding on Fatigue Strength. A. Juenger. *Draht,* v. 10, Mar. 1959, p. 95.

After nitriding or carburizing the endurance bending strength is increased and is no longer influenced by surface condition. (Q7a, A7g, 2-64, J28k; ST)

661-Q.* (German.) Corrosion Protection of Nickel Coatings Produced by the Chemical Process. *Galvanotechnik,* v. 50, Mar. 15, 1959, p. 148-149.

Due to the phosphorus content the hardness of Ni coat amounts to 650 Vickers. Heating 1 hr. at 400° C. increases the hardness to 1200 Vickers—similar to that of hard Cr coatings. Heating for 5 hr. in inert atmosphere at 750° C. and slow cooling to 200° C. makes the surface corrosion resistant. (Q29n, R-general; Ni, 8-62, *P*)

662-Q.* (German.) Material Tests in Modern Machine Design. L. Gillemot. *Periodica Polytechnica-Engineering Series,* v. 2, no. 4, 1958, p. 251-273.

Material quality can be characterized by work of deformation per unit volume which can be calculated from traction test data. Values depend on the multi-axial stress condition. Test is useful in design to avoid brittle fractures. 18 ref. (Q25, Q26s, 17-51)

663-Q.* High-Nickel Airframe. *Aircraft Production,* v. 21, Apr. 1959, p. 122-126.

Mechanical properties and fabrication of Inconel X. (Q-general, G17, K3n, T24a, 2-62; Ni-b, 17-57)

664-Q.* Serviceability of Welds Containing Discontinuities. William L. Green. *News in Engineering,* v. 31, Feb. 1959, p. 13-16, 27.

Static load characteristics of the mild steel welds were not affected by porosity in amounts reducing the cross section area up to about 7%. (Q-general; CN, 7-51, 9-68)

665-Q.* Surface Film May Be Clue to Low Wear of Alloy CI Tappets. George H. Robinson, Robert F. Thomson and Fred J. Webbere. *SAE Journal,* v. 67, Apr. 1959, p. 80-83.

Wear tests with various lubricants on cast iron and carburized steel. (Q9, T21b; CI-q, ST, NM-h)

666-Q.* (Japanese.) Effect of Aluminum on the Hot Workability of Low-Carbon Steel. Takeshi Akutagawa, Yoshitsugu Michima, Eiichiro Asano and Akizi Suseki. *University of Tokyo, Faculty of Engineering,* v. 17, Mar. 1959, p. 54-59.

Aluminum oxide, in form of inclusions, interferes with deformation by hot rolling. (Q23q, F23; CN, N, 9-69)

667-Q.* Influence of Arsenic Content in Copper Crystals on Easy Glide at -183° C.

K. Schroder. *Physical Society, Proceedings*, v. 73, Apr. 1, 1959, p. 674-676.

Addition to a pure metal of a soluble impurity increases the range of easy glide observed in tensile tests of single crystals. Shear stress, orientations, shear strain curves for crystals. 8 ref. (Q24a, Q2j, 2-63, 2-60; Cu-b, *As*, 14-61)

668-Q.* (French.) Present Knowledge of Brittle Fracture. C. Miklosi. *Metalurgia si Constructia de Masini*, 1958, p. 21-27.

Theory of the mechanism of plastic deformation. Difference in the behavior of welded assemblies from that of riveted assemblies is caused by residual stress, precipitation from supersaturated solutions under thermal shock and incomplete transformations. 30 ref. (Q26s, K9n; 7-51, ST)

669-Q. (German.) Increase of the Fatigue Life of Crankshafts by Bath Nitriding. B. Finnern. *Draht*, v. 10, Mar. 1959, p. 95.

Elimination of straightening after heat treatment. Increase of fatigue strength and wear resistance. (Q7a, J28k, T7; ST)

670-Q. (German.) Radiographic Measurement of Stress in Hardened Gears. U. Wolfstieg. *Draht*, v. 10, Mar. 1959, p. 96-97.

Use of a Geiger tube goniometer instead of photographic film increases accuracy and enables measurement of internal stress. (Q25, T7a, X2m; ST)

671-Q. (German.) Possibilities of Multi-Axial Stress Measurement by X-Ray Diffraction. I. S. Szanto. *Periodica Polytechnica-Engineering Series*, v. 2, no. 4, 1958, p. 275-289.

Statistical observation of lattice changes. Description of new X-ray deformograph. (Q25, M22g, 1-53)

672-Q. Quenching Studies on Mechanical Properties of Pure Gold. M. Meshii and J. W. Kauffman. *Acta Metallurgica*, v. 7, Mar. 1959, p. 180-186.

Yield stress increases with cooling rate, aging and quenching temperature 500-1050° C. Activation energy measured at increases in yield stress. Cooling rates were 1000 to 6000° C. per sec. 17 ref. (Q23b, Q25p, J26, 2-65; Au-a, 4-61)

673-Q.* Deformation Mechanisms During Creep in Metals. R. Widmer. *Brown Boveri Review*, v. 45, Nov-Dec. 1958, p. 575-581.

Mainly crystallographic slip is experienced at high stresses accompanied by severe distortion of the lattice. In contrast, at medium and light stresses it is usually possible to find a cellular mechanism for which, in the process of deformation, the crystals may be subdivided into subgrains whose lattice is undisturbed. 7 ref. (Q3; SS-e)

674-Q.* Properties and Heat Treatment of Cast Austenitic Steel Containing Ferrite. G. Faber. *Brown Boveri Review*, v. 45, Nov-Dec. 1958, p. 582-588.

Difficulties experienced when welding stabilized cast austenitic steel, due to segregation at the grain boundaries, can be avoided if the steel is alloyed in such a manner that a small percentage of ferrite is produced during solidification. If, by appropriate heat treatment, the initially coherent ferrite is broken up into separate islands, the serious embrittlement which results from formation of the sigma phase at temperatures of 600 to 800° C. is no longer possible; at the same time resistance develops to intercrystalline corrosion. 9 ref. (Q26s, R2h, J-general; SS-e, 9-69)

675-Q.* Refractory Materials. D. R. Williamson and Lorraine Burgin. *Colorado School of Mines Mineral Industries Bulletin*, v. 2, Mar. 1959, p. 1-16.

Problem of high-temperature service, properties of high-temperature materials. 19 ref. (Q-general, P-general, 2-62; EG-d37, SGA-h)

676-Q. Theory of the Low-Temperature Maximum of the Internal Friction of Metals. H. Donth. *United Kingdom Atomic Energy Authority*, AERE Lib/Trans 789, Jan. 1959, 21 p.

Pairs of over-dislocations can be continuously formed by the concentration of energy from the normal vibrations of the dislocation line. The energy concentration is produced by interaction with the thermal lattice waves. By means of this interaction the energy of vibration of the dislocation is increased and decreased by small amounts in an irregular fashion. 38 ref. (Q22, 2-63)

677-Q. Tensile Properties of Pure Plutonium. H. R. Gardner and J. M. Jefferes. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission*, HW-57130, Aug. 6, 1958, 16 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Tensile, hardness and density data, typical stress-strain curves. Yield

strength was determined on the basis of 0.02% offset, an acceptable criterion for brittle materials. A delta phase anneal did not significantly alter the tensile properties of as-cast Pu. (Q27a, Q29n; Pu-a)

678-Q. Radiation Damage Studies of Boron Stainless Steel. Interim Report. H. T. Watanabe and W. O. Schaffbit. Phillips Petroleum Co., Atomic Energy Division. *U. S. Atomic Energy Commission,* IDO-16483, Sept. 18, 1958, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Tensile specimens of 18-8 stainless steel containing 1% boron, enriched to 93% in boron-10, were fabricated and irradiated to 15 and 25% burnup of boron-10. As a result of irradiation large changes occur in total elongation, yield strength and ultimate tensile strength. Further increase in dosages increase brittleness at a reduced rate with a lesser increase in tensile strength. (Q-general, 2-67; SS, *B*)

679-Q. Multiaxial Creep Studies on Inconel at 1500° F. C. R. Kennedy, W. O. Harms and D. A. Douglas. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2622, Feb. 5, 1959, 38 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Creep rate and rupture life of axially loaded pressurized Inconel tubes studied at 1500° to develope failure criteria based on properties measured in the conventional uni-axial tension test. Creep rate results are compared on the bases of established theories of stress analysis and good correlation is shown between uni-axial test results and the results of tests with multi-axial stress states. (Q3; Ni-b)

680-Q. Mechanical Properties of Certain Aircraft Structural Metals at Very Low Temperatures. R. L. McGee, J. E. Campbell, R. L. Carlson and G. K. Manning. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151459, Nov. 1958, 63 p. $1.75.

Alloys tested were 17-7PH and AM-350 stainless steels, AISI 4340 and Tricent steels, 7079-T6 Al and ZK60A-T5 Mg alloys and A110AT, C110M and 6A1-4V Ti alloys. Notched impact energies were determined on the two steels and the Al and Mg alloys. Values for hardness, elastic modulus, yield strength and tensile strength of these materials tended to increase as the temperature was reduced to -235° C. (Q-general, 2-63; ST, SS, Mg-b, Ti-b)

681-Q.* (French.) Construction of the "Atomium" in Brussels. F. Hebrant. *Revue de la Soudure Lastijdschrift,* v. 15, Jan. 1959, p. 1-18.

Impact tests and other mechanical tests made at various temperatures on sheet steel used in the construction. Determination of embrittlement temperatures. 9 ref. (Q-general; CN-g, 4-53)

682-Q.* (French.) Copper Alloyed Steel. H. Dessart and J. Liegeois. *Revue de la Soudure Lastijdschrift,* v. 15, Jan. 1959, p. 30-43.

Effect of Cu on mechanical properties, phase transformations, fluidity and corrosion behavior. Welding methods. 43 ref. (Q-general, 2-60, N8, E25p, R-general, K-general; AY, *Cu*)

683-Q.* Dislocation Contribution to the Temperature Dependence of the Internal Friction and Young's Modulus of Copper. D. O. Thompson and D. K. Holmes. *Journal of Applied Physics,* v. 30, Apr. 1959, p. 525-541.

Use of fast neutron irradiation for an accurate evaluation of the components due solely to dislocations. 19 ref. (Q21a, Q22, M26b, 2-67, 2-61; Cu)

684-Q. Creep Deformation of Aluminum-Copper Two-Phase Alloys. R. M. N. Pelloux, A. R. Chaudhuri and N. J. Grant. *Metallurgical Society of AIME, Transactions,* v. 215, Apr. 1959, p. 204-209.

Stable, over-aged two-phase Al-Cu alloys were deformed in creep at 500 and 700° F. Creep strengths, mechanisms of deformation and recovery, types of fracture and ductility were studied to determine the effects of precipitate dispersion and alloy content. (Q3, Q26; Al-b, *Cu*)

685-Q. Investigation of the Relationship Between Microstructure and Creep-Rupture Properties of Heat-Resistant Alloys. A. P. Coldren and J. W. Freeman. University of Michigan. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB PB 151421, July 1958, 71 p. $2.

Influence of conditions of hot working on the properties of alloys at high temperatures. (Q3, Q26, 2-64, 3-68; Ni-b, SGA-h)

686-Q. Cyclic Creep Buckling of Integrally Stiffened Aluminum Alloys Panels.

C. W. King and B. J. Nolan. North American Aviation Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151515, Apr. 1958, 124 p. $2.75.

Comparisons of creep buckling lifetimes for intermittent loading tests with continuous load tests for creep buckling specimens, and for tension creep specimens with a master rupture parameter. (Q3c, Q3m; Al-b)

687-Q. Low-Cycle Fatigue of Notched and Unnotched Specimens of 2024 Aluminum Alloy Under Axial Loading. T. H. H. Pian and R. D'Amato. Massachusetts Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151355, Feb. 1958, 87, p. $2.25.

A straight-line relationship exists between the range of strain measured at the edge of the notch and the number of cycles to failure when these variables are plotted on log-log scales. (Q7; Al-b)

688-Q. Radiation Damage Studies of Boron Steel. Final Report. W. O. Schaffnit. Phillips Petroleum Co., Atomic Energy Div. *U. S. Atomic Energy Commission*, IDO-16502, Jan. 28 1959, 27 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Tensile specimens of 18-8 stainless steel containing 1% boron, enriched to 93% in boron-10, were fabricated and irradiated in the Materials Testing Reactor. Specimens were tested for tensile strength, hardness and elongation, and examined metallographically to observe changes in microstructure. The irradiated material was extremely brittle, changes were noted in the microstructure, and a crack was discovered in one of the higher burnup specimens. (Q-general, M27, 2-67; SS, *B*)

689-Q.* (Russian.) Microhardness of Zinc or Tin-Base Cast Alloys. A. A. Presnyakov and N. S. Sakharova. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 886-891.

Prolonged homogenizing or plastic deformation with subsequent annealing does not completely eliminate heterogeneity. After deformation and thermal treatment, residual heterogeneity is less in alloys with a smaller amount of alloying element. (Q29q, 3-68; Zn-b, Sn-b)

690-Q.* A Generalization of Cumulative Damage. R. M. Mains. *American Society of Mechanical Engineers*, Paper no. 59-MET-1, 1959, 6 p.

Expressions relating allowable response to largest excitations with a load-distribution factor, material-and-structure factor and the material constants from fatigue tests. Numerical examples. 11 ref. (Q7k, Q8g; ST)

691-Q.* Effect of Relaxation on the Behavior of Materials Under Combined Alternating and Static Stress. F. H. Vitovec. *American Society of Mechanical Engineers*, Paper no. 59-MET-3, 1959, 5 p.

Stress range diagram for notched and unnotched specimens of heat resistant alloys. Representation of relaxation mechanism by two parallel nonlinear Maxwell units. Application of relaxation model to stress range diagram. (Q7f, Q7a, Q3a, 2-61, 3-66; SGA-h)

692-Q.* Steady Creep of a Tube Under Combined Bending and Internal Pressure. Iain Finnie. *American Society of Mechanical Engineers*, Paper no. 59-MET-5, 1959, 3 p.

Expressions for ratio of bending creep rate, with and without internal pressure. Axial creep rate and stresses of Pb tubes under combination of internal pressure and bending at 120° F. 4 ref. (Q3n, Q5m, 3-74; Pb-b, *Sb*)

693-Q.* Report of Anomalous "Brittle Failures of Heavy Steel Forgings at Elevated Temperatures". A. J. Babecki, P. P. Puzak and W. S. Pellini. *American Society of Mechanical Engineers*, Paper no. 59-MET-6, 1959, 12 p.

Mechanical and metallurgical factors involved in catastrophic low-energy absorption shear failure of Cr-Mo-V heavy steel forgings serving as retaining rings for billet containers used in hot extrusion of Al. Results of notched tension drop-weight and Charpy V-notch impact tests at elevated temperatures. Rupture mechanism; effect of improved heat treatment. 13 ref. (Q26, Q6n, Q3q; AY, 4-51)

694-Q.* Notch Ductility of Mild-Steel Weld Metal. F. Watkinson. *British Welding Journal*, v. 6, Apr. 1959, p. 162-174.

Results of hardness, tensile and Charpy V-notch tests. Microfissure surveys and chemical analyses of weld metal deposited by basic cellulosic or rutile electrodes used in downhand, overhead, vertical or horizontal-vertical position. (Q-general, K1a; CN, 7-51)

695-Q.* Mechanical Properties of Metal-Arc Welds in Galvanized Mild Steel. P. W. Jones. *British Welding Journal*, v. 6, Apr. 1959, p. 175-180.

Tensile, hardness and Charpy V-notch impact test, microfissure surveys of welds

in sheet and plate with and without hot dipped galvanized coating. Effect of galvanizing on hot cracking. (Q23r, Q27a, Q29n, Q6n, K1a, 9-72; CN, *Zn*, 8-65, 7-51)

696-Q.* Development of Refractory Sheet Metal Structures. Alan V. Levy and Saul E. Bramer. *Society of Automotive Engineers*, Preprint no. 56-T, 1959, 39 p.

Problems in application of Mo and Mo alloy with 0.5% Ti; cutting, forming, fastening, welding, machining and coating of sheet Mo. Physical properties and mechanical properties at high temperatures of Mo, Cb, W and Ta alloys. (Q-general, 2-62, P-general, G-general, K-general, L-general; Mo-b, *Ti*, W-a, Ta-b, Cb-b, 4-53)

697-Q.* Radioisotopes in Research. W. P. Evans and E. W. Landen. *Society of Automotive Engineers*, Preprint no. S 181, 1959, 25 p.

Measurement of wear of parts activated in a nuclear reactor or by diffusion of carbon or phosphorus tracer. Oil leakage from powder metal bushing. Seal evaluation; gamma-ray radiography. 11 ref. (Q9, S13e, 1-59; ST)

698-Q. Effect of Single Trace Impurities on the Properties of Pure Iron. J. L. Rutherford and M. Herman. Franklin Institute, Philadelphia. (For Wright Air Development Center), 1959, 6 p.

Techniques for producing quantities of zone-refined Fe; fatigue tests on zone-refined Fe. (Q7, 3-69, C28k; Fe)

699-Q. Investigation of the Strength and Ductility Relationships in Titanium-Aluminum Alloys Between 6 and 15% Aluminum for Application at Elevated Temperatures. Manufacturing Laboratories Inc. (For Wright Air Development Center), Mar. 31, 1959, 7 p.

Striation markings represent subboundaries derived from the original martensitic platelets that form on cooling through the beta-alpha transus. Tests show that there is no improvement in bend ductility when the striations are eliminated by cold work and recrystallization. Kinetic studies based on room-temperature bend ductility tests and elevated-temperature electrical resistance measurements indicate that the activation energy for embrittlement is about 34,000 cal. per mol for temperatures above about 650° F. (Q5g, 2-62; Ti-b, *Al*)

700-Q. Test of 61S-T6 Aluminum Sheet Under Short-Duration, High Rate of Rise, Heating. J. A. Barber. Sandia Corp. *U. S. Atomic Energy Commission*, SCTM3-58(16), Jan. 20, 1958, 16 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Elongation and ultimate strength of 61S-T6 sheet metal in both welded and unwelded specimens in the 400 to 900° F. range. 30% of total specimen elongation occurs at 700° F. Elongation due to thermal expansion is a straight-line function from approximately 480 to 800° F. Welded samples exhibit more variation in ultimate strength than solid samples. (Q27; Al-b, 4-53)

701-Q. Research Program on the Investigation of Seal Materials for High Temperature Applications. R. H. Baskey. Horizons Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151451, June 1958, 74 p. $2.

Best alloys contain tungsten boride or chromium nitride as the basic metal. Tungsten boride gives a constant wear rate at all temperatures while wear rate of chromium nitride decreases at the higher temperatures. (Q9n; Cr-b, W-b, B, W, SGA-h)

702-Q. Study of Refractory Materials for Seal and Bearing Applications in Aircraft Accessory Units and Rocket Motors. L. B. Sibley. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151483, Oct. 1958, 59 p. $1.50.

Alumina-chromium-molybdenum cermet, silicon carbide, alumina and a titanium carbide-nickel-molybdenum cermet showed promise for short-life rubbing-seal applications, although rapid wear and erratic frictional behavior were observed. (Q9n, Q9p, R6g; Al, C, Si, Ti, SGA-c, 6-69, 6-70)

703-Q.* (French.) Influence of Hot Working Conditions on the Properties of the Alloy A-U4SG. Pt. 1. Roger Develay. *Revue de l'Aluminium*, v. 36, Feb. 1959, p. 193-197.

Prior homogenization and temperature at which extrusion is performed influence macrostructure and tensile properties. Decreasing extrusion temperature lowers recrystallization temperature. Totally and partially recrystallized as well as unrecrystallized structures are obtainable. (Q27a, F24a, M28, N5h, 2-61; Al-b, *Cu, Si*)

704-Q.* (German.) Burst Testing of Structural Steels Resistant to Brittle Cleavage

Fracture. H. Hauttmann. *Schweisstechnik*, v. 13, Feb. 1959, p. 13-19.

Results obtained with various steels, arc welded with different electrodes. Effect of heat treatment on the properties of welded joints. Burst testing with gradually increasing load and under impact produced by explosion. 4 ref. (Q10b, Q26s, 2-64; 7-51, CN-g)

705-Q.* (German.) Processes Causing Residual Stress. Ulrich Dehlinger. *Zeitschrift fur Metallkunde*, v. 50, Mar. 1959, p. 126-130.

Residual stress is explained by dislocations caused by deformation traveling within the lattice and piling up when obstacles—primary dislocations—prevent their migration. 16 ref. (Q25h, M26b)

706-Q.* (Italian.) High-Silicon Acid Resistant Cast Irons. Berardo Abignente. *Fonderia*, v. 8, Mar. 1959, p. 99-102.

Design and founding of castings; physical and mechanical properties; machinability; comparative corrosion resistances in numerous organic and inorganic acid media. (Q-general, E-general, R6g, R7b, CI-q, *Si*)

707-Q.* (Swedish.) A Study of the Influence of Different Factors on Rockwell C Tests. K. F. Lindstrand. *Jernkontorets Annaler*, v. 143, n. 1, 1959, p. 29-36.

Rockwell C hardness tests on Jernkontorets standard hardness blocks (the generally accepted Swedish standard) by several firms and with different machines and penetrators were analyzed statistically. No pronounced irregularities in the Jernkontorets scale could be found. (Q29)

708-Q.* (Swedish.) Fatigue Tests on a Welded Chromium-Molybdenum Steel. I. Weibull. *Jernkontorets Annaler*, v. 143, no. 1, 1959, p. 37-48.

A 0.25% carbon steel was subjected to various heat treatments before and after welding. The fatigue limit is mainly determined by geometrical factors. For ground test bars of normalized material the fatigue strength was to a certain extent determined by minimum hardness. Reheat treatment after welding improved the fatigue strength, more so for hardened and tempered than for normalized base material. (Q7; CN-p, *Cr, Mo*, 7-51)

709-Q.* Brittleness of Cobalt-Iron Alloys. C. W. Chen and G. W. Wiener. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 199S-201S.

Experiments on two Co-Fe alloys with the addition of Cr or V establish the embrittling action of hydrogen at the grain boundaries. 14 ref. (Q26s, Q23p; Fe-b, *Co*, H)

710-Q.* Investigation of a Precipitation Hardening Elinvar. F. C. Hawkes. *Journal of Applied Physics*, v. 30S, Apr. 1959, p. 206S-207S.

The decrease in strain-induced magnetostriction as a result of aging in this alloy raised the elastic modulus and changed the shape of the modulus versus temperature curve below the Curie point. 5 ref. (Q21a, Q22, 2-65, P16b; Ni-b)

711-Q.* (French.) New Method for Measuring Poisson's Ratio of Metals and Alloys. Georges Vidal and Francois Girard. *Comptes Rendus*, v. 248, Mar. 2, 1959, p. 1286-1289.

Method permits the determination of the Poisson's ratio of isotropic metals with an accuracy of ± 1% and can be used at all temperatures. Tests conducted to check Poisson ratios of Al, Mg, Be, Fe, Ni and Mo, resulting in known values, prove the accuracy of the method. (Q21c; Al, Mg, Be, Fe, Ni, Mo)

712-Q.* (French.) Mechanism of Plastic Deformation of Metals. Aurel Berghezan and Angeline Fourdeux. *Comptes Rendus*, v. 248, Mar. 2, 1959, p. 1333-1335.

X-ray transmission methods applied to the deformation of monocrystals show that plastic deformation is a consequence of generation and movement of dislocations in the crystals. (Q24, M21e, M26s)

713-Q.* (French.) Application of Some Alloys in Aircraft Construction. P. Egre. *Revue du Nickel*, v. 25, Jan-Feb. 1959, p. 14-17.

Properties and limitations of steels containing C, Mn, Ni, Cr, Mo, Si and Ti and of stainless aircraft steels. (Q-general, T24, SS, AY, *C, Mn, Ni, Cr, Mo, Si, Ti*)

714-Q.* (Italian.) Influence of Iron and Magnesium on the Structure and Mechanical Properties of Inafond S7 and Inafond S71 Alloys. E. Di Russo and D. Gualandi. *Alluminio*, v. 28, Feb. 1959, p. 53-59.

In S7 alloys, reduction of Fe content to under 0.1% does not appreciably improve ductility. The opposite is true of S71 alloys, thus permitting increase in Mg content and lengthening of artificial aging treatment to obtain improved mechanical properties. 5 ref. (Q23p, Q27a, J-general, 2-60; Al-b, *Si, Fe, Mg*)

715-Q. Determination of Tensile, Compressive, Bearing and Shear Properties of Sheet Steels at Elevated Temperatures. J. Robert Kattus, James B. Preston and Herman L. Lessley. *Wright Air Development Center.* Technical Report no. 58-365, Nov. 1958, 274 p.

Data for A-286 austenitic alloy, Thermold J alloy steel, 420 stainless steel, 422 stainless steel, 17-22A(S) alloy steel—all quenched and tempered—and 17-7PH stainless steel, RH 950 condition. Strength properties and moduli of elasticity decreased with increasing temperatures. Decreases in strength are believed to be associated with structural changes produced by tempering. (Q-general, 2-62; SS)

716-Q.* (Russian.) Temperature Stresses in Flat Metallic Forms. O. Yu. Kotsyubinskii. *Liteinoe Proizvodstvo,* Mar. 1959, p. 30-34.

Mathematical method of stress determination. 6 ref. (Q25p)

717-Q.* (Russian.) Effect of Small Barium Additions on the Nonuniform Structure and Heat Resistance of Stainless Steel Castings. N. S. Kreshchanovskii, A. F. Silaev and M. F. Sheshenev. *Liteinoe Proizvodstvo,* Mar. 1959, p. 39-42.

In large stainless steel (12KH11V2NMF-L) castings, addition of small quantities of Ba, in the form of Al-Ba-Ca alloy, considerably improves mechanical and heat resisting properties. (Q-general, E25, 2-60; SS, AD-q40, *Ba*)

718-Q.* (Russian.) Explosive-Type Impact Testing Machine. V. G. Kononenko. *Zavodskaya Laboratoriya,* v. 25, Mar. 1959, p. 343-346.

Rapid tests are possible for elongation, compression, bend and diverse metal treatments at varying rates of deformation and temperature ranges. 9 ref. (Q6q, 1-53)

719-Q. Dynamic Loading: Its Effect on Casting Design. Pt. 2. John B. Caine. *Foundry,* v. 87, May 1959, p. 92-95.

Design to minimize stress concentration in castings which undergo dynamic loading. (To be continued.) 23 ref. (Q25k; 5, 17-51)

720-Q. (English.) Calculation of a Cylindrical Shell of a Standard Vessel Subjected to Internal Pressure. W. P. Kerkhof. *Lastechniek,* v. 25, Mar. 1959, p. 50-52.

Specification of German boiler steels, their composition and properties. (Q25, T26q)

721-Q. (French.) Soviet Research in the Rupture of Metals. J. B. Friedmann. *Revue de la Soudure Lastijdschrift,* v. 15, Jan. 1959, p. 44-51.

Rupture mechanism under short-time and long-time static loads. Fatigue rupture. (Q3q, Q7)

722-Q. (French.) Fatigue Rupture. *Revue de la Soudure Lastijdschrift,* v. 15, Jan. 1959, p. 52-54.

Structural analysis of a welded crankshaft that failed. (Q7, T7j, 7-51)

723-Q. Elevated-Temperature Mechanical Properties and Oxidation Resistance of Columbium and Its Alloys. *Defense Metals Information Center,* Memo. No. 8, Feb. 4, 1959, Columbus, Ohio, 10 p.

Literature review of tensile and rupture properties oxidation behavior over a wide range of temperatures. Ternary and higher alloying gives further improvements in oxidation resistance. Alloys containing Zr-Ti, Ti-Al, Cr-Co, Fe-Al and Cr-Al show up to a 2000-fold improvement in oxidation resistance at 1000° C. 28 ref. (Q-general, R1h, 2-60; Cb-b, Zr, Ti, Al, Co, Cr, Fe)

724-Q. Effects of Inelastic Action on the Resistance to Various Types of Loads of Ductile Members Made From Various Classes of Metals. Pt. 10. T-Section Eccentrically-Loaded Tension Members Made of 17-7PH Stainless Steel and Tested at 1000° F. O. M. Sidebottom and S. Dharmarajan. University of Illinois, Dept. of Theoretical and Applied Mechanics. *Wright Air Development Center,* Technical Report 56-330, Nov. 1, 1958, 25 p.

Theoretical load deflection curves and comparison with experimental values. Tension creep data. Modulus of elasticity determination. (Q27a, Q21a, Q3m, 2-62; SS, 4-57)

725-Q. Partitioning and Microdistribution of Interstitial Alloying in Titanium. New York University College of Engineering, Research Div., Quarterly Progress Report no. 4. *Wright Air Development Center,* Mar. 1959, 3 p.

Effects of oxygen and carbon on grain boundary stress relaxation. Data for alpha Ti and beta-phase alloys of Ti-Cb alloys. (Q3a, 2-60; Ti-b, *Cb, O, C*)

726-Q. Tensile Properties of Aircraft-Structural Metals at Various Rates of Loading After Rapid Heating. Haywood E. Dedman, Edmund J. Wheelahan and J. Rovert Kattus. Southern Research Institute. *Wright Air Development Center,* Technical Report no. 58-440, Nov. 1958, 197 p.

Four steels—Chrow-Mow toolsteel, Thermold-J toolsteel, Peerless-56 toolsteel and AM-350 precipitation-hardening stainless steel—and 6A1-4V Ti alloy were evaluated, the steels being tested at temperatures up to 1200° F. and the Ti alloy up to 1000° F. Test results show that, at the lower temperatures, the strength properties tend to increase slightly or to remain constant with increasing strain rates. Near the maximum test temperatures, the effect of strain rate becomes much greater, the strength properties increasing greatly with increasing strain rates. (Q27, 3-68; SS, TS, Ti-b)

727-Q. Evaluation of Alloys for High Temperature Gear Applications. E. G. Jackson, C. F. Muennch, E. H. Rowe and E. H. Scott. *Wright Air Development Center,* Technical Report no. 58-546, Dec. 1958, 79 p.

Materials investigated were M50 high speed toolsteel, modified M50, L.P.D. hot work die steel, M1 high speed toolsteel, Nitralloy N, Co-Cr die steel, 6A1-4V Ti alloy. High-temperatuae data were obtained on hardness, dimensional stability, tensile, impact and tooth fatigue strengths, corrosion and oxidation and on surface scoring resistance. (Q-general, 2-62, T7a; TS, Ti-b)

728-Q.* (Russian.) Recovery After Deformation in Aluminum, Silver and Platinum After Removal of Testing Load. A. Ya. Samoilova and V. S. Postnikov. *Fizika Metallov i Metallovedenie,* v. 6, no. 6, 1958, p. 1081-1087.

Deformation by low-frequency torsional fluctuations at small amplitude was preceded by deformation caused by elongation. 22 ref. (Q22n; Al, Ag, Pt)

729-Q.* (Russian.) Effect of Heat Treatment on the Shear Modulus and on the Curie Point of Elinvar. V. V. Propastina. *Fizika Metallov i Metallovedenie,* v. 6, no. 6, 1958, p. 1105-1109.

Raising the hardening temperature causes a phase change and considerably influences the magnitude and abnormality of the shear modulus. The value of the shear modulus depends upon the number of carbide phases. Carbon in the carbide binds the alloying elements into a complex triagonal carbide and raises modulus value. Cr, W and Mn alloy additions impoverish the solid solution and help to raise the Curie point, thus increasing the abnormality of shear modulus. 8 ref. (Q21d, 2-64; Fe-b, Ni, SGA-s)

730-Q. Evaluation of High Strength Steels for Elevated Temperature Applications in Aircraft. Pt. 1. Flat Rolled Products. Division of Engineering and Industrial Research, National Academy of Sciences. *Dept. of Defense and the National Academy of Sciences,* Report no. MAB-131-M, Apr. 8, 1958, 67 p.

Survey of mechanical, physical and chemical properties desired by the aircraft industry. Tensile properties, modulus of elasticity, creep properties, hardness, thermal conductivity, coefficient of thermal expansion, corrosion resistance, weldability, machinability, composition of hot work steels, martensitic alloy steels, martensitic stainless, semi-austenitic and austenitic stainless steels meeting aircraft requirements. Influence of temperatures up to 1200° F. on properties. (Q-general, P-general, 2-62, K9s, G17k, T24a; TS, SS, 4-53, SGB-a)

731-Q. Effect of Texture on the Mechanical Properties of Beryllium-Copper Wire. August Freda and B. D. Cullity. University of Notre Dame, Dept. of Metallurgy. *Office of Naval Research,* Technical Report no. 6, June 1958, 8 p.

Texture, grain size and mechanical properties of Be-Cu wire after cold work and heat treatment. (Q27a, Q1a, 3-72, 2-59, M26c, 2-64; Cu-b, *Be,* 4-61)

732-Q. Research on the Delay Time Study of Metal Single Crystals. R. H. Baskey. Horizons Inc. *Office of Naval Research,* July 1, 1958, 70 p.

Single crystals of bcc. beta brass, close-packed-hexagonal Zn and Mg impact tested at +25 to -190° C. Resonance frequency measurement of Young's modulus. Relation of critical resolve shear stress with temperature and strain duration. Effect of precompressing on delay time for yielding. Influence of recovery heat treatment. 26 ref. (Q24a, Q28h, 3-67; Cu-a, Mg-a, Zn-a, 14-61)

733-Q. Engineering Behavior of Structural Metals Under Slow and Rapid Loading. J. M. Massard and R. A. Collins. University of Illinois, Dept. of Civil Engineering, Urbana, Ill. *Office of Naval Research,* Oct. 1958, 105 p.

Time-sensitive stress-deformation characteristics of rimmed semikilled and fully killed mild steels, alloy steels and 6061-T6 Al alloy as determined by slow and rapid application of stress under uniaxial conditions and conditions of pure flexure. Engineering significance. 41 ref. (Q24, Q25n, 3-67; ST, AY, Al-b)

734-Q. Compressive Creep Buckling of Metal Columns. Pt. 6. Effect of Initial Imperfection. Alfred Rudnick, Robert L. Carlson and George K. Manning. Battelle Memorial Institute. *Wright Air Development Center*, Technical Report 52-251, Oct. 1958, 52 p.

Columns of 6A1-4V Ti alloys tested at 750 to 900° F. Interrelationships between column load, lifetime, temperature and initial imperfection. 31 ref. (Q3c, 2-62; Ti-b, *Al, V*)

735-Q. The Relationships Between Transformations and Residual Stresses in Heat Treated Steels. E. P. Klier. Syracuse University Research Institute, Metallurgical Engineering Dept. *Bureau of Aeronautics, Dept. of the Navy*, Final Report no. 2, Aug. 1958, 86 p.

Influence of section size, cooling medium, quenching temperature, martensite temperature range and tempering characteristics on residual stresses in quench cylinders of Mn-Cr toolsteel (0.7% C), Hy Tuf, 218 Halcomb, 4340 and 2340 steels. Residual stress measurement; cooling curves for cylinders; cooling transformation diagrams, hardness, microstructure. 13 ref. (Q25h, Q25m, 2-64; AY, TS)

736-Q. Mechanical Properties of Certain Aircraft Structural Metals at Very Low Temperatures. Robert L. McGee, James E. Campbell, Robert L. Carlson and George K. Manning. Battelle Memorial Institute. *Wright Air Development Center*, Technical Report 58-386, Nov. 1958, 57 p.

Tensile properties and Vickers hardness values of 17-7PH and AM-350 stainless steel sheet stock: AISI 4340 and Inco Tricent steel bar stock, 7-79-T6 Al alloy billets, ZK60A-T5 Mg bar stock and A11OAT, C11OM and 6A1-4V Ti alloy sheets at temperatures from -253 to +25° C. Tensile properties of plain and notched specimens. Charpy impact values for Al, Mg and steel bar stock. (Q-general, 2-63; SS, AY, Ti-b, Al-b, Mg-b, 4-53, 4-55)

737-Q. Heat Treatment Response, Mechanical Properties and Stability of Titanium Sheet Alloys. Eugene Delgrosso, Peter Kuzmenko, Allan Springmeyer, Brian Weldon, A. Richard Zello and James Chafey. Chase Brass and Copper Co., Inc. *Wright Air Development Center*, Technical Report 58-409, Jan. 1959, 104 1.

Effect of solution treatment, aging and interstitial content on mechanical properties and microstructure of Ti-4A1-3Mo-1V, Ti-15V-2.5A1 and Ti-4Al-1Pb-1Sn-1V-IZr alloys. Beta transi, room and elevated-temperature tensile properties, notch sensitivity, bendability and creep properties. Influence of deformation on aging. 28 ref. (Q-general, M27b, 2-64, 2-65; Ti-b, *Al, V, Sn, Mo, Zr, Pb*)

738-Q. Energy of Crack Formation and Crack Propagation Under Impact. W. B. Triplett and C. Wells. Carnegie Institute of Technology, Metals Research Laboratory, *Wright Air Development Center*, Progress Report no. 3, Apr. 15, 1959, 25 p.

Charpy V-notch impact values for longitudinal and transverse specimens of AISI 8740, AISI 87B40 with rare earth additions, AISI 4340, AISI 4340 and Ni-Cr steels tested at temperatures of -321 to +212° F. Estimation of crack formation and crack propagation energies, comparison with experimentally determined values. Tear phenomena. 7 ref. (Q26p, Q26q, Q6n, 2-63; AY)

739-Q.* New Impact Tester Checks Metal Fatigue. S. J. Ziembinski. *Industrial Science and Engineering*, v. 6, Apr. 1959, p. 22-27.

Machine for testing metals under repeated shocks. (Q7, Q6, N7e, 1-53)

740-Q.* Deformation of Metals by Vickers-Type Pyramidal Indenters. T. O. Mulhearn. *Journal of the Mechanics and Physics of Solids*, v. 7, Mar. 1959, p. 85-96.

Mechanism of indentation of a plane surface by a wedge. 10 ref. (Q29c)

741-Q.* Strain-Rate Sensitivity of Uranium. C. J. Maiden. *Journal of the Mechanics and Physics of Solids*, v. 7, Mar. 1959, p. 106-113.

Stress-strain curves obtained in compression tests indicate uranium is slightly strain-rate sensitive. 8 ref. (Q28; U)

742-Q.* Stress-Strain Cycles of Large Amplitude. D. S. Dugdale. *Journal of Mechanics and Physics of Solids*, v. 7, Mar. 1959, p. 135-142.

Strain cycles of constant amplitude were imposed on specimens of Cu, steel and Al alloy while variations in stress amplitude were recorded. For annealed materials the stress increased with successive cycles, but for cold worked materials it diminished, reaching steady values after definite amounts of plastic strain. 6 ref. (Q7; Al, Cu, ST)

743-Q. Slip Theory of Plasticity for Crystalline Aggregates. H. Payne. *Journal of the*

Mechanics and Physics of Solids, v. 7, Mar. 1959, p. 126-134.
5 ref. (Q24a)

744-Q. Note on the Elastic Constants of Uranium. S. J. Rothman and E. S. Fisher. *Nuclear Science and Engineering*, v. 5, Mar. 1959, p. 195-196.
(Q21)

745-Q. (German.) The Upper Yield Point. Ulrich Dehlinger. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1959, p. 416-418.
Theory and mathematics. (Q27a)

746-Q. (German.) Modulus of Elasticity and Damping Capacity of Cd-Mg Alloys. Werner Koster and Walter Lang. *Zeitschrift fur Metallkunde*, v. 49, Aug. 1958, p. 419-423.
Elasticity and damping capacity as a function of temperature and composition. 14 ref. (Q21a, Q8g, 2-61, 2-60; Mg-b, *Cd*)

747-Q. (German.) Poisson's Ratio in Elastic Deformation and in the Beginning of Plastic Deformation. Werner Koster and Johannes Scherb. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 501-507.
(Q21c)

748-Q. (German.) Determination of Poisson's Ratio. Hermann Franz. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 510-516.
92 ref. (Q21c)

749-Q. (Russian.) Heat Resistant Thin Steel Strip Used in Manufacturing of Pipes. E. Yu. Chemardurova. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1958, p. 1095-1099.
Behavior of several steels during plastic deformation in the cold state. Strengthening or increased hardness during deformation in the cold state was determined by basic changed of block sizes and not by distortion of the second order. 6 ref. (Q24m, M25; ST)

750-Q. (Russian.) Strength of Thick Walled Pipes. V. A. Gladkovskii, L. F. Vereshchagin and V. E. Ivanov. *Fizika Metallov i Metallovedenie*, v. 6, no. 6, 1959, p. 1100-1104.
Strength of pipes subjected to ultra-high internal pressures up to 14,000 atmospheres. 5 ref. (Q23b; 4-60, ST)

751-Q. (Russian.) Crack Sensitivity During Impact Bend Tests. V. A. Drozdovskii and Ya. B. Fridman. *Zavodskaya Laboratoriya*, v. 25, Mar. 1959, p. 320-328.
16 ref. (Q5, Q26s)

752-Q. (Russian.) Testing Method for Abrasive Wear Under Impact Cycling. S. S. Ermakov. *Zavodskaya Laboratoriya*, v. 25, Mar. 1959, p. 337-339.
Resistance of steels to abrasive wear depends mainly on structure and hardness and very little on the chemical composition. (Q9n, Q6; SS)

753-Q. (Russian.) Equipment for the Determination of Young's Modulus at High Temperatures. V. A. Kuz'menko. *Zavodskaya Laboratoriya*, v. 25, Mar. 1959, p. 351-353.
(Q21a, X28)

754-Q.* Impact Test for Evaluating Toolsteels. Gary Steven. *Metal Progress*, v. 75, May 1959, p. 76-77, 188.
A shallow ($\frac{1}{2}$-in. radius) notch in the standard Charpy impact specimen is suitable for rating toughness of hardened toolsteels. Several different grades are compared along with the effects of various heat treatments on a single grade (M2). (Q6r; TS)

755-Q.* Metals at Low Temperatures. H. M. Rosenberg. *New Scientist*, Apr. 9, 1959, p. 802-804.
Effect on mechanical properties. (Q-general, 2-63)

756-Q. Determination of Materials Design Criteria for 6A1-4V Titanium Alloy at Room and Elevated Temperatures. J. K. Childs and M. M. Lemcoe. Southwest Research Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151274, Aug. 1958, 275 p. $4.
Effect of high temperature on mechanical properties. (Q-general, 2-61; Ti-b, *V, Al*, 17-51)

757-Q.* (German.) Effect of Deformation on the Mechanical Properties of an Age-Hardening Aluminum Alloy. Herbert Richter and Gunter Wassermann. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 549-556.
While the elastic limit shifts to higher values in proportion to the degree of aging, work-hardening effects are diminished. In over-aging, the elastic limit value decreases and work-hardening effects remain unchanged. 12 ref. (Q23a, Q27, N7a, 3-68; Al-b, *Cu, Mg*, 4-68)

758-Q.* (German.) The System Tantalum-Nitrogen. Erich Gebhardt, Hans-Dieter Seghezzi and Wolfgang Durrschnabel. *Zeitschrift fur Metallkunde*, v. 49, Nov. 1958, p. 577-583.

An increase of nitrogen in Ta causes an increase of hardness, tensile strength and the electric resistance and upward shift of the elastic limit, while elongation and cross section reduction noticeably decrease with growing nitrogen content. 29 ref. (Q27a, M24b, 2-60; Ta, *N*)

759-Q.* Coarse Grain. H. B. Grainger and P. B. A. Willis. *Aircraft Production*, v. 21, May 1959, p. 170-176.

Detrimental effects of coarse grain, various attempts to produce consistently fine-grained material by the "peripheral fine grain" or Kynal PFG technique. 23 ref. (Q-general 2-59; Al-b)

760-Q.* Mechanical Properties of Commercial Wrought Iron. R. Jeffrey, J. Seager and J. H. Woodhead. *British Safety in Mines Research Establishment, Research Report*, no. 154, Feb. 1959, 25 p.

Survey of commercial wrought iron and study of the effects of composition and strain aging on its mechanical properties. (Q-general, N7e, 2-60; Fe-c)

761-Q.* Investigation of Hydrogen Embrittlement in Copper. Einar Mattsson and Franz Schuckher. *Institute of Metals, Journal*, v. 87, Apr. 1959, p. 241-247.

When Cu is annealed in a hydrogen-bearing atmosphere, hydrogen embrittlement does not take place during the initial period of annealing but only after a definite period of "incubation". 31 ref. (Q26s, J23a; Cu, *H*)

762-Q. Department of Defense Titanium Sheet-Rolling Program: Thermal Stability of the Titanium Sheet-Rolling-Program Alloys. E. S. Bartlett, D. N. Williams, H. R. Ogden and R. I. Jaffee. Defense Metals Information Center. (Battelle Memorial Institute.) *U. S. Office of Technical Services*, PB 151061, Nov. 1958, 48 P. $1.25.

Mechanical properties under stress during thermal exposure at 500-1000° C. are satisfactory. There are some aging and overaging effects. (Q-general, 2-62, 2-65, 3-66; Ti-b)

763-Q. Development of Active Eutectoid Base Titanium Alloys. R. F. Bunshah, D. Osterberg, E. Ence and H. Margolin. New York University, College of Engineering, Research Division. *Wright Air Development Center*, Quarterly Progress Report no. 3. Feb. 1959, 9 p.

Alloy development studies on Ti-Cu, Ti-Ni and Ti-Ni-Cu base alloys heat treated to an alpha plus compound structure. Effect of forging and heat treatment variables on mechanical properties and stability of these active eutectoid alloys. (Q-general, 2-64; Ti-b, *Cu, Ni*)

764-Q.* Cycle-Dependent Stress Relaxation. JoDean Morrow and G. M. Sinclair. Paper from "Symposium on Basic Mechanisms of Fatigue". American Society for Testing Materials, 1958, p. 83-109.

Stress relaxation in thin-walled tubes of SAE 4340 steel at three levels of hardness when subjected to a constant amplitude of alternating strain about a constant mean strain. Analysis of stress-strain relationship. 12 ref. (Q25n, Q7b, Q3a, Q7e; AY)

765-Q.* Recent Observations on Fatigue Failure in Metals. W. A. Wood. Paper from "Symposium on Basic Mechanisms of Fatigue". American Society for Testing Materials, STP no. 237, 1958, p. 110-119.

Notches, peaks, surface disintegration and resultant crack formation as revealed by small angle taper-sectioning technique. 16 ref. (Q7h, Q24c; Cu-a, Cu-n)

766-Q.* (German.) Effect of Molybdenum on Structure and High-Temperature Strength of Cast Heat Resistant Nickel-Chromium Alloys. Karl Roesch and Hans Zeuner. *Giesserei*, v. 46, Apr. 23, 1959, p. 202-215.

Effect of Mo on age hardenability and toughness in the age hardened state. Effects on carbon and tungsten, present together with Mo. 11 ref. (Q3m, N7a, 2-60, 3-71; Ni-b, *Cr, Mo*)

767-Q.* (German.) Elastic Anisotropy of Transformer Sheet With Two Different Textures. Ferdinand Stangler. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 489-490.

Relationship between the directions of easiest magnetization and the modulus of elasticity. 4 ref. (Q21a, P16; SGA-n, AY, 4-53, *Si*)

768-Q. The Dislocation-Oxygen Interaction in Alpha Titanium and Its Effect on the Ductile-to-Brittle Transition. D. Gupta and S. Weinig. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 209-216.

Internal friction techniques using a low-frequency torsion pendulum are used to study the oxygen atom interactions with dislocations in "superpurity" Ti. Both the saturation of the room temperature decrement and the transition from ductile to brittle behavior occurred at 1.5 at.% oxygen. Embrittlement was probably due

to oxygen atoms immobilizing the dislocations. 10 ref. (Q23r, Q26s, M26b; Ti-a, *O*)

769-Q. Dislocation Blocking in Face-Centered-Cubic Metals. I. R. Kramer. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 226-230.

A delay time for yielding in cold worked face-centered-cubic metals was found. Slip on (123) planes was observed while glide on these planes occurred during the delay-time period before slip starts on the (111) planes. 13 ref. (Q24a, M26b)

770-Q. Cause of Cleavage Fractures in Ductile Materials. J. Washburn, A. E. Gorum and E. R. Parker. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 230-237.

Experimental evidence was obtained in support of the idea that cleavage fracture can be initiated by dislocation pile-up. The high ductility of MgO crystals when tested in bending compared to their relative brittleness in tension was explained on the basis that large pile-ups are more likely in a tension specimen. 8 ref. (Q26n, M26b, Q23p)

771-Q. The Effect of Surface Adsorption of Gas on Crack Propagation. M. R. Achter and H. W. Fox. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 295-296.

Oxidation strengthens the metal while adsorption of gas lowers the surface energy, relative to that in vacuum, and reduces the work required to propagate a crack. (Q26q, P13d)

772-Q. Activation Energies for Creep of Single Aluminum Crystals Favorably Oriented for Cubic Slip. Y. A. Rocher, L. A. Shepard and J. E. Dorn. *Metallurgical Society of AIME, Transactions*, v. 215, Apr. 1959, p. 316-320.

From 78 to 780° K. the activation energies agree closely with those previously found for creep by (111) (101) slip. Between 78 and 140° K., the activation energy was identified with the Peierls process, while between 260 and 780° C. the activation energy was close to that for cross-slip. 11 ref. (Q3, Q24a, 3-72; Al, 14-61)

773-Q. Strengthening of Copper Alloys by Internal Oxidation. M. Safdar Ali and V. A. Phillips. *Metallurgical Society of AIME, Transactions*, v. 215, p. 340-344.

Tensile properties of Cu-O.20% Al, Cu-0.45% Mg, Cu-0.27% Cr, and Cu-0.22% Be solid solution alloys were studied at -196, 18, 250 and 500° C. on wires internally oxidized at 900 and 1000° C. Internal oxidation produced marked increases in yield strength relative to pure Cu, particularly at low temperature. 24 ref. (Q27a, R1h; Cu-b, *Al, Mg, Cr, Be*, 14-67)

774-Q.* Internal Friction, Plastic Strain and Fatigue in Metals and Semiconductors. Warren P. Mason. Paper from "Symposium on Basic Mechanisms of Fatigue". American Society for Testing Materials, STP no. 237, 1958, p. 36-50.

Pb, Cu and Ge specimens stressed to fatigue failure using barium titanate transducer attached to tapered brass horn. Determination of internal friction and plastic strain and their variation with stress. Theoretical action of Frank-Read dislocation sources. 11 ref. (Q21e, Q8k, Q7b, Q8g, 3-66; Pb-a, Cu-a, EG-j, Ge)

775-Q.* Slipband Formation and Fatigue Cracks Under Alternating Stress. M. R. Hempel. Paper from "Symposium on Basic Mechanisms of Fatigue". American Society for Testing Materials, STP no. 237, 1958, p. 52-82.

Formation and propagation in slip line in single crystals of bcc. alpha-Fe and in polycrystalline fcc. Al under cyclic stress at room temperatures. Effect of load and orientation; tensile properties. 58 ref. (Q24c, Q26e, Q27a, Q7b; Fe-a, Al-a)

776-Q.* Work of the Task Group on Brittle Failure With Respect to Research. A. O. Schaefer. Paper from "Symposium on Brittle Failure of Rotor Forgings". American Society for Testing Materials, STP no. 231, 1958, p. 12-15.

Correlation between Charpy transition temperature and susceptibility of rotor forgings to brittle failure. Effect of Cr, Ni and Si on transformation characteristics of alloy steels. (Q26s, Q23r, T7h, 2-60; AY, 4-51h, *Cr, Ni, Si*)

777-Q. Development of Active-Eutectoid Base Alloys. R. F. Bunshah and H. Margolin. New York University. *Wright Air Development Center*, Technical Report no. 58-328, Oct. 1958, 43 p.

Ti-Cu alloys form an active eutectoid Ti alloy system in which the decomposition of the beta phase to alpha-plus compound occurs rapidly. Effect of stepwise additions of Al and/or Sn and/or Zr to binary Ti-2Cu, Ti-4Cu and Ti-6Cu alloys. A Ti-6Cu-7Al-6Zr alloy proved outstanding,

showing a tensile strength of 108,900 psi. at 1200° F. 12 ref. (Q-general, N9; Ti-b, *Cu, Al, Sn, Zr*)

778-Q. Mechanical Properties of Chromium. Arthur G. Metcalfe, Sheldon A. Spachner and W. Rostoker. Armour Research Foundation. *Wright Air Development Center,* Technical Report no. 58-342, July 1958, 69 p.

Grain size is shown to have a small influence on the ductile-brittle transition temperature of electrolytic Cr containing 0.5% O. and 0.03% N. Heat treatment is very effective, under some conditions, in reducing the transition temperature, particularly when it reduces the yield stress. Nitrogen alone is not responsible for the brittleness of Cr. 20 ref. (Q-general, Q26s, 2-64, 2-59; Cr, *O, N*)

779-Q.* (Swedish.) Influence of Sulphur and Oxygen on Red-Shortness of Steel. A. Josefsson, J. Koeneman and G. Lagerberg. *Jernkontorets Annaler,* v. 143, no. 2, 1959, p. 53-75.

Influence of thermal history on red-shortness in steels containing 0.02-0.08% S., 0.01 to 0.09% Mn and high carbon contents studied by means of impact testing. Sulphur causes red-shortness by hardening the austenite and forming intergranular sulphide precipitates. Both phenomena lead to intercrystalline fracture. Mn counteracts red-shortness. 23 ref. (Q26s, 2-60; CN-r, *S, Mn*)

780-Q. (Book.) 1958 Book of ASTM Standards Including Tentatives. Pt. 3. Methods of Testing Metals (Except Chemical Analysis). 974 p. 1958. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Property, corrosion, metallographic and nondestructive tests. (Q-general, P-general, S22, R11, M-general)

781-Q. (Book.) Nimonic Alloys. W. Betteridge. 332 p. 1959. Edward Arnold, Ltd., 41 Maddox St., London, W.1, England. 60 s.

High-temperature properties of Ni alloys, with emphasis on creep; fabrication, inspection and applications. (Q-general, Q3, G-general, K-general, S-general, 2-62, 17-57)

782-Q. (Book-French.) Fatigue of Metals. 4th Ed. R. Cazaud. 572 p. 1959. Dunod, 92, Rue Bonaparte, Paris 6, France.

Fatigue fracture; mechanism and theory; tests and testing apparatus; fatigue limits for various metals and alloys; types of loading, shape of part, temperature, corrosion, cavitation and other factors influencing fatigue behavior; fatigue strength of various types of assembly. 916 ref. (Q7)

783-Q. (Translation—AIP) Creep of Zinc Single Crystals Under Liquid Films of Low-Melting Metals. V. A. Labzin and V. I. Likhtman. *Soviet Physics Doklady,* v. 3, July-Aug. 1958, p. 778-780.

See item 111-Q, 1959. (Q3, 2-61; Zn, Pb, Sn, 14-61, 14-62)

784-Q. (Translation—BISI no. 1189.) Experimental Study of Hot Deformation of Steels and Alloys. A. Gueussier and R. Castro. *Revue de Metallurgie,* v. 55, Nov. 1958, p. 1023-1041.

See item 276-Q., 1959. (Q24, Q5, Q27, 2-61, 2-60; AY, SS)

785-Q.* Fatigue Crack Formation in Silver Chloride. P. J. E. Forsyth. Paper from "Symposium on Basic Mechanism of Fatigue". American Society for Testing Materials, STP no. 237, 1958, p. 21-35.

Formation of defects and propagation of cracks in silver chloride specimens stressed to fatigue failure by reverse plane bending. Extrusion and intrusion of slipbands. (Q24a, Q24c, Q26p, Q7g)

786-Q.* (German.) Quality Evaluation of Pure Aluminum Sheet for Deep Drawing. K. R. Vassel. *Aluminium,* v. 35, Apr. 1959, p. 189-191.

Determination of quality by deep drawing tests such as the Erichsen and similar cupping tests. Criteria can also be based on tensile strength, elongation, Brinell hardness, bend values and grain size data. (Q23q, G4b; Al, 4-53)

787-Q.* (German.) Titanium—Preparation, Properties and Applications. Klaus Rudinger. *Industrie-Anzeiger,* v. 81, Jan. 2, 1959, p. 2-5.

Effect of heat treatment on tensile properties; strength of weldments; influence of various testing temperatures on result of impact tests; Erichsen cupping test with sheets of various thickness. (Q27, Q6n, 2-61, 2-64, Q23q; Ti)

788-Q.* (Japanese.) Wear of Carbon Steel Weld Metal. Pt. 2. Sukemitu Ito, Kozo Honda and Kikuzo Ishiyama. *Journal of Mechanical Laboratory (Japan),* v. 13, Jan. 1959, p. 12-17.

Effect of heat treatment upon structurally changed layers and wear volume. Quenched and tempered specimens are tested by dry rubbing. At high speeds the

specimens tempered at 600° C. show the highest wear resistivity. 8 ref. (Q9; 7-51, CN)

789-Q.* (Japanese.) Wear of Carbon Steel Weld Metal. Pt. 3. Sukemitu Ito and Kikuzo Ishiyama. *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 18-23.

Relationship between the rubbing conditions and structural changes. Rubbing behavior depends on sliding distance, velocity and load. 6 ref. (Q9; CN, 7-51)

790-Q.* (Japanese.) Indentation of a Ball. Shigehiko Yazawa, Kiyoshi Sato, Masao Unno and Go Yaguchi. *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 24-29.

Strain figures in and on the surface of a steel ball 3/8 in. diameter indented into annealed steel specimens containing 0.19% carbon. (Q29b, CN-g)

791-Q.* (Japanese.) Wear of Nickel-Chromium Austenitic Steel Weld Metal. Sukemitsu Ito and Kozo Honda. *Journal of Mechanical Laboratory (Japan)*, v. 13, Mar. 1959, p. 54-60.

Structurally changed layers of the worn surface examined microscopically by the taper sectioning method and microhardness tests. Ni-Cr-steel behaves differently from that of carbon steel due to its work hardening effect. (Q9; 7-51, SS, CN)

792-Q.* (Russian.) Effect of Neutron Irradiation on Structure and Properties of Ferritic-Pearlitic Steels. V. S. Lyashchenko and Sh. Sh. Abragimov. *Atomnaya Energiya*, Mar. 1959, p. 277-280.

At 500-600° C. the mechanical properties of 1Kh17N2, 2Kh13, 30KhMA and 1Kh17 Cb steels were considerably changed by irradiation, an effect which was not noticed in Cb steel. The increased strengthening of the three steels was due to structural changes. 5 ref. (Q-general, N-general, 2-67; SS)

793-Q.* (Russian.) Effect of Hydrogen on Formation of Cold Cracks in Welding Medium Carbon Steel. P. A. Kozlov. *Svarochnoe Proizvodstvo*, Apr. 1959, p. 17-22.

A quantitative relationship exists between hydrogen in the weld metal and the formation of cracks in welded joints of C-Cr-Mo-Ni steel, depending upon the carbon equivalent in the base metal. 7 ref. (Q26, 2-60; CN-p, 7-51, *Cr, Mo, Ni, H*)

794-Q.* Complex Stress Creep Relaxation of Metallic Alloys at Elevated Temperatures. A. E. Johnson, J. Henderson and V. C. Mathur. *Aircraft Engineering*, v. 31, Apr. 1959, p. 113-118.

Results of tests at 50% and 200° C. (Q3a; Al-b, Mg-b)

795-Q.* Effect of Successive Annealing Upon the Room-Temperature Internal Friction of Cold-Compressed Commercially Pure Polycrystalline Aluminum. Genjiro Mima. *Osaka University, Technology Reports*, v. 8, Oct. 1958, p. 373-383.

Internal friction introduced by cold compression diminished with annealing time over the entire range of the cold working levels. 23 ref. (Q22, 2-64, 3-68; Al-a)

796-Q.* Hydrogen Brittleness of Steel. Pt. 2. Iwano Ohnishi, Yoneo Kikuta and Kiyokazu Kawai. *Osaka University, Technology Reports*, v. 8, Oct. 1958, p. 395-404.

Effect of hydrogen embrittlement on tensile properties. 7 ref. (Q26s, Q27a; ST)

797-Q.* Evaluating High-Temperature Materials. Edward A. Loria. *Machine Design*, v. 31, May 28, 1959, p. 121-125.

Creep, stress rupture, fatigue and notch tensile tests used as standards. (Q-general, 1-54; SGA-h)

798-Q.* How to Get the Most From Sheet Metal in High Temperature Service. Harry A. Pearl. *Materials in Design Engineering*, v. 49, May 1959, p. 116-120.

How existing sheet materials can best be used for reusable manned and unmanned vehicles that have to withstand outer skin temperatures of 2000° F. for 1 to 100 hr. in an oxidative environment. (Q-general, 2-62, Al-b, Mg-b, Ni-b, Ti-b, SS, 4-53)

799-Q.* (German.) Influence of Grain Size on Hardness. H. Borchers and H. Jordan. *Metall*, v. 13, May 1959, p. 390-392.

Macrohardness measured in a 6% tin bronze increased in proportion to decreasing grain size, while microhardness within the grain boundaries was not influenced. This is explained by the slip retarding influence of the grain boundaries. 4 ref. (Q29n, 2-59, N5; Cu-s)

800-Q.* (German.) Gas Content and Hot Shortness of Aluminum Alloys. F. Erdmann-Jesnitzer. *Metall*, v. 13, May 1959, p. 405-407.

Relationship between hot shortness, hydrogen content and casting temperature. (Q26s, N16; Al-b, *Mg, H*)

801-Q.* "Whiskers" Research. Arthur R. Lytle. *SAE Journal,* v. 67, May 1959, p. 59.

Strength of filamentary crystals. (Q27a, A9; 14-61)

802-Q. The Effects of Neutron Irradiation on the Ductile-Brittle Transition Temperature of Weldable Structural Steel Plates. R. C. Burnett, J. M. N. Allen, D. R. Harries. *United Kingdom Atomic Energy Authority,* AERE M/R 2536, Apr. 1958, 30 p.

Neutron irradiation effects on the notched-bar properties of a $4\frac{5}{8}$ in. thick welded Ducol W. 30 steel plate. Irradiation induced increases in transition temperatures are accompanied by decreases in the energies to fracture in the slow bend test and increases in the hardness. The decreases in the energies are most marked at temperatures corresponding to the ductile portions of fracture transition curves. 8 ref. (Q23r, Q26, 2-67; SGB-s, 4-53, CN-g)

803-Q. Thermal Stresses in Stainless Steel Box Beams. *U. S. National Bureau of Standards, Technical News,* STR-2340, Apr. 1959, 4 p.

Internal radiant heat transfer investigated as a mechanism for relieving thermal stress in Type 302 stainless steel box beams. Effects of internal radiant heat transfer were related to temperature distribution, thermal stress and beam deflection for temperatures up to 1200° F. (Q25p, P11k, 2-62; SS)

804-Q.* Effects of Irradiation on Type 347 Stainless Steel Flow Separator in the EBR-1 Core. R. E. Bailey and M. A. Silliman. Paper from "Symposium on Radiation Effects on Materials", v. 3. American Society for Testing Materials, STP no. 233, 1958, p. 84-102.

Effects on mechanical properties corrected by annealing. 15 ref. (Q-general, J23, 2-67; SS)

805-Q.* (English.) Comparison of Notched Bar Tests Over the Temperature Transition Range. *Materialprufung,* v. 1, Jan. 20, 1959, p. 13-18.

Izod, Charpy U-notch and Charpy V-notch tests with mild steels and alloy steels carried out at temperatures from -190 to +110° C. Rupture energy varies with the material, temperature and the original position of the sample in relation to the rolling direction. 26 ref. (Q6p, 2-61; CN-g, AY-n)

806-Q.* (French.) Cracking and Brittle Fracture of Hydrogen Charged Steel. Paul Bastien. *Materialprufung,* v. 1, Jan. 20, 1959, p. 3-12.

Possibilities of hydrogen absorption by steel in the liquid and solid states. Decrease in the deformability of alpha-steels caused by hydrogen. Steels with a structure of finely distributed spheroidal carbides were found to be less sensitive to hydrogen embrittlement than steels with laminar carbides. 41 ref. (Q26s; ST, *H*)

807-Q. (Italian.) Mechanical Testing. Roberto Allara. *Macchine,* v. 14, Apr. 1959, p. 345-353.

Elastic and tensile properties. (Q27, Q21)

808-Q.* Notch Toughness of Commercial Ship Plate. R. C. A. Thurston. *Canadian Mining and Metallurgical Bulletin,* v. 52, Apr. 1959, p. 245-254.

Results of tear tests and Charpy V-notch impact tests on manganese steel. 12 ref. (Q26s, Q23s, T22g, 2-63; ST-c, *Mn,* 4-53)

809-Q. Mechanical Properties of 17-7 PH and PH 15-7 Mo Stainless steel. Alton Brisbane. Materials Laboratory. *Wright Air Development Center,* Technical Report no. 58-400, Jan. 1959, 31 p.

Tensile stress-strain test results from room temperature to 100° F. Compression and bearing data were also obtained at room temperature. PH 15-7 Mo gives the best elevated temperature ultimate strength through 1000° F. Both materials display approximately the same percent elongation up to 800° F. (Q-general, 2-62; SS)

810-Q. Mechanical Properties of AM350 and AM355 Stainless Steels. Alton W. Brisbane. Materials Laboratory. *Wright Air Development Center,* Report no. 58-672, Feb. 1959, 45 p.

Results of smooth and notched tension tests and compression, bearing, bending and Charpy V-notched impact tests. Several heat treatments were used to determine the effects on mechanical properties. Varying the aging temperatures had some effect on the strength properties and ductility. Best ductility based on elongation and reduction in area was obtained by a -100° F. + 950° F. heat treatment. (Q-general, 2-64, 2-65; SS)

811-Q.* Deformation of Solids at High Rates of Strain. A. H. Cottrell. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 1-12.

Yield and related subjects, such as elastic and plastic waves, temperature and heating effects, crystal slip, dislocation and cracks. 45 ref. (Q24a, Q24j, M26b)

812-Q.* Yield Strength of Steel at an Extremely High Rate of Strain. E. de L. Costello. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain", Institution of Mechanical Engineers, London, SW1, England, 1957, p. 13-21.

High explosive technique for determining yield strength. Results are compared for mild steel and Vibrac. 21 ref. (Q23b, Q10; CN)

813-Q.* Experimental Techniques Developed in Investigations Into High-Speed Yield in Brittle Fracture. T. S. Robertson. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 22-30.

High-speed photographs in conjunction with high-speed wire resistance strain gages placed near or in path of crack, together with photographs taken after fracture, led to new picture of actual mechanism of brittle fracture. (Q26s)

814-Q.* Plane-Strain and Axially Symmetric Velocities and Pressures in Extrusions. E. G. Thomsen. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 77-85.

Determined velocity fields for the inverted extrusion of Pb. Results obtained by incremental techniques using plane-strain and axial-symmetric inverted extrusions at several strain rates. Compared results with theoretical slip-line solutions. 16 ref. (Q24c, F24, 3-74; Pb)

815-Q.* True Stress-Strain Curves for Steel in Compression at High Temperatures and Strain Rates, for Application to the Calculation of Load and Torque in Hot Rolling. P. M. Cook. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 86-97.

Yield stress-strain curves for 12 types of steel at 900-122° C. with strains of $1\frac{1}{2}$, 8, 40 and 100 per sec. Effects of carbon and alloy content, strain rate, temperature. 8 ref. (Q24, F23; CN)

816-Q.* The Effect of High Strain-Rate in Strip-Rolling. D. G. Christopherson and B. Parsons. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 115-121.

Effects of high strain rate on work done per unit volume, hardness, surface roughness and work hardening of Cu, Al and mild steel. 6 ref. (Q24, F23; Cu, Al, CN, 4-53)

817-Q.* Some Strain-Rate Effects in Drop-Forging Tests. H. L1. D. Pugh and M. T. Watkins. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 122-127.

Effects of strain rate on compression of Cu, Pb and Al obtained and dynamic stress-strain relationships determined. Calculated stress-strain agreed with those measured directly. Comparison of static tests showed effects of friction to be small. 10 ref. (Q24, F22n; Cu, Pb, Al)

818-Q.* Effect of Loading History Upon the Yield Strength of a Plain Carbon Steel. Irwin Vigness, J. M. Krafft and R. C. Smith. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 138-146.

Measured yield strength for three different patterns of load application: constant load with superimposed increasing oscilatory loading; load increasing linearly with time; and load suddenly applied and then held constant. Yield is expressed in terms of delay-time which elapses between static upper yield stress and dynamic yield. 22 ref. (Q23b, 3-68; CN)

819-Q.* Delayed Yield and Other Dynamic Loading Phenomena in a Medium-Carbon Steel. J. D. Campbell and J. Duby. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 214-220.

Compression impact tests and measured yield as a function of time. Interpretation of tests based on dislocation theory. Dynamic stress-strain curves for repeated impacts. 10 ref. (Q24, Q28k, Q6; CN-p)

820-Q.* Non-Uniform Yield in a Mild Steel Under Dynamic Straining. D. B. C. Taylor. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 229-238.

Series of tests made on a number of specimens at different impact velocities, stress levels, with straining being continued until nonuniform yielding of gage length. Mean dynamic stress, rate of plastic yielding and permanent set. 10 ref. (Q24; CN)

821-Q.* On the Elastic-Plastic Strain of Steels Under Longitudinal Impact. G. V. Uzhik and J. J. Voloshenko-Klimovitsky. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 239-243.

Equipment and method to determine small elastic-plastic deformation and evaluate resistance of metal to initial yielding under impact. 4 ref. (Q24; ST)

822-Q.* (French.) Hot Hardness. J. Pomey, A. Royez and J. P. Georges. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 215-228.

Application of high-temperature hardness testing machine operating in an argon atmosphere up to 1000° C. with a diamond indenter for the investigation of isothermal transformations as a function of time and for the study of creep. 6 ref. (Q29p, Q3, 1-53, 3-67)

823-Q.* (French.) Scatter of Fatigue Test Results. R. Esquerre. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 260-266.

Various rotating bend fatigue tests were carried out on steel and light metal specimens showing scattered results. In each case the Wohler curves were drawn following statistical analysis by the Henry line method. (Q7c)

824-Q.* (French.) The "Minimum Life" Phenomenon in Fatigue Under Constant of Varying Stresses. A. M. Freudenthal and E. J. Gumbel. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 295-298.

There exists a minimum number of stress reversals capable of producing a fatigue fracture and a fatigue limit observed under varying reversed stresses. The "minimum life" represents a phenomenon characteristic of fatigue under varying stresses and the endurance limit is strongly reduced by the application of such stresses. 5 ref. (Q7, Q26)

825-Q.* (French.) Effect of Notches on Resistance of Steel to Alternate Stresses Under Varying Temperatures. M. Weisz and R. Cazaud. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 299-310.

Changes in notch sensitivity in reverse bending from room temperature to 625° C. In Cr-Mo steel, annealed-quenched-annealed, a rather close relationship exists between notch sensitivity and various parameters calculated from tensile tests. The reduction of fatigue limit is regular in the temperature range up to 400° C. 16 ref. (Q7, Q23s, 2-61; AY, *Cr, Mo*)

826-Q.* (German.) Application of Magneto-Mechanical Effects for High Damping and High-Strength Alloys. Alexander Cochardt. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 203-206.

High damping effect of a steel with 12% Cr, 0.5% Ni and 0.1% C, used for turbine blades, is explained by magneto-mechanical hysteresis. Preparation of a Ni-Co alloy with 35% Ni and small quantities of other elements with a ten times higher damping capacity compared with the commonly used materials. 14 ref. (Q8q; SS, Co-b, *Ni*)

827-Q.* (German.) The Plasticity of Nickel-Cobalt Single Crystals. Joachim Meissner. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 207-217.

Stress-shear strain curves were found for single crystals with 0-40 at.% Co in the temperature range 90 and 295°K. A decrease of temperature affects the curves in a similar manner to an increase of Co concentration. 38 ref. (Q24a, 2-61, 2-60; Ni-b, *Co*, 14-61)

828-Q.* (Russian.) Mechanism of Nucleated Crack Development in Crystals During Plastic Deformation. V. N Kozhanskii. *Doklady Akademii Nauk*, v. 123, no. 4, 1958, p. 648-651.

Cracks are formed along the slip planes during partial dissociation of opposite directions and move in closely spaced parallel planes of slip. Formation also occurs in cases when the slip and

cleavage planes coincide. 18 ref. (Q26p, Q24a)

829-Q.* (Russian.) Effect of Surface-Active Agents on the Surface of Cold Worked Metals. G. I. Epifanov, N. I. Glagolev and P. A. Rebinder. *Doklady Akademii Nauk*, v. 123, no. 4, 1958, p. 663-666.

Kinetics of the formation of a strengthening layer of pure Fe in air and in a medium of stearic acid in decalin. Surface-active agents make the flow of plastic deformation easier during the initial stage of cold working and produce intensive strengthening during subsequent stages of cold working. 8 ref. (Q24a, G-general, 1-67; Fe)

830-Q.* Molybdenum as a Structural Material. Julius J. Harwood. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 1-18.

Effect of alloy and impurity content on high-temperature strength properties, recrystallization temperature, ductility, transition temperature and workability. Resistance of sprayed electroplated, clad or chromized coatings to oxidation. 9 ref. (Q3q, Q5g, Q27j, R1h, 2-60, 2-62; Mo-b, *Ti, Zr, Cb, V,* Re, SGB-s)

831-Q.* Development of Molybdenum Base Alloys. George A. Timmons. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 19-38.

Forging, extrusion and working of vacuum-arc cast ingots, resultant mechanical properties, influence of alloying elements on elevated-temperature tensile properties hardness and ductility. Lattice parameters, recrystallization temperature, variation of hardness with hot working, annealing and testing temperatures. (Q3q, Q27a, Q27n, 2-62, 2-60, F22, F23, F24; Mo-b, *Zr, Ti, Cb, W, V*)

832-Q.* Production and Quality of Molybdenum Mill Products. W. L. Bruckart. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 39-62.

Available sizes and tolerances in bar, plate and sheet of Mo and Mo-0.5 Ti alloys. Mechanical properties, anisotropy and grain structure resulting from hot-cold working. (Q23p, Q27a, M27c; Mo-b, *Ti,* 4-53, 4-55)

833-Q.* Elevated Temperature Relaxation Properties of 17-7 PH Stainless Helical Compression Springs. Mason Clogg, Jr. *Draht (English Edition)*, no. 40, Apr. 1959, p. 31-35.

Effect of final hardening temperatures for 17-7 PH and the stress relieving temperature for 18 Cr-8 Ni on relaxation properties. Data on effect of temperature on the torsional modulus of 17-7 PH, 18 Cr-8 Ni, Inconel "X" and music wire. (Q3, T7c, 2-62; SS)

834-Q.* Analysis of the Mechanics of Cold Strip Rolling. Donald Jortner, J. Fletcher Osterle and Carl F. Zorowski. *Iron and Steel Engineer*, v. 36, May 1959, p. 127-133.

Theory takes into account the elastic deformation of the strip and rolls and the effect of applied tensions as well as the plastic strip deformation. Theory has applications in the investigation of causes of nonuniform strip gage and roll fatigue failure. 12 ref. (Q24, Q7, F23, 1-67; ST, 4-53)

835-Q.* Sag Characteristics of Steel Versus Temperature. Robert F. Patrick. *Porcelain Enamel Institute, Proceedings*. v. 20, 1958, p. 8-12.

Importance of sag resistance in the reduction of cost of enameling by use of lower firing temperatures. 6 ref. (Q-general, L27, 2-61, 17-53; ST)

836-Q.* Loaded Beam Stress Measurement. D. C. Bowman. *Porcelain Enamel Institute, Proceedings*, v. 20, 1958, p. 42-49.

New method of measuring compressive stress developed in porcelain enamels. (Q28; ST, 8-71)

837-Q. Dynamic Tensile Testing Machine. A. M. P. Brookes and J. L. Reddaway. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 31-36.

Machine designed to find energy absorbed in fracturing tensile test specimen at strain rates up to 2400 in. per sec. 6 ref. (Q26, 1-53)

838-Q. Photo-Electric Method of Determining Stress and Strain in Rapidly Strained Metals. P. W. Wright and R. J. Lyon. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 37-50.

Photo-electric method which studies behavior of specimen under dynamic

strain by recording and measuring motion of its interfaces. 19 ref. (Q25, X29q)

839-Q Study of Rapid Micro-Yielding in Mild Steel by Scleroscopic Methods. B. J. Vincent, R. Gee and S. C. Hunter. Paper from "Proceedings of the Conference on the Properties of Materials at High Rates of Strain". Institution of Mechanical Engineers, London, SW1, England, 1957, p. 51-65.

Dynamic indentation techniques for investigating microstrain effects in steel. Results explained in terms of dislocation theory of yielding and Hertz theory of elastic collisions. 16 ref. (Q24, Q6; CN)

840-Q.* New Magnesium Alloy Improves Design of Ramjets. C. P. King. *Modern Metals*, v. 15, May 1959, p. 58, 62, 64-65.

Mechanical properties of HM21A-T8 alloy. Good formability and weldability plus high strength-to-weight ratio at 700-900° F. and excellent resistance to creep. (Q-general, P-general, K9s, T2p; SGA-h, Mg-b)

841-Q. Investigation of the Effects of Impurities and Metallurgical Variables on the Notch Sensitivity of Titanium Alloys. Frank C. Holden, Richard W. Douglass, Horace R. Ogden and Robert I. Jaffee. Batelle Memorial Institute. *Wright Air Development Center*, Technical Report no. 58-438, Dec. 1958, 79 p.

Notch tensile properties of three commercial Ti-base alloys, A11OAT (Ti-5.0 Al-2.5 Sn), Ti-6Al-4V, and Ti-140A (Ti-2Fe-2Cr-2Mo) at six interstitial levels, four microstructural conditions, and over a range of temperature from -196 to 200° C. Notch sensitivity generally was increased by increased interstitial content, low temperature and acicular-type microstructures. (Q23s, Q27a, 3-69, 2-61; Ti-b, *Al, Sn, V, Cr, Mo*)

842-Q. The Influence of Ferrite Banding on the Impact Properties of Mild Steel. W. S. Owen, Morris Cohen and B. L. Averbach. Ship Structure Committee Report no. SSC-114. *National Academy of Sciences, National Research Council*, Oct. 6, 1958, 23 p.

Charpy properties at the lower end of the testing temperature range are not appreciably affected by the degree of ferrite banding, direction of specimen axis or orientation of the notch. Evidence suggests that the fracture appearance is not sensitive to specimen orientation even in a severely banded steel, although notch orientation is a factor. Nonpreferred crystallographic orientation of the ferrite was found. (Q26, Q6; CN)

843-Q.* (German.) Determination of the Service Life of Tools. Henning Siebel. *Industrie-Anzeiger*, v. 81, May 5, 1959, p. 549-554.

Service life of hard metal cutting tools. Geometry of the cutting edge, depth of cut, feed, structure of tool material, structure and strength of material machined and the as yet undetermined effect of the furnace charge on the tool material are significant. 24 ref. (Q9, T6n; EG-d)

844-Q.* (German.) Correlations Between the Mechanical Properties of Castings and Cast Test Pieces. Fritz Iske. *Industrie-Anzeiger*, v. 81, May 12, 1959, p. 583-585.

Computations and nomograms permit determination of mechanical properties of castings by cylindrical test pieces if wall thickness, ratio of surface to volume, and composition are given. 10 ref. (Q27, Q29; CI)

845-Q.* (German.) Spheroidal Graphite Cast Iron. *VDI-Zeitschrift*, v. 101, May 21, 1959, p. 594-595.

Mechanical properties, wear resistance and plasticity as influenced by heat treatment and alloying elements. (Q27, Q29n, Q9n, 2-64, 2-60; CI-r)

846-Q.* (Russian.) Improving Mechanical Properties of Carbon Steels. D. A. Smolyarenko. *Metallurg*, v. 4, Apr. 1959, p. 9-11.

Killed steel after heating and quenching in water has higher mechanical properties than hot rolled killed carbon steel, even though their carbon content is the same. (Q-general, 2-64; CN, ST-c)

847-Q.* (Russian.) Corrosion Fatigue During Bend and Torsion Testing. L. A. Glikman, E. N. Kostrov and V. K. Dobrer. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 456-460.

The fixed ratio that exists between bend and torsion ultimate fatigue, when tests are carried out under corrosive conditions (3% NaCl), varies according to the corrosion resistance of the material involved. (Q1, Q5, R4b, R1e)

848-Q.* Work Softening in Irradiated Copper. M. J. Makin. *Acta Metallurgica*, v. 7, Apr. 1959, p. 233-239.

Temperature dependence of the flow stress of polycrystalline Cu, both unirradiated and after neutron irradiation investigated by repeated tensile testing. Temperature sensitivity of the flow stress is very large during the early stages of the deformation; irreversible effects occur

when the temperature of the deformation is changed. 8 ref. (Q24, 2-67, N7e; Cu)

849-Q.* Room Temperature Deformation Processes in Zirconium. E. J. Rapperport. *Acta Metallurgica*, v. 7, Apr. 1959, p. 254-260.

Single crystals were deformed in tension and compression at room temperature. The only slip system observed was $(10\bar{1}0)$ $(12\bar{1}0)$ with a critical resolved shear stress of about 0.65 kg. per sq. mm. in compression. The active twin planes were $\{10\bar{1}2\}$ $\{11\bar{2}1\}$, $\{11\bar{2}2\}$, and $\{11\bar{2}3\}$. 15 ref. (Q24, M26; Zr, 14-61)

850-Q. High-Temperature Mechanical Properties of Tantalum. David C. Drennen, M. Eugene Langston, Charles J. Slunder and Joseph G. Dunleavy. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1326, Mar. 2, 1959, 32 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Creep and creep-rupture tests performed at 1200° F. in helium on arc cast and sintered rolled Ta sheet to investigate the effect of structure and gaseous contamination on the creep resistance of Ta. The highest creep resistance is found in a fine-grained sintered material which had been degassed 20 to 60 min. at 4500 to 4650° F., cold rolled to an 80% reduction, and then recrystallized 10 to 15 min. at about 2800° F. prior to creep testing. (Q3, 2-62; Ta, 4-53)

851-Q.* (Russian.) Brittle Failure of Metals. V. I. Sappak. *Uspekhi Fizicheskoi Khimii*, v. 67, no. 2, 1959, p. 349-361.

Theoretical strength of metals; Griffith's theory of rupture; dislocation theory of rupture; effect of temperature on yield point; steel structures and susceptibility to brittle rupture. Distribution of cracks and crevices. 78 ref. (Q3q; ST)

852-Q.* The Role of Boron in Cast Austenitic Alloys. R. Wayne Kraft, Jr., and R. A. Flinn. *American Society for Metals, Transactions*, v. 52, Preprint no. 133, 1959, 34 p.

Structures and mechanical properties at 70 and 1500° F. of as-cast and heat treated 18% Ni—20% Cr steels containing up to 2% B. Influence of boron and interpretation of effects. 28 ref. (Q-general, M26r, M27b, 2-60, 2-62; SS-e, B)

853-Q.* The Effect of Grain Size on the Tensile Properties of High-Purity Molybdenum at Room Temperature. A. A. Johnson. *Philosophical Magazine*, v. 4, Feb. 1959, p. 194-199.

Room temperature tensile properties for polycrystalline Mo specimens with grain diameters varying from 0.03 to 0.26 mm. Estimation of effective surface energy for fracture. 6 ref. (Q27a, 2-59; Mo-a)

854-Q.* The Fatigue of Metals at 1.7° K. R. K. MacCrone, R. D. McCammon and H. M. Rosenberg. *Philsophical Magazine*, v. 4, Feb. 1959, p. 267-268.

Fatigue behavior of Cu and Cd between 20.4 and 1.7° K. (Q7a, 2-63; Cd, Cu)

855-Q.* The Deformation of Lithium, Sodium and Potassium at Low Temperatures; Tensile and Resistivity Experiments. D. Hull and H. M. Rosenberg. *Philosophical Magazine*, v. 4, Mar. 1959, p. 303-315.

Tensile tests on Li, Na and K at temperatures down to 4.2° K. Change in electrical resistivity during deformation at 4.2 and 20° K. Martensitic transformation of Li and Na on cold work at low temperatures. 8 ref. (Q27a, Q24m, N6q, P15g, 2-63; K, Na, Li)

856-Q.* Thermally Activated Glide in Face-Centered Cubic Metals and Its Application to the Theory of Strain Hardening. Z. S. Basinski. *Philosophical Magazine*, v. 4, Apr. 1959. p. 393-432.

Influence of temperature down to 1.7° K. and strain rate on the flow stress of polycrystalline Al and single crystals of Al, Cu and Ag. Changes in flow stress resulting from thermally activated surmounting of barriers by glide dislocations. Main types of barriers, distances and forces between dislocations and obstacles. 37 ref. (Q24, Q27a, N7e, 2-63; Al, Cu, Ag, 14-61)

857-Q.* Some New Yield Phenomena in Molybdenum. A. A. Johnson and D. E. Peacock. *Philosophical Magazine*, v. 4, Apr. 1959, p. 528-530.

Load elongation curves of Mo tensile specimens during prestraining treatment and on retesting after annealing. (Q24c, Q27a, 2-64; Mo-k)

858-Q. The Effect of a Brittle Case on the Notched Impact Transition of Unirradiated and Irradiated Steel. D. Hull. *United Kingdom Atomic Energy Authority*, AERE M/R 2432, Nov. 1957, 8 p.

Notched impact specimens with a brittle layer on the outside, produced by nitriding, tested after neutron irradiation. Irradiation raises the transition temperature by 15° C. but does not affect the energy required to propagate a fast running

crack. Specimens with a nitride layer give a sharp transition so that the effect of irradiation on the transition temperature can be determined accurately. (Q26q, 2-67; CN)

859-Q. Lead-Lithium Shielding Alloy—Metallurgical Studies. D. H. Hanse, E. E. Hoffman and D. M. Shepherd. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2404, Mar. 23, 1959, 20 p.

Mechanical property tests conducted on a Pb-Li alloy and results compared with those for a Pb-6% Cu alloy. The Pb-Li alloy has superior strength at room temperature but the Pb-Cu alloy has superior creep strength at 110° C. Results indicate that at 110° C. the Pb-Li oxidizes more rapidly than pure Pb. (Q-general, Q3; Pb-b, *Li, Cu*)

860-Q.* Effect on Fatigue Strength of Internal Defects in Welded Joints: A Survey of the Literature. H. P. Newman. *British Welding Journal,* v. 6, Feb. 1959, p. 59-64.

Influence of slag inclusions, internal cracks, porosity, lack of fusion and penetration in butt welds in mild steel plate. 9 ref. (Q7; CN-g, 4-53, 7-51, 9)

861-Q.* Effects of Hydrogen in Wrought Steel and in Ferrous Weld Metal. P. D. Blake and W. I. Pumphrey. *British Welding Journal,* v. 6, May 1959, p. 211-224.

Effects of hydrogen on mechanical properties of steel and weld metal. Effects of hydrogen are qualitatively similar, apparent differences being largely due to inherent difference in microstructure and composition of weld metal and wrought steel. 67 ref. (Q26s; ST, *H,* 7-51)

862-Q.* Radiation Damage in Ferrous Materials. R. E. Smallman. *Iron & Steel,* v. 32, May 1959, p. 175-180.

Effect of neutron irradiation on the mechanical properties of pure iron, ferritic and austenitic steels. The problem of brittle fracture is concerned in terms of the increase in yield stress irradiation. Evidence indicating the structure of irradiation damage and mechanism of radiation hardening is also discussed, together with the recovery behavior of subsequent annealing. 18 ref. (Q-general, 2-67; Fe-a, SS)

863-Q.* (Czech.) New Method of Brittleness Testing. Vladimir Koselev. *Hutnicke Listy,* v. 14, May 1959, p. 409-415.

Relationships between impact strength, testing temperature and composition. Graphs show results of tests with steels containing varying amounts of Mn, Si, Al and Ni. (Q26s, Q6n; AY, *Mn, Si, Al, Ni*)

864-Q.* (Czech.) Properties of Heat Resistant Cr-Mo-W-V-Steels. Richard Pokorny. *Hutnicke Listy,* v. 14, May 1959, p. 442-448.

Tensile tests; micrographs of steels with various compositions. The flow limit is influenced unfavorably by too high Cr content, while hot strength is improved by an adequate vanadium content. Effects of austenitization temperature, cooling rate and annealing temperature. 14 ref. (Q27a, Q27c, 2-60, 2-64; CN, SGA-h, *Cr, Mo, W, V*)

865-Q.* (German.) Cast Alloy "Alzen 305". *Giesserei-Praxis,* no. 9, May 10, 1959, p. 176-177.

Mechanical and physical properties of a Al-Zn-Cu alloy used in the casting of bushings, bars and bearings. (Q-general, P-general; Al-b, *Cu, Zn*)

866-Q.* (Polish.) Some Functions of the Theory of Plasticity. Feliks Tychowski. *Archiwum Hutnictwa,* v. 4, no. 1, 1959, p. 3-43.

Data are applied to the quantitative deformation of errors resulting from an improper expression of strains. 17 ref. (Q23)

867-Q.* (Polish.) Metal Flow and Structural Phenomena in Hot Rolling With High Draught. Zygmunt Wusatowski and Bronislaw Hoderny. *Archiwum Hutnictwa,* v. 4, no. 1, 1959, p. 63-80.

Steel specimen were drilled and filled with steel rods of similar chemical composition and after heating to 1150° C. and 60, 70, 80 and 90% rolling were tested by X-rays. The deformation caused considerable reduction in the grain size. Strain hardening on external surfaces resulting from cooling effect of rolls were observed. 4 ref. (Q24g, F23; ST)

868-Q. (Czech.) The Lenin Steel Mills in Plzen (Czechoslovakia) and Their Research Program. Ladislav Jenicek. *Hutnicke Listy,* v. 14, May 1959, p. 369-391.

Hot strength testing methods; wear tests; physical and mechanical property tests; metallography. 212 ref. (Q-general, P-general, 1-54)

869-Q. (German.) LOS—Fatigue Testing Equipment. Thiele. *Draht*, v. 10, Apr. 1959, p. 160.
(Q7, 1-53)

870-Q. (German.) New Types of Malleable Cast Iron. W. Finger. *Industrie-Anzeiger*, v. 81, May 12, 1959, p. 588-589.
Microstructure and mechanical properties. (Q27a, Q29, M27; CI-s)

871-Q. (Russian.) Dynamic Testing of Geometrically Similar Samples at Low Temperatures. O. F. Stankevich and Yu. E. Bondarev. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 470-472.
In some cases of dynamic testing for impact strength, a departure from standardized shape samples to geometrically similar samples, smaller in size, is recommended at low temperature (+5 and +23° C.) testing. (Q6, 3-73)

872-Q. (Russian.) Electrical Method to Determine Modulus of Elasticity "E". Yu. D. Safronov. *Zavodskaya Laboratoriya*, v. 25, Apr. 1959, p. 472-474.
Electrical device determines Young's modulus of elasticity when the tested sample is used as a cantilever beam. (Q21a)

873-Q. Friction and Wear of Refractory Compounds. K. P. Zeman and L. F. Coffin, Jr. General Electric, Atomic Products Div. *U. S. Atomic Energy Commission*, APEX-454, Apr. 1958, 54 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.
Refractory compounds were investigated as bearings with the possibility of employing liquid metals as lubricants for these materials. Several couples were found which show promise of sliding successfully at temperatures as high as 2000° F. in air. These couples include MgO-SiO_2, MgO-Al_2O_3, Al_2O_3-TiC and SiC-TiC. 9 ref. (Q9n, Q9p, T7d; Mg, Si, Al, Ti, NM-a34)

874-Q.* (Russian.) Fatigue Strength of Heat Treated Rail Heads Containing Arsenic. L. L. Pinkhusovich, R. S. Mar'yanovskaya and Z. G. Fridman. *Stal'*, Apr. 1959, p. 360-363.
Hardening rail heads containing As in water or oil, with careful adherence to optimum conditions, increases their fatigue strength. Quenching in water produces a higher strength than quenching in oil. 6 ref. (Q7a, J26; ST, *As*)

875-Q.* (Russian.) Improving the Mechanical Properties of Reinforcing Steel Bars by Heat Treatment. E. S. Tovpenets, N. I. Goncharenko, A. S. Babit and G. Z. Shcherbina. *Stal'*, Apr. 1959, p. 364-367.
Mechanical properties of low-carbon structural steel ST-5 may be considerably improved by hardening it immediately after rolling (at the temperature of the last rolling pass) followed by tempering. 6 ref. (Q-general, 2-64; CN-g)

876-Q.* Note on the Predication of Relaxation Stress-Time Curves From Static Tensile Test Data. A. E. Johnson, J. Henderson and V. D. Mathur. *Metallurgia*, v. 59, May 1959, p. 215-220.
Static and creep relaxation tests on a Mg alloy at 20° C. Test results provide no evidence for the existence of a mechanical equation of state for this material and indicate that a reasonably close prediction of relaxation stress-time curves from static tensile test data is not possible. 14 ref. (Q3a; Mg-b)

877-Q.* The Low-Temperature Mechanical Properties of Some Cast Stainless Steels. G. Mayer and K. Balajiva. *Metallurgia*, v. 59, May 1959, p. 221-226.
Tensile properties are inferior to those of corresponding types of wrought steel but the cast materials provide good ductility values at low temperatures. At all temperatures the impact values of the cast stabilized steels, and at low temperatures those of the nonstabilized steels, are higher the lower their carbon content. 5 ref. (Q-general, 2-63; SS, 5-60)

878-Q.* Unusual Fracturing of Hard-Drawn High-Conductivity Copper Strand. Clement Blazey. *Metallurgia*, v. 59, May 1959, p. 237-240.
Fracturing of stranded Cu conductor in the interval between lagging the drums at the completion of stranding and opening them for use. Causes of fracturing are correlated with types of wood used for the drums and corrosion data. (Q26, R-general; Cu, 4-61)

879-Q.* (German.) Unalloyed Steel Testing in Various Gases. Max Hempel, Albert Kochendoerfer and Alfons Tietze. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 211-218.
Influence of air, oxygen, nitrogen, hydrogen and argon on tensile strength, compressive strength, resistance to alternating stresses and surface conditions of CK10 steel. 19 ref. (Q27, Q28, Q7; ST)

880-Q.* (German.) Failure Mechanism of Steels Subject to the Action of Water Containing H_2S. Friedrich Karl Naumann and Wolfhard Carius. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 233-238.

Long-time bending tests were performed on carbon steel, stainless, Cr, Cr-Mo and Cr-Mo-Ni steels of various chemical composition and after various treatments, while the samples were exposed to the action of water containing hydrogen sulphide. There exists a hyperbolic relationship between the endurance on one side and the tensile stress in the extreme fiber and the hardness on the other side. No failure occurs as long as the product of hardness and tensile stress does not surpass a limit. Differences in composition and structure of samples do not affect the endurance as long as the hardness stays the same. 26 ref. (Q10, Q26; SS, CN)

881-Q.* (German.) Effect of Heat Treatment on Some Properties of Corrosion Resistant Nickel-Molybdenum Alloys. Karl Bungardt and Hans Hermann Weigand. *Zeitschrift fur Metallkunde*, v. 56, Jan. 1959, p. 11-18.

Heat treatment effects on microstructure, hardness, strength and corrosion resistance. (Q-general, R-general, 2-64; Ni-b, *Mo*, SGA-g)

882-Q.* Copper in Cast Iron. Albert de Sy. *Modern Castings*, v. 35, June 1959, p. 41-48.

Effects of Cu additions to gray iron castings. Improves crystal structure, strength and hardness properties, machinability and wear resistance. 10 ref. (Q-general, G17k, M26, 2-60; CI-n, *Cu*)

883-Q. Influence of Prolonged Service at Elevated Temperatures and Pressures on the High-Temperature Strength of Chromium-Molybdenum Alloy Tubing. John F. Ewing. *American Petroleum Institute, Proceedings*, v. 38, no. 3, 1958, p. 122-138.

Creep-rupture tests conducted with longitudinal coupon specimens machined from the walls of four 5% Cr, ½% Mo alloy furnace tubes retired from service after periods ranging from 44,000 to 115,000 hr. (Q3m, 2-62; SGA-h, *Cr, Mo*)

884-Q. Investigation of the Impact Properties of Vessel Steels. F. B. Hamel. *American Petroleum Institute, Proceedings*, v. 38, no. 3, 1958, p. 239-257.

Relative merits of A285, A212, A201, A204 and A283 steels. (Q6r; SS, SGA-h)

885-Q. Investigation of Deformation in Armco Iron by Means of Internal Fraction at Megacycle Frequencies. W. J. Bratina. *Canadian Journal of Physics*, v. 37, May 1959, p. 579-590.

5 ref. (Q24, Q22; Fe-a)

886-Q. Relation Between the Critical Alternating Propagation Stress and Crack Length for Mild Steel. N. E. Frost. *Chartered Mechanical Engineer*, v. 6, May 1959, p. 201-203.

(Q26q, 3-66; CN)

887-Q. Effect of Stress Reduction on Secondary Creep of Mild Steel. Toshio Nishihara, Shuji Taira, Kichinosuke Tanaka and Kiyotsugu Ohji. *Japan Society of Mechanical Engineers, Bulletin*, v. 2, no. 5, 1959, p. 102-107.

The transient behavior of 0.14% carbon steel studied at 450° C. Strain rate after partial reduction of stress was found smaller than the true steady creep rate for the reduced stress; however, it gradually increased with time and appeared to tend to the steady creep rate. 6 ref. (Q3; CN-g)

888-Q. Fatigue Tests of Metals at Ultrasonic Frequency. Jobu Awatani and Hiroshi Miyamoto. *Japan Society of Mechanical Engineers, Bulletin*, v. 2, no. 5, 1959, p. 111-115.

Testing equipment and measurements of the fatigue of metals under supersonic frequency. 4 ref. (Q7, 1-74)

889-Q. (English.) Wear of Carbon Steel Weld Metal. Pt. 1. Microscopical Observations of the Structural Changed Layers of the Worn Surface. Sukemitu Ito, Kozo Honda and Kikuzo Ishiyama. *Journal of Mechanical Laboratory of Japan*, v. 4, no. 2, 1958, p. 49-56.

See item 116-Q, 1959. (Q9p, M27; CN, 7-51)

890-Q. (English.) Indentation Hardness Testing on Copper. Shigehiko Yazawa, Masao Unno, Go Yaguchi and Iwakichi Sawano. *Journal of Mechanical Laboratory of Japan*, v. 4, no. 2, 1958, p. 57-59.

See item 117-Q, 1959. (Q29b; Cu)

891-Q. Influence of Order-Disorder on Creep of a Superlattice Alloy. *Physical Society of Japan, Journal*, v. 14, Apr. 1959, p. 463-472.

25 ref. (Q3, N10)

892-Q. (English.) The Workability of Cast Iron With Spheroidal Graphite. Chang Tso-Mei, Shu U-Yung and Gau Tze-Ming. *Scientia Sinica*, v. 8, no. 1, 1959, p. 110-131.

Tensile, compression, Charpy impact, impact tensile, twisting, upsetting tests used to determine workability. (Q23q, Q-general; CI-r)

893-Q. Boron and Zirconium From Crucible Refractories in a Complex Heat-Resistant Alloy. R. F. Decker, John P. Rowe and J. W. Freeman. *U. S. National Advisory Committee for Aeronautics,* Report no. 1392, 1958, 38 p.

Creep-rupture properties at 1600° F. and hot workability of ingots were improved in proportion to the increase in trace amounts of Zr derived from reaction of the melt with zirconia crucible. 49 ref. (Q3m, E10, 2-60, 2-62; SGA-l, 5-59, *Zr, B*)

894-Q. (Russian.) Anisotropy in the Strength of Structural Materials. E. K. Ashkenaze. *Zhurnal Tekhnicheskoi Fiziki,* v. 29, Mar. 1959, p. 374-380.

Computations on the influence of rolling direction on the strength properties of Al and steel. 9 ref. (Q27a; Al, ST)

895-Q. (Japanese.) Properties of Nodular Cast Steel. M. Homma, H. Meguro, A. Minato and Y. Abe. *Japan Foundrymen's Society, Journal,* v. 31, Jan. 1159, p. 9-19.

This type of steel is less affected by careless selection of materials, and has better mechanical properties than that of ductile cast iron or malleable cast iron especially in tensile strength, impact value and fatigue limit, and has far better castability than cast steel and ductile cast iron (Q-general; ST, 5)

896-Q. Effect of Specimen Taper on Determination of Elongation in the Tension Test. Eric B. Kula and Frank R. Larson. *ASTM Bulletin,* no. 238, May 1959, p. 58-61.

A difference of 1% in diameter between the center and ends of the gage length section of round tension. Specimens may lead to local strain differences of over 30%. 8 ref. (Q27, Q23p, 1-60, 3-73)

897-Q. Press-Fit Test Picks Solid Lubricants for Extreme Pressures. A. Sonntag. *Product Engineering (Design Issue),* v. 30, June 22, 1959, p. 64-66.

Determining the coefficient of friction when surfaces slide at high loads and low velocities. (Q9p, 1-53; NM-h)

898-Q. (Russian.) Radiation Effect on Bodies. Yu. N. Solursii. *Atomnaya Energiya,* v. 6, Apr. 1959, p. 403-424.

Steel and structural materials.. 25 ref. (Q-general, 2-67; ST, SGB-s)

899-Q. Physical and Mechanical Properties of Molybdenum and the Mo-0.5% Ti Alloy. *Defense Metals Information Center,* Memorandum no. 14, Apr. 10, 1959, 21 p.

Physical properties in relation to high-temperature applications. Tensile, impact and fatigue properties, creep and stress-rupture over a wide range of temperatures. 18 ref. (Q-general, P-general, 2-62; Mo-b, *Ti*)

900-Q. Mechanical and Physical Property Data on Modified 21% Chromium Martensitic Sheet Steels for Airframe Applications. *Defense Metals Information Center,* Memorandum no. 15, Apr. 18, 1959, 50 p.

Compilation of properties of U. S. Steel 12MoV and Crucible 422. Data on tensile, impact, compressive, fatigue and creep-rupture tests. (Q-general, 2-62; SS-c, 4-53)

901-Q.* (Japanese.) Metal Flow in Forging. Taikichi Awano and Masao Ochiai. *Governmental Industrial Research Institute, Nagoya, Report,* v. 6, Jan. 1957, p. 10-17.

Study of the mechanical properties of plasticine, since its plastic flow is analogous to that of mild steel during forging. Stress-strain relationship, shearing strain, coefficient of friction for various loads, roughness and effects of lubricants; comparison of similar results for mild steel in hot forging. (Q23, F22, 17-52; CN)

902-Q. (Pamphlet.) Kinetics of Deformation and Fracture. S. R. Valluri. Guggenheim Aeronautical Laboratory, California Institute of Technology. Apr. 15, 1959, 15 p.

High-speed camera operating at 70,000 frames per sec. permits observation of fracture in single crystals. (Q26; 14-61)

903-Q. (Book.) Symposium on Basic Mechanisms of Fatigue. 121 p. 1958. American Society for Testing Materials, STP no. 237, 1916 Race St., Philadelphia 3, Pa. $3.75.

Papers abstracted separately. (Q7, Q26p, Q24c, M26b)

904-Q. (Book.) Proceedings of the Conference on the Properties of Materials at High Rates of Strain. 268 p. 1957. Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, SW1, England.

Papers abstracted separately. (Q-general)

905-Q. (Book.) Symposium on Radiation Effects on Materials. v. 3, 164 p. 1958.

American Society for Testing Materials, STP no. 233, 1916 Race St., Philadelphia 3, Pa. $4.25.

Pertinent papers abstracted separately. (Q-general, 2-67)

906-Q.* (Translation—AIP.) Influence of Deformation Conditions on the Mechanism of the Formation of Slip Bands. E. V. Kolontsova and I. V. Telegina. *Soviet Physics, Crystallography*, v. 2, no. 5, 1958, p. 648-652.

Study by an X-ray method of the structure of the slip bands in Sn monocrystals deformed by stretching. 8 ref. (Q24c, 3-68; Sn, 14-61)

907-Q. (Translation—Brutcher no. 4506.) Effect of Hydrogen on Structure and Properties of the Industrial Titanium Alloys VT 2, VT 3, and VT 3-1. S. T. Glazunov, I. I. Kornilov and A. M. Yakimova. *Izvestiya Akademii Nauk SSSR*, June 1958, p. 30-36.

See item 260-Q, 1959. (Q26s; Ti-b, H)

908-Q. (Translation—ConBur.) Deformation Systems of Alpha-Zirconium. Iu. N. Sokurskii and L. N. Protsenko. *Soviet Journal of Atomic Energy*, v. 4, May 1958, p. 579-582.

Deformation systems of alpha-Zr iodide studied in coarse-grained polycrystalline specimens deformed by upsetting. 6 ref. (Q24; Zr)

909-Q.* Residual Stresses in Titanium Carbide-Nickel Cermets. H. W. Newkirk, Jr., and H. H. Sisler. *American Ceramic Society, Journal*, v. 42, June 1959, p. 306-309.

New experimental evidence qualitatively confirms the conclusion that the Ni phase in a titanium carbide-nickel cermet is under considerable tension due to cooling stresses, and indicates that the compressive and extensive stresses in the Ti carbide phase are of approximately equal magnitude, since there is no resultant displacement of the diffraction lines. (Q25h; 6-70, 6-69, Ti, Ni, C)

910-Q.* A Technique for Thermal-Shock and Thermal-Fatigue Testing Based on the Use of Fluidized Solids. E. Glenny, J. E. Northwood, S. W. K. Shaw and T. A. Taylor. *Institute of Metals, Journal*, v. 87, June 1959, p. 294-302.

Laboratory test for studying the behavior of materials under conditions of transient thermal stress, such as may be encountered by the turbine blading of a gas-turbine engine. The most suitable testing technique is by immersion of the test specimen in a bed of powdered refractory substance supported on a permeable plate and fluidized by a stream of air. 18 ref. (Q7j, Q10a, 1-54)

911-Q. (Russian.) Effect of Chemical Composition and Cooling Rate on the Wear Resistance of Gray Cast Iron. N. V. Ivanov. *Liteinoe Proizvodstvo*, Apr. 1959, p. 35-37.

Depending on ferritic, pearlitic or pearlitic-cementite structure, wear resistance of gray iron castings is affected by carbon and silicon content in the first two groups and by combined carbon content in the third group. Wear resistance properties depend also on solidification under conditions of overcooling during crystallization. (Q9n, N12, 2-60; CI-n, *C, Si*)

912-Q. (Russian.) Effect of Minor Vanadium, Tungsten and Boron Additions on the Structure and Mechanical Properties of NAMts 12-9-2 Bronze. A. V. Kurdyumov and K. I. Akimova. *Liteinoe Proizvodstvo*, May 1959, p. 26-28.

Small amounts of vanadium (0.150 to 0 0.175%) in this bronze alloy increased its tensile strength and yield point and decreased relative elongation. Annealing at 600-700° C. raised the tensile strength and yield point still higher and further reduced elongation. Tungsten has practically no effect on mechanical properties, and boron, apart from reducing the relative elongation, has no other effect. Vanadium causes a change in the microstructure in that the dendrite form of beta phase disappears. 4 ref. (Q-general, M27, 2-60, 2-64; Cu-s, *V, W*, B)

913-Q.* Mechanical Properties of 17-4PH. F. Kenneth Iverson. *Precision Metal Molding*, v. 17, June 1959, p. 25-26.

Results of limited tensile testing show that best combination of tensile strength and ductility results from a 1-hr. aging at 900 to 950° F. Cb additions prevent loss of properties due to overaging. (Q27a, 2-60, 2-65; SS, *Cr, Ni, Cb, Cu*)

914-Q.* (French.) Influence of Hot Working on Properties of A-U4SG Aluminum Alloy. Pt. 2. Roger Develay. *Revue de l'Aluminum*, v. 36, Mar. 1959, p. 315-322.

Influence of forging conditions, rolling, forming, homogenization, aging and working on fatigue limit and elongation. Tensile properties. (Q-general, F22, F23, G-general, 2-64; Al-b)

915-Q. Wear of Grinding Wheels. J. Koloc. *Microtecnic*, v. 13, Feb. 1959, p. 12-15.

(Q9n, W25c)

916-Q. (Japanese.) Fatigue and Dynamic Creep Properties of 13% Cr Steel at Elevated Temperature Under Combined Stresses of Static Tension and Alternating Bending. Shuji Taira, Kichinosuke Tanaka, Ryoichi Koterazawa and Mutsuo Inaue. *Japan Society of Mechanical Engineers, Transactions,* v. 25, Mar. 1959, p. 148-155.

Fatigue and dynamic creep tests made under simulated service conditions of turbine blades (i.e., combined stresses of static tension and alternating bending at elevated temperature of 450° C.) 10 ref. (Q3, Q7, 2-62; SS)

917-Q. (Japanese.) Creep of Mild Steel Under Periodic Stresses. Shuji Taira, Kichinosuke Tanaka, Kiyotsugu Ohji and Isao Harumato. *Japan Society of Mechanical Engineers, Transactions,* v. 25, Mar. 1959, p. 155-162.

Creep tests made with 0.14% carbon steel at 450° C. under changing stress levels. (Q3, 2-62; CN-g)

918-Q. (Japanese.) Dynamic Creep Characteristics of Low-Carbon Steel at Elevated Temperatures. Shuji Taira, Kichinosuke Tanaka, Ryoichi Koterazawa, Hideki Tanaka and Yoshiyuki Fujita. *Japan Society of Mechanical Engineers, Transactions,* v. 25, Mar. 1959, p. 163-169.

Rupture and dynamic creep tests made on annealed low-carbon steel at 450° C. 17 ref. (Q3, 2-62; CN-g)

919-Q. (Japanese.) Effect of Combined Alternating Bending and Torsional Stress on the Hardness of Low-Carbon Steel. Zenji Ando, Yozo Kato, Masao Iwata and Takeomi Hasegawa. *Japan Society of Mechanical Engineers, Transactions,* v. 25, Mar. 1959, p. 170-174.

A hardness change noted halfway between the pure plane bending and pure torsion. (Q29, Q5, 3-66; CN-g)

920-Q. (Japanese.) Thermal Characteristics of Metal Wear. Toshio Sata. *Japan Society of Mechanical Engineers, Transactions,* v. 125, Mar. 1959, p. 227-234.

Wear varies according to the temperature of the rubbing surface. (Q9n, 2-61)

921-Q.* (Russian.) Effect of Straightening on Properties of Rails (Type P-65). L. M. Shkol'nik. *Stal',* v. 19, May, 1959, p. 451-456.

Cold straightening of high-carbon heavy steel rail with 0.73% C increased the proportional limit and yield point and to a degree the tensile strength, but decreased the relative elongation. Impact strength remained unchanged. 7 ref. (Q-general, 3-68; CN-r)

922-Q.* Molybdenum in Alloy Steel Castings. G. French and B. H. C. Waters. *Alloy Metals Review,* v. 9, Mar. 1959, p. 2-11.

In the low-alloy steels Mo increases hardenability, toughness and creep resistance and reduces temper brittleness, while in high-alloy steels its use is more specific, as in replacing tungsten in toolsteels and improving corrosion resistance of austenitic stainless steels in certain environments. 15 ref. (Q-general, 2-60, R-general; AY, SS, 5, 17-57)

923-Q.* (Russian.) Effect of Production Processing on Properties of KH25N20 Steel. M. I. Vinograd and B. H. Lyubinskii. *Stal',* v. 19, May 1959, p. 448-451.

Elastic properties of KH25N20 alloy steel electrodes during high-temperature welding are not affected by carbon within the 0.06-0.25% range. Properties are somewhat lessened when Si is increased from 0.4 to 1.0%. 5 ref. (Q21, W29h; AY)

924-Q.* New Developments in Metals and Ceramics for High Temperature Service (Above 1000° F.) Julius J. Harwood. *American Society of Mechanical Engineers,* Paper no. 59-MD-2, 1959, 12 p. $.80.

Comparative evaluation of materials with respect to their high-temperature capabilities, potentialities and limitations. (Q27a, 2-62; SGA-h, 6-70, ST, Mg-b, Al-b, Ti-b, Ni-b, Co-b, Cb-b, Cr-b, Ta-b, Mo-b, W-b, Be-b, SS)

925-Q.* Relations Between the Notch Tensile Strength of Cylindrical and Prismatic Specimens of Titanium Alloys and Heat-Treated Steels. G. Sachs, J. G. Sessler, R. F. Pray and T. H. Yeh. *American Society of Mechanical Engineers,* Paper no. 59-MET-2, 1959, 10 p.

Notched tensile strength of 4340 steel heat treated to various strength levels and of Ti alloys 6 Al-4 V and 5 Al-1.5 Fe-1.4 Cr-1.2 Mo. Effects of notch geometry, specimen shape, type of loading, material history and test temperature. 31 ref. (Q23s, Q27a, Q3q, 1-60, 2-61; AY, Ti-b, *Al, V, Fe, Cr, Mo*)

926-Q.* Nonmetallic Inclusions and Fracture Behavior of Steels. S. Yukawa. *American Society of Mechanical Engineers,* Paper no. 59-MET-10, 1959, 6 p.

Influence of nonmetallic inclusions in plain and notched specimens on room-temperature fracture and fatigue properties of Ni-Mo-V steel and high-temperature rupture properties of Cr-Mo-V steel. 6 ref. (Q26, Q7a, Q3q, 2-61; AY, *Cr, Mo, V, Ni,* 9-69)

927-Q.* Effect of Wall Thickness on Stress-Rupture Life of Tubular Specimens. J. T. Tucker, Jr., E. E. Coulter and L. F. Kooistra. *American Society of Mechanical Engineers,* Paper no. 59-MET-11, 1959, 9 p.

Stress-rupture properties of carbon steel, 2¼Cr-1-Mo alloy steel and Type 321 stainless steel in tubular forms stressed by internal pressure at 850-1200° F. (Q3q, 2-62, 3-73; AY, SS, CN-g, *Cr, Mo*)

928-Q.* Report of Project SP-4 to Steam Power Panel of the ASME-ASTM Joint Committee on the Effect of Temperature on the Properties of Metals. John S. Worth. *American Society of Mechanical Engineers,* Paper no. 59-MET-12, 1959, 13 p. $.80.

Results of short-time tensile tests at 70 to 1000° F., creep and creep rupture tests at 800 to 1000° F. on SA 212 Grade B steel plate. Effect of welding. (Q27a, Q3m, Q3q, 2-62, 2-64; ST, 4-53, 7-51)

929-Q.* Notch Rupture Strength of Type 347 Heat Affected Zone. R. J. Christoffel. *American Society of Mechanical Engineers,* Paper no. 59-MET-13, 1959, 11 p. $.80.

Notch rupture tests at 1100-1200° F. on weldments in both as-welded and solution heat-treated conditions. Hardness and microstructures. Relation of notch rupture strength to service cracking in weld joints. 9 ref. (Q3m, Q3q, Q23s; SS-e, 7-51)

930-Q.* Creep Rupture Tests for Design of High-Pressure Steam Equipment. E. A. Davis. *American Society of Mechanical Engineers,* Paper no. 59-MET-14, 1959, 12 p. $.80.

Creep rupture tests on tubular specimens of Type 316 stainless steel at temperatures of 1200° F. and pressures of 24,000 psi. Tests with pure internal pressure and with equal bi-axial tension. Comparison with results of uni-axial tension tests. (Q3m, Q3n; SS, 4-60)

931-Q.* The Influence of Surface Residual Stress on Fatigue Limit of Titanium. E. C. Reed and J. A. Viens. *American Society of Mechanical Engineers,* Paper no. 59-PROD-1, 1959, 4 p. $.80.

Correlation between endurance limit and surface residual stress for 6 Al-4 V Ti alloy with stresses introduced into surface by various grinding procedures and wet blasting with glass beads. 6 ref. (Q7a, Q25h, L10c, G18k; Ti-b, *Al, V*)

932-Q.* Early Detection of Fatigue in Metal Alloys by Ultrasonics. Karl Sittel. *Nondestructive Testing,* v. 17, May-June 1959, p. 165-171.

Fundamental aspects of fatigue; causes of attenuation of ultrasonic wave energy in metals; possible applications of acoustical methods to the detection and measurement of dislocations during early stages of fatigue. 26 ref. (Q7, Q21f, 1-74)

933-Q.* Yield Point Phenomena in Alpha Brass and Other Face-Centered Cubic Metals. G. F. Bolling. *Philosophical Magazine,* v. 4, May 1959, p. 537-559.

Characteristics of yield points which may be produced in a 70:30 alpha brass at several temperatures. Effects arising from aging under stress are compared with experiments on repeated yielding. Results in brass are supplemented by experiments on Ag, Al, Ni and Pb. 18 ref. (Q24c, 2-65, 3-66; Cu-n, Ag, Al, Ni, Pb)

934-Q.* On the Release of Cold-Work in Cadmium in Terms of Mechanical Properties. R. Kamel and E. A. Attia. *Philosophical Magazine,* v. 4, May 1959, p. 644-653.

Three principal recovery processes were investigated by isothermal internal friction and elasticity measurements on heavily cold worked Cd samples annealed at various temperatures up to 280° C. The first recovery process is room-temperature recovery and was observed immediately after shear deformation. The second process occurred after annealing below the recrystallization temperature at about 150° C., the third was observed above 150° C. 21 ref. (Q22n, N4; Cd)

935-Q.* Temperature Dependence of Fractional Velocity Changes in a Silicon Single Crystal. F. Stein, N. G. Einspruch and R. Truell. *Journal of Applied Physics,* v. 30, June 1959, p. 820-825.

Measurements were carried out as a function of frequency from 10 to 170 mc/sec. for compressional wave propagation along the [100] axis of Si over a temperature range of -60° + 15° C. No frequency dependence was found. 6 ref. (Q21e, Q24j, 2-61; Si, 14-61)

936-Q. Preliminary Experiments on Irradiation Cycling and Partial Beta-Phase Irradiation of Uranium. J. H. Kittel. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5712, Apr. 1959, 21 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Both highly textured material (300° C. rolled) and nominally randomly oriented material (300° C. rolled and beta-quenched) were studied. Irradiation cycling of both types of material may result in greater elongation than would be anticipated on the assumption that the effects of irradiation and thermal cycling acting alone were additive. (Q7j, M26c, 2-67, P10d; U)

937-Q. Neutron Damage to Metals—a Program Document. A. L. Bement, D. L. Gray and R. L. Hales. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission,* HW-59300A, Mar. 1, 1959, 63 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.65.

Recovery of radiation damage occurs over a wide range of temperatures in a series of steps which represent various thermally activated processes. When the temperature ranges for recovery and the number of recovery states are unknown, the isochronous annealing method is used to establish the number of states and their general temperature range prior to detailed isothermal kinetic determinations. (N4, J23, 2-67)

938-Q.* (German.) Friction of Solid Materials as a Physico-Chemical Problem. Adolf Knappwost and Gerhard Rust. *Zeitschrift fur Metallkunde,* v. 50, May 1959, p. 240-247.

Friction between iron and hardenable $AlMg_2Si$ and CuCr alloys is investigated close to the minimum of the Stribeck curve. Friction between iron and AlMg solid solutions is also studied. 19 ref. (Q9p; Al-b, *Mg,* Cu-b, *Cr,* 14-67)

939-Q.* The Dynamic Yielding of a Carbon Steel. C. J Maiden. *Acta Metallurgica,* v. 7, May 1959, p. 297-304.

A criterion for dynamic yielding is developed to give a theoretical relationship between the yield stress and time to yield for any given stress-time function and test temperature. Tests indicate that only a small number of dislocations relock immediately after the application of an impact stress of sufficient magnitude and duration to cause yielding. 13 ref. (Q24c; CN)

940-Q.* A Study of Slip Lines in Alpha Brass as Revealed by the Electron Microscope. J. T. Fourie and H. G. F. Wilsdorf. *Acta Metallurgica,* v. 7, May 1959, p. 339-349.

The frequency of lines with given amounts of glide, the density of slip lines and the average glide per line were determined for various values of stress and strain. 14 ref. (Q24a; Cu-n)

941-Q.* Relationship Between Fatigue Life of Welded Pressure Vessels and Composition of Parent Metal. F. J. Wilkinson and C. L. M. Cottrell. *Welding and Metal Fabrication,* v. 27, June 1959, p. 249-252.

Fatigue test results in 1% Cr-Mo steel. Sulphur and phosphorus reduce fatigue life at high stress levels whereas nickel and carbon increase the life by promoting better hardenability. (Q7, T26q, 2-60; 7-51, AY, Ni, *Cr, Mo, S, P*)

942-Q. (Russian.) Testing of Tubes Under High Gas Pressure for Prolonged Endurance. N. P. Cherhykh. *Zavodskaya Laboratoriya,* v. 25, May 1959, p. 591-595.

Tubes made of E.I.579, E.I.579B and 30KHMA steels were tested under hydrogen and nitrogen gas at 600 atm. pressure and 550° C. The greatest reduction in endurance was shown by 30KHMA steel under hydrogen pressure. Determination of strength was made under actual working conditions. 7 ref. (Q27; AY, *Cr, Mo,* 4-60)

943-Q.* High Temperature Alloys. M. R. Cieslicki. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 326-336.

Mechanical properties of heats made by the vacuum induction process with special reference to Udimet 500. (Q-general, C5j, 1-73; Ni-b, SGA-h)

944-Q. The Case for Charpy Impact Tests. Joseph G. Olivieri. *Machine Design,* v. 31, June 25, 1959, p. 135-136.

Test used to help control metal fabrication and predict serviceability of parts. (Q6)

945-Q. (Russian.) X-Ray Study of an Obliquely Cut Cold Worked Surface. O. N. Shivrin. *Zavodskaya Laboratoriya,* v. 25, May 1959, p. 560-564.

Microhardness studies of cold worked steel and brass surfaces give a less complete picture of distortion distribution than X-ray photography. (Q29q, 9-74; CN, Cu-n)

946-Q. (Russian.) Anistropy Determined With Reference to Hardness and Changes in Contour Outline. V. K. Grigorovich. *Zavodskaya Laboratoriya,* v. 25, May 1959, p. 601-605.

Evaluation of anisotropy of plastic deformation resistance of Zn, Sb and Bi by their hardness and changes in the outline and in micrographs. 4 ref. (Q24q, Q29n; Zn, Sb, Bi)

947-Q.* Theory of Creep Limited by Self-Diffusion. R. W. Christy. *Journal of Applied Physics*, v. 30, May 1959, p. 760-764.

Derivation of theoretical expressions for steady state creep rate at high temperature and stress. Experimental data for Zn and AgBr crystals. 23 ref. (Q3n, N1d, M26b, 2-62; Zn)

948-Q.* Whisker Structure and Tensile Strength. H. Weik. *Journal of Applied Physics*, v. 30, May 1959, p. 791-792.

Influence of layer structure of skin and core of Fe whiskers on tensile strength. Effect of thin Ni coating. 6 ref. (Q27a, M27a; Fe, *Ni*, 14-61, 14-62)

949-Q.* (German.) Armco 17-7 PH Corrosion Resistant and Precipitation Hardening Steel. *Draht*, v. 10, May 1959, p. 222-224.

Parts are subjected to various types of heat treatment and then tested in tension and fatigue. Tabular survey on mechanical and physical properties; methods of descaling. (Q-general, P-general, 2-64, L12; SS)

950-Q.* (Swedish.) Factors Influencing the Strain Embrittlement of Mild Steels. Ake Josefsson. *Jernkontorets Annaler*, v. 143, no. 3, 1959, p. 121-150.

Rimming and killed carbon steels with varying carbon and Mn contents showed a shift of transition temperature depending on the degree of deformation. Compression generally causes a larger increase in transition temperature and a higher degree of embrittlement than is produced by tensile deformation or drawing through a die. 16 ref. (Q23r, 3-68; CN, *Mn*)

951-Q.* (Swedish.) Strain Embrittlement Eliminated by Annealing Below the A_1-Point. Ake Josefsson. *Jernkontorets Annaler*, v. 143, no. 3, 1959, p. 151-166.

Annealing eliminates strain embrittlement of rimming, electric and openhearth steels after tensile deformation (5-20%) or after compression (10-30%). 3 ref. (Q26s, J23, N7e, 3-68; ST)

952-Q.* Tentative Fatigue Strength Reduction Factors for Silicate-Type Inclusions in High-Strength Steels. H. Cummings, F. Stuben and W. Schulte. *ASTM Proceedings*, v. 58, 1958, p. 505-514.

Fatigue strength reduction factors for silicate inclusions in specimens of SAE 4340 and 4350 steels. The value of the notch factor depends on both the inclusion size and steel hardness. Fatigue failure is more readily caused by larger inclusions (0.003 in. diameter), and is more pronounced at high hardness levels. Below 0.00025 in. diameter, inclusions have practically no effect on fatigue strength. (Q7a; AY, 9-69, SGB-a)

953-Q.* Effect of Static Prestrain on Fatigue Properties. F. H. Vitovec. *ASTM Proceedings*, v. 58, 1959, p. 552-570.

Effect of prestrain on fatigue properties of notched and unnotched specimens of 7075-T6, 2024-T4 Al alloys, 16-25-6 Fe-Cr-Ni-Mo alloy and S-816 Co-Ni-Cr alloy. Stresses used for prestrains corresponded to those which produced rupture at 100-200 hr. Factors influencing fatigue failure include residual stresses, metallurgical reactions, cracks, strain hardening and relaxation of residual stress. (Q7, Q3, 3-68; Al-b, Fe-b, Co-b, *Cr, Ni, Mo*)

954-Q.* A Fatigue Failure Hypothesis Based Upon Stabilized Unidirectional Slip. D. G. Younger, Jr. *ASTM Proceedings*, v. 58, 1958, p. 576-594.

The total slip process taking place during the cyclic stressing of metals is considered to be that of a to-and-fro deformation superimposed upon a unidirectional deformation. A distinction is made between two phases of failure mechanism—unidirectional slip process which ceases early in the fatigue life, and alternating slip which continues throughout the fatigue life. (Q24a, Q7b)

955-Q.* Effect of Strain Rate and Temperature on the Strength of Magnesium Alloys. R. Fenn, Jr., and J. Gusack. *ASTM Proceedings*, v. 58, 1958, p. 685-696.

Investigation of the effect of strain rate (0.005, 0.050, 0.50 and 5.0 per min.) on the strength of several rolled, extruded and cast Mg alloys at temperatures up to 900° F. reveals significant increases in strength with increasing testing speed. The study provides information for use in design of structures subjected to rapid loading. (Q27, 3-68, 2-61; Mg-b)

956-Q.* Stress-Rupture Properties of Malleable Iron at Elevated Temperatures. L. C. Marshall and F. Sommer. *ASTM Proceedings*, v. 58, 1958, p. 733-752.

Performance of ferritic and pearlitic malleable iron at temperatures ranging

from 800 to 1200° F. Results are high for ferritic malleable irons at 800, 1000 and 1200° F., with a distinctly anomalous behavior on the part of low-carbon ferritic material which exhibits unexpectedly high strength at 800° F. (Q3q, 2-62; CI-s)

957-Q.* The Creep Properties of Three Low-Shrinkage, Copper-Base Casting Alloys. W. Simmons and J. Kura. *ASTM Proceedings*, v. 58, 1958, p. 791-804.

Creep tests, creep-rupture tests and tension tests conducted on cast specimens of 80-10-10, 85-5-5-5 and Navy "M" alloys, in the 350-550° F. range. Exposure to creep at higher temperatures produced moderate increase in yield strength, while tensile strength and ductility showed significant effects of prior exposure. (Q3, Q3q; Cu-b)

958-Q.* Isochronous Stress-Strain Curves for Some Magnesium Alloys, Showing the Effects of Varying Exposure Times on Their Creep Resistance. R. B. Clapper. *ASTM Proceedings*, v. 58, 1958, p. 812-825.

Short-time creep resistance studied as a function of time. Total extension of the material is investigated in terms of soaking time. Neither heating rate nor rate of straining has a significant effect on the 400, 500 and 600° F. short-time creep resistance of HK31A-H24 sheet alloy. (Q3, 2-61, 3-67; Mg-b, 4-53)

959-Q.* Young's Modulus of Magnesium Alloys as a Function of Temperature and Metallurgical Variables. Raymond W. Fenn, Jr. *ASTM Proceedings*, v. 58, 1958, p. 826-837.

A static tension method used to determine values of the relaxed Young's modulus. Significant variations are correlated with differences in composition, grain size, prior cold work and heat treatment. (Q21a, 2-60, 2-61, 2-64, 2-59; Mg-b)

960-Q.* A High Damping Magnesium Alloy for Missile Applications. G. Weissmann and W. Babington. *ASTM Proceedings*, v. 58, 1958, p. 869-892.

Mg alloys tested for damping capacity as a function of strain. An alloy containing 0.6% Zr showed best results. (Q8, T24e, 3-68; Mg-b, *Zr*)

961-Q.* A Study of the Variability in the Mechanical Properties of Alloy-A Phosphor Bronze Strip. M. Torrey, G. R. Gohn and M. B. Wilk. *ASTM Proceedings*, v. 58, 1958, p. 893-911.

Variability along the length, across the width and among milling lots of the strip. Results show variability in dimensions and mechanical properties that may be expected among specimens from a single strip. (Q-general; 4-53, Cu-s)

962-Q.* Microstructural Observations Pertinent to the Tempering and Temper Brittleness of Steel. W. Clancy and M. Norton. *ASTM Proceedings*, v. 58, 1958, p. 912-929.

Ferrite grain growth in SAE 3140 steel occurs below the lower critical temperature. "Upper nose isothermal temper embrittlement" is thought of as a change in impact properties accompanying the normal changes in microstructure which occur during the fourth stage of tempering. Etching with picric acid reagents delineates clearly the ferrite grain boundaries. (Q26s, Q6, N3, M20q; ST)

963-Q.* Effect of Size on the Yielding of Mild Steel Beams. Cedric W. Richards. *ASTM Proceedings*, v. 58, 1958, p. 955-970.

Results show a linear relationship between size and yield strength in accordance with statistical theory. (Q23b, 3-73; CN)

964-Q.* High Strength Steel Castings, Mechanical Properties and Processing Techniques. K. D. Holmes, J. Zotos, and P. J. Ahearn. *Modern Castings*, v. 36, July 1959, p. 65-70.

Mechanical properties obtainable through various heat treating and testing procedures. The superiority of arc furnace practice is indicated by data from coupon fins wherein a strength level of 225,000 psi. is obtained with 35% reduction in area and 15 ft-lb. impact at -40° F. 11 ref. (Q-general, J-general; ST, 5, 1-60)

965-Q.* (Dutch.) High Speed Toolsteels. Herbert Briefs. *Metalen*, v. 14, May 1959, p. 150-156.

Mechanical properties of high speed steels, steels used for stamping punches and dies, and of hot work toolsteel after various heat treatments and testing temperatures. 16 ref. (Q-general, J-general, W24n, W24p, 2-64, 2-61; TS-M)

966-Q.* (Italian.) Fatigue Resistance of Inafond C4S Alloy Under Rotation Bending Load. L. Mori. *Alluminio Nuova Metallurgia*, v. 28, no. 4, 1959, p. 169-175.

Fatigue resistance tests on naturally and artificially aging Al-Cu-Si alloys. Influence of sample preparation and chill temperature on mechanical properties. Micrographic examination. (Q7, Q26; Al-b, *Cu, Si*)

967-Q.* (Ukrainian.) Wear Resistance of a Metal Machined at Various Temperatures. F. P. Belyankin. *Dopovidi Akademii Nauk Ukrainskoi R.S.R.*, no. 5, 1959, p. 485-488.

Soft steel was machined into a spherical sample at starting temperatures of -195° C. and +20° C. or at a temperature maintained by a.c. or d.c. heating. Wear resistance of samples machined at differing starting temperatures varies. A.c. heating affects the wear resistance differently from d.c. heating. (Q9n, G17, 2-61; CN)

968-Q.* Fatigue Testing—a New Way to Get Quality. R. F. Griswold. *SAE Journal*, v. 67, June 1959, p. 58-61.

Fatigue testing combined with statistical analysis determines operations and quality of torsion bar strength. (Q7)

969-Q.* (French.) Effect of Stress Concentrations on Metal Fatigue. G. V. Oujik and M. J. Galperine. *Revue de Metallurgie*, v. 56, May 1959, p. 482-486.

Effect of local increases in stresses, gradient of maximum normal stress and degree of heterogeneity of stress conditions on the fatigue of 40x chromium steel and 45 medium-carbon steel. Local increase in stresses has a decisive influence on the fatigue strength. (Q7a, 3-66; CN-p, AY)

970-Q.* Thermal Stresses in Design, Pt. 11. Stresses Under Plastic Flow and Creep. S. S. Manson. *Machine Design*, v. 31, July 9, 1959, p. 124-129.

Methods of computing stress distribution for applications where the yield point of the material is exceeded. Formulations and solution by deformation theory. 14 ref. (Q25p, Q24, 17-51)

971-Q.* (French.) Effects of Copper in Gray Cast Iron. A. De Sy, W. Simoens and J. Vidts. *Fonderie Belge*, v. 29, Apr. 1959, p. 95-104.

Effect of Cu alloy additions on graphitization, ferrite reaction and mechanical properties. Brinell hardness and tensile strength of test bars with Cu additions to 2.96% and of thin and thick-section castings containing Cu additions to 2%. Comparison with identical castings containing 2% Ni instead of Cu. 10 ref. (Q-general, N8s, N8j, CI-n, *Ni, Cu*, AD-p37)

972-Q.* (French.) Fatigue Strength of Welded Aluminum-Magnesium Alloys. R. Develay. *Revue de Metallurgie*, v. 56, June 1959, p. 31-38.

Fatigue tests with sheets of various alloys, butt welded or welded in overlapped position by the TIG method. The fatigue strength of butt welded assemblies is higher than that of overlapped welds. Strength can be increased in both cases by correctly applied pretension. (Q7a; Al-b, *Mg*, 7-51)

973-Q.* (Ukrainian.) Residual Stresses in Quenching of Cast Iron. V. P. Lagutin and V. K. Titov. *Dopovidi Akademii Nauk Ukrain' skoi R.S.R.*, no. 3, 1959, p. 290-292.

Relationship between value of the longitudinal residual stresses, due to quenching of cast iron, the quenching medium and the graphite dispersion, showed the complex nature of stress distribution on the cross section of the specimen. The predominance of structural stresses accounts for the presence of tensile stress on the surface of the specimen. 10 ref. (Q25h, J26n; CI-n)

974-Q.* Hydrogen in Heavy Forgings. J. E. Steiner. *Metal Progress*, v. 76, July 1959, p. 72-75.

Hydrogen causes flakes in heavy forgings and adversely affects ductility; consequently, much effort has gone toward hydrogen reduction. Lengthy heat treatments are not reliable, but some hydrogen reduction is possible through careful melting. Vacuum casting techniques eliminate hydrogen. (Q23p; ST, *H*, 4-51, 9-70)

975-Q.* Mechanical Properties of A356 Aluminum Casting Alloy. G. N. Reinemann and L. E. March. *Metal Progress*, v. 76, July 1959, p. 80-86.

Since tensile strength and elongation depend so much on freezing rate, a full stress analysis should be given of complex castings to permit the proper placing of risers and chills. (Q27a, E25; Al-b)

976-Q.* Measuring Decarburization by Microhardness. H. Czyzewski and H. H. Honegger. *Metal Progress*, v. 76, July 1959, p. 93.

Microhardness survey of a 4130 steel sample. By using a Knoop diamond with

a 200-g. load, and 50 X objective, the depth of decarburization was determined at 0.0045 in. Decarburization of 0.002 in. was reported by the metallographic method. (Q29q, J4a; ST)

977-Q.* Normalization Procedures for NRL Drop-Weight Test. P. P. Puzak and A. J. Babeck. *Welding Journal*, v. 38, May 1959, p. 209s-218s.

Data for 90 steels and procedures for determination of surface strain in test specimens by means of weld crack opening. Procedures can be used to establish test conditions necessary to achieve a normalization of variables involving odd size steels. 8 ref. (Q6, Q26q, Q24; CN, 7-51)

978-Q.* (Czech.) Rimming L-D Steel From Iron With a Higher Phosphorus Content. Frantisek Krumnikl and Rudolf Strobl. *Hutnicke Listy*, v. 15, June 1959, p. 493-499.

Comparison of the properties of L-D steel with those of rimming openhearth and basic bessemer steels. 7 ref. (Q-general, D10a; ST-d, ST-e, ST-g)

979-Q.* The Tensile Properties of High-Purity Niobium at Low Temperatures. B. F. Dyson, R. B. Jones and W. J. McG. Tegart. *Institute of Metals, Journal*, v. 87, June 1959, p. 340-342.

High-purity Cb was tested over the range -196 to 240° C. Yield points were observed at all temperatures, the magnitude of the yield drop increasing with decreasing temperature. The temperature-dependence of the yield stress was similar to that of other body-centered cubic metals, and the material was ductile at -196° C. (Q27a, Q23b, 2-63; Cb-a)

980-Q.* Effect of Annealing Treatment on the Structure and Tensile and Creep Properties of a Commercial Titanium Alloy (4%Aluminium-4%Manganese). H. W. Mead. *Institute of Metals, Journal*. v. 87, June 1959, p. 343-346.

Changes in annealing treatment had little effect on the tensile properties of annealed as-rolled rod, but the creep strength was greatest in specimens furnace-cooled to 540° C. after annealing at either 700° C. (when tested at 300° C.) or 800° C. (when tested at 400° C.) The optimum treatment for as-rolled rod was to anneal at 800° C., furnace cool at a rate not exceeding 100° C. per hr. to 550° C., and then air cool. (Q27a, Q3m, 2-64; Ti-b, *Al, Mn*)

981-Q.* The Correlation of the Stress-Rupture Properties of the Nimonic Alloys. Hans Conrad. *Institute of Metals, Journal*, v. 87, June 1959, p. 347-349.

Correlation is achieved by an equation based on theoretical and experimental considerations. The ability of this equation to predict stresses for rupture times up to 34,000 hr. from test data of less than 3000 hr. duration is good, being comparable to that of the Manson-Haferd parameter and better than that of other parameters in common use. 21 ref. (Q3q; Ni-b)

982-Q.* Mechanical Properties of Investment Cast 410. W. Fred Carn. *Precision Metal Molding*, v. 17, July 1959, p. 34-36.

Effect of varying tempering temperatures on mechanical properties of 410 stainless with time at tempering temperature held constant. (Q-general, J29; 5-62, SS)

983-Q.* Properties of Extruded Alloys. Pt. 11. *Precision Metal Molding*, v. 17, July 1959, p. 59.

Fabrication and corrosion characteristics of various Mg alloys. (Q-general, R-general; Mg-b, 4-58)

984-Q.* (Czech.) Improvement of the Properties of Heat Resistant Nickel-Chromium Alloys. M. Vystyd. *Hutnicke Listy*, v. 15, June 1959, p. 536-537.

Effect of Mn, W, Co, B and Zr on creep strength, tensile strength and elongation. (Q3m, Q27a, Q23p, 2-60; Ni-b, *Cr, Mn, W, B, Zr, Co*)

985-Q.* (German.) Fracture Phenomena of Tubular Samples Exposed to Internal Pressure at Low Temperatures Ranging Down to -70° C. Alfred Krisch. *Archiv fur das Eisenhuttenwesen*, v. 30, June 1959, p. 337-344.

Samples were subjected to tensile load and simultaneous hydraulic pressure from within. Formation of longitudinal or transverse cracks is influenced by the testing temperature. (Q26, 2-63, 3-74; ST, 9-72)

986-Q.* (German.) Penetration of Hydrogen Into Steel and Fracture Phenomena. Friedrich Karl Naumann and Wolfhard Carius. *Archiv fur das Eisenhuttenwesen*, v. 30, June 1959, p. 361-370.

Hydrogen diffusion from a saturated solution of H_2S in water into carbon steel. Embrittlement by molecular

hydrogen present at the grain boundaries. 25 ref. (Q26, N1; CN, *H*)

987-Q.* (Report.) Properties of Cast Iron at Elevated Temperatures. J. R. Kattus and Bryan McPherson. Mar. 1959, 90 p. ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals. ASTM STP no. 248. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Properties evaluated at 800 and 1000° F. by means of tensile, creep-rupture, thermal-shock and growth tests. Alloys are promising for long-time load-carrying applications and for applications involving thermal shock at temperatures up to 800° F., but not at 1000° F. Mo improves creep-rupture properties; Ni increases resistance to thermal shock; Cr adds to structural stability. 46 ref. (Q-general, 2-62, 2-60; CI-n, *Mo, Ni, Cr*)

988-Q. (Translation—Brutcher No. 4526.) Effect of Columbium on Temper Brittleness of Manganese Steel. I. V. Volobvev and V. V. Gavranek. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 28-33.

Investigation of up to 0.82%Cb and 1.84-2.07%Mn in one set of samples and up to 1.30%Cb with 1.77-1.79%Mn in another group of samples. Cb in medium-Mn alloy steel sharply reduces its susceptibility to temper brittleness. Mn steels with 0.4-0.5%C are susceptible to temper brittleness. 10 ref. (Q26s, 2-60; AY, *Cb, Mn*)

989-Q. (Translation—Brutcher No. 4527.) Impact Resistance of 30KhGS Steel. S. S. Ermakov. *Metallovedenie i Obrabotka Metallov*, v. 5, Feb. 1959, p. 34-36.

Cyclic impact loading of a Cr-Mn-Si low-alloy steel revealed features undisclosed by single impact bending. The impact fatigue curve in relation to tempering temperature has two maxima at 200 and 400° C. 4 ref. (Q6n, Q7a; AY)

990-Q. (Translation—Brutcher No. 4435.) Transition of Elastic Deformation Into Permanent Deformation During Structural Transformation. D. M. Nakhimov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 2-6.

Permanent deformation in metals and alloys is of two types. In the first, there is the migration of a large group of atoms, while in the second there is the migration of individual atoms. High temperature, degree of structural metastability and prolonged load-induced strain are causes of the second type of deformation. 11 ref. (Q21, N1e, Q24m; AY)

991-Q. (Translation—Brutcher No. 4436.) Changes in Mechanical and Technological Properties of Ternary Titanium Alloys. L. P. Luzhnikov and V. M. Novikova. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 6-13.

Study of mechanical, technological and welding properties of fine ternary alloys Ti-Al-Mo, Ti-Al-Cr, Ti-Al-Fe and Ti-Al-Mn showed it to be advantageous to fuse the Ti-Al alloy with a beta stabilizer to the limit approaching their solubility in alpha Ti. 5 ref. (Q-general, M26q; Ti-b, *Al, Fe, Mn, Cr*)

992-Q. (Translation—Brutcher No. 4539.) Rupture Strength of Tubular Steel Specimens Tested Under Internal Hydrogen Pressure at High Temperatures. N. N. Kolgatin, L. A. Glikman, V. P. Teodorovich and V. I. Deryabina. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 19-24.

Rupture strength depends upon wall thickness of the tubes. Rupture is caused by the gradual breaking up of grain boundaries and the weakening of bonds between the crystallites. (Q3q, 3-73, 3-74, 2-62; CN, 4-60)

993-Q. (Translation—Brutcher No. 4540.) Effect of Residual Aluminum on the Impact Strength of Steel at Low Temperature. E. I. Rabinovich, M. K. Skul'skii and K. K. Biktagirov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 25-28.

Steel with traces of Al, heat treated at 880-1000° C., water quenched, tempered at 660-680° C., normalized and annealed, shows the most severe cold brittleness at -40, -20 and 0° C.; impact strength is about 1 kg. per sq. cm.; while the critical temperature of cold brittleness is decreased as the amount of residual aluminum is decreased. 4 ref. (Q26s, Q6n, 2-63, 2-60; CN, *Al*)

994-Q. (Translation—Brutcher No. 4541.) Steels for Fastening Parts Used in Steam Power Plants Operating at 140° and 570° C. A. V. Ratner and A. S. Panicheva. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Mar. 1959, p. 28-32.

20 Kh1M1F1 or EI909 Cr-Mo-V (0.2-0.25%C, 1%Cr, 1%Mo and 1%V) low-alloy steels, after being heat treated, have high strength and relaxation properties at 565-570° C., making them suitable for

high-pressure high-temperature installations. 4 ref. (Q27, Q3q, 2-62, 2-64; AY)

995-Q. (Translation--Brutcher No. 4543.) Effect of Rare Metals on Mechanical Properties of Iron-Aluminum Alloys. E. M. Savitskii, V. F. Terekhova and I. V. Burov. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Mar. 1959, p. 38-43.

Boron and vanadium increase hardness; Ta and Zr raise impact strength and plasticity in hot rolling. The presence of oxygen is the principal contaminant in Fe-Al alloys, causing brittleness. 15 ref. (Q27a, Q6n, Q29n, 2-60; Fe-b, *Al,* Ad-n32)

996-Q. (Translation--Brutcher No. 4544.) Heat Treatment and Mechanical Properties of Magnesium Alloy Products. A. A. Naryshkin. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Mar. 1959, p. 44-46.

Heat treatment seldom results in any change in mechanical properties. It is possible to manufacture products from strip, tubes and various profiles subjected to aging at 170° ± 50° C. Heating to 170° ± 10°, not exceeding 15 min., neither changes the microstructure nor reduces the tensile strength, and needs no artificial aging. (Q27a, J27d, 2-64; Mg-b)

997-Q. (Translation--Brutcher No. 4547.) Effect of Alloying Elements on the Grain Boundaries of Aluminum Alloys at High Temperatures. L. D. Kharitonova. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Mar. 1959, p. 51-55.

Zn and Mn expand the boundary in solid solutions; Zn causes a reduction of grain-boundary strength; Mn increases it at elevated temperature. 8 ref. (Q23p, M27f, 2-60; Al-b, *Cu, Mn, Zn,* 14-67)

998-Q. (Translation--Brutcher no. 4548.) Properties of Bearing Materials. E. E. Verner and N. S. Zinovich. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Mar. 1959, p. 56.

Sn alloys of Type B-83 show no decrease of plastic deformation at elevated temperatures. (Q24; Sn-b, SGA-c)

999-Q. (Translation--Brutcher no. 4564.) Determination of Characteristic Deformation From Creep-Relaxation Curves. I. A. Odingang and G. I. Lenin. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Apr. 1959, p. 2-8.

Creep-relaxation curves constructed from mathematical equations, for iron at 280° C. and E. I. 257 steel at 600° C. 4 ref. (Q3m, Q3a; Fe-a, CN)

1000-Q. (Translation--Brutcher No. 4568.) Effect of Alloy Content on Friction Properties of Titanium. I. S. Kaptyug and V. I. Syshchikov. *Metallovedenie i Termicheskaya Obrabotka Metallov.* v. 5, Apr. 1959, p. 22-27.

Ti and Ti alloys possess low resistance to wear caused by sliding friction. With alloy additions a comparatively small reduction of the friction coefficient is apparent. (Q9p, 2-60; Ti-a, Ti-b)

1001-Q. (Translation--Brutcher no. 4569.) Relation Between Steel Structure and Yield Point Elongation. G. T. Nazarenko. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Apr. 1959, p. 28-33.

By varying the heat treatment and hence the structure it is possible to change the yield point elongation in all carbon steels. Tempering temperature corresponding to the appearance of the yield point elongation is at 300-500° C. After tempering at 680-700° C. the length of yield point elongation is maximum for all steels irrespective of their carbon content. 8 ref. (Q24c, Q23b, J29, 2-64, 2-61, 3-71; CN)

1002-Q. (Translation--Brutcher no. 4575.) Brittleness of High-Strength Nodular Cast Iron. A. A. Zhukov. *Metallovedenie i Termicheskaya Obrabotka Metallov,* v. 5, Apr. 1959, p. 53-58.

Mg-inoculated high-strength cast iron is marked by comparatively high brittleness at the grain boundary. The greatest harm to metal is caused by Si and P. Refining can be attained by reducing Si content but the carbon content must be increased. 5 ref. (Q26s, 2-60; CI-r, *Mg, Si, P,* AD-p36)

1003-Q.* A Method for Determining Abrasion Resistance of Thick Anodic Coatings on Aluminum. Bruce E. Deal. *Plating,* v. 46, July 1959, p. 823-827.

Abrasion resistance determined with jet abrasive apparatus in terms of time required for a stream of abrasive particles under controlled conditions to break through the coating. 14 ref. (Q9; Al, 8-73)

1004-Q.* (French.) Tension-Compression Fatigue Tests With Low-Alloy Steel Subjected to Nickel Plating Followed by Chromium Plating. Tigeot. *Centre d'Information du*

Chrome Dur—Bulletin de Documentation, v. 104, June 1959, p. 30.

Fatigue strength is decreased by Cr plating but can be improved by heat treatment. It is not affected by the previous Ni plating. (Q7a, L17, 2-64; AY, *Ni, Cr*)

1005-Q.* (French.) Wear Resistance of Electrodeposited Chromium and Chromium-Molybdenum Alloys as Affected by Surface Condition. P. A. Jacquet, J. Galbrun and A. Popoff. *Centre d'Information du Chrome Dur—Bulletin de Documentation,* v. 104, June 1959, p. 29-30.

Plate that is electrolytically polished shows better wear resistance in comparison with mechanically polished surfaces. Wear resistance is also increased by the presence of Mo. (Q9n, L13p, L10b; Cr-b, *Mo,* 8-62)

1006-Q.* (German.) A Theory of Metal Creep. Paul Taeubert. *Abhandlungen der Deutschen Adademie der Wissenschaften Zu Berlin,* v. 7, 1958, p. 1-59.

Creep is explained as an effect of strain hardening and recovery. A system of equations is formulated on the basis of this conception. (Q3, N7e, N4)

1007-Q. (French.) Determination of Elasticity and Damping Properties and of the Rigidity of Complex Structures. Pierre Sorin and Armand Giet. *Comptes Rendus,* v. 248, June 22, 1959, p. 3533-3535.

(Q21, Q8)

1008-Q.* A New Look at Ductility. Michael V. Zaustin. *Machine Design,* v. 31, July 23, 1959, p. 134-141.

Elongation and reduction are no criteria of ductility since they vary with the dimensions and shape of a test specimen and thus are not fundamental properties of metals. A new method is proposed based on shear resistance and cohesion of the material and is, therefore, independent of the shape and size of the specimen. (Q23p, 1-54)

1009-Q.* Thermal Stresses in Design. Pt. 12. S. S. Manson. *Machine Design,* v. 31, July 23, 1959, p. 144-150.

Techniques of applying a method of successive approximations to thermal-stress problems in which the starting point involves two unknowns or the temperature has a two-dimensional distribution. 14 ref. (Q25p, 17-51)

1010-Q.* Adhesion of Evaporated Metal Films. F. Schossberger and K. D. Franson. *Vacuum,* v. 9, Mar. 1959, p. 28-35.

Abrasion-resistivity test developed to study the adhesion of vacuum-deposited Al films on glass surfaces. Differences in the plating and annealing conditions of evaporated Al films detected. Poorest adhesion found on platings made on unclean surfaces and platings made at a slow rate of evaporation of the metal. Optimum substrate temperature for good adhesion was determined to be 175° C. 8 ref. (Q10c, K11a, 1-53; Al-b, 14-62)

1011-Q.* Joint Design for Automatic Welding Eliminates Cracking and Porosity. A. J. Rosenberg and E. W. Jamison. *Welding Design & Fabrication,* v. 32, July 1959, p. 32-34, 52, 53.

Radial, fusion line, transformation, centerbead cracking and porosity minimized in the consumable electrode welding of a low-alloy forged steel to a cast Co-base high-temperature alloy. (Q26q, K1; AY, Co-b, 17-51, SGA-l)

1012-Q.* (Chinese.) Mechanism of Internal Friction Peak of Interstitital Atoms in the Face-Centered Cubic Crystal. Tsien Chi-Tsiang. *Acta Metallurgia Sinica,* v. 4, Mar. 1959, p. 69-74.

Relationship between carbon contest and height of the internal friction peak of carbon diffusion in pure Ni and in Mn steel containing 18.5% Mn. The internal friction peak induced by the interstitial atomic diffusion in the pure metal of a face-center cubic crystal is due to the rotation of the atomic pair of two neighboring atoms in the crystal lattice under the action of stress. 13 ref. (Q22, M25, N1, 3-66; Ni, AY, *Mn*)

1013-Q.* (French.) Additions Influencing the Elastic Limit of Refractory Alloys at Room Temperature. H. Nohl, B. Lux and W. Siegfried. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, June 1959, p. 19-29.

Effects of Cb, Al, Ti, B, Cu, Ce and Mn additions and of artificial aging on elastic limit and first phase of plastic deformation of Cr-Ni-Co alloys. 11 ref. (Q21, 2-60, 2-65; Ni-b, *Cr, Co,* SGA-h)

1014-Q.* (French.) Addition of Bismuth to Gray Cast Iron. J. C. Margerie and M. Drouzy. *Memoires Scientifiques de la Revue de Metallurgie,* v. 56, June 1959, p. 47-73.

Effects of Bi on the hardness and hardness depth, elasticity, tensile strength, ductility and structure. 17 ref. (Q29n, Q21, Q27a, E25q, 2-60; CI-n, *Bi*)

1015-Q.* (Japanese.) Studies on the Standard Indentation Hardness Tester. Pt. 2. Kentaro Yamamoto, Hirosi Yano and Nobuaki Yajima. *Central Inspection Institute of Weights and Measures, Report, Tokyo,* v. 8, no. 1 (17), 1959, p. 4-16.

Analysis of the load-indentation curves of the Rockwell C hardness test. Amount of piling-up and sinking-in during process of penetration; depth of indentation from surface of test piece. 5 ref. (Q29b, Q24)

1016-Q.* (Japanese.) Temperature Characteristics of Springs for Scales. Yukivoshi Shozi, Teruji Takahashi and Shozi Shibata. *Central Inspection Institute of Weights and Measures, Report, Tokyo,* v. 8, no. 1 (17), 1959, p. 42-49.

Temperature coefficient of modulus of rigidity is affected during manufacturing. Measurements, by means of an optical lever, of springs for scales made of high-carbon steel and Co-Elinvar. 4 ref. (Q21e, T6c, 2-61; CN, Fe-b, *Co*)

1017-Q.* (Swedish.) Fracture Mechanism in Metals With Special Regard to Brittle Fracture. C. Schaub. *Jernkontorets Annaler,* v. 143, no. 4, 1959, p. 185-206.

The flow criterion of von Mises; influence of strain rate on yield stress; correlation between transition temperature level according to Charpy V and temperature below which brittle fracture may appear in practice. 13 ref. (Q26, Q26s, Q23r)

1018-Q.* (Swedish.) Principles of Testing and Evaluation of Testing Results in the Study of the Brittle-Fracture Tendency of Steel. T. M. Noren. *Jernkontorets Annaler,* v. 143, no. 4, 1959, p. 207-230.

Testing methods from four points of view—range of application, type of test bar and method of applying the load, criterion used for estimating the testing results, and correlation between testing results and service behavior of a welded structure. Fracture appearance, energy absorption, deformation and nominal fracture stress of notched bars are considered as testing criteria for brittle fracture tendency. 57 ref. (Q26s, 1-54)

1019-Q.* Fracture Strengths Relative to Onset and Arrest of Crack Propagation. G. Irvin, J. Kies and H. Smith. *ASTM Proceedings,* v. 58, 1958, p. 640-660.

A generalized plane-stress viewpoint applied to fracture strength investigations in thin plates containing a crack. A method is developed for the measurement of fracture strength which makes occurrence of fractures predictable under conditions of thickness and yield stress. (Q26q)

1020-Q.* Torsion Tests on Galvanized Wire. Ove Falck Holm. *Draht (English Edition),* no. 41, June 1959, p. 69-70.

Tensile strength and bending strength will show a normal decline after completion of the galvanizing process while the torsion figures will fall steeply. It is suggested that torsion tests on galvanized wire be carried out after pickling and removal of the Zn coating since the quality can only be determined with the wire in this condition. (Q1, Q27a; 4-61, 8-65)

1021-Q.* Investigation of High-Temperature Properties of Nickel-Base Alloys Using Balanced-Experiment Designs. T. L. Robertshaw. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 16-27.

Stress-rupture properties of three alloy systems consisting of Ni, Cr, Co and Fe in atomic ratios of 60:20:10:10 and with concurrent additions of Al, Ti and Ta; Al, Ti and W; and Al, Ti and Mo, respectively. Basic designs used were fractional-replicate, full factorial and composite. Cast specimens outperformed forged specimens of same alloy composition and heat treatment. (Q3p, A9p, 2-60, 2-62; Ni-b, *Al, Ti, Ta, W, Mo,* SGA-h)

1022-Q.* Evaluation of a Cast Nickel-Base Alloy for Use as a Bucket Material at 1650° F. R. A. Signorelli, J. R. Johnston and J. W. Weeton. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 28-37.

Wheel of 52 investment-cast Guy alloy buckets installed in J33-9 turbojet engine operated without failure at 1650° F. for 102 hr., at which point fatigue failure of compressor ended the test. Predicted life of this engine, based on stress-rupture data obtained from test bars, is 400 hr. 8 ref. (Q-general, Q3q, T7h, T24b, 2-62; Ni-b, *Cr, Mo, Al, Cb, Fe, B, Mn, Si,* SGA-h)

1023-Q.* W545—a New Higher Temperature Turbine Disk Alloy. J. T. Brown and J. Bulina. Paper from "High Temperature

Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 38-55.

Commercial development of Fe-base precipitation-hardening alloy containing boron additions is virtually complete. Tensile and stress-rupture properties of notched and plain bar test specimens and wrought products from commercial ingots; effects of boron on notch sensitivity; theory of boron effect; heat treatment. (Q-general, Q3q, Q27, J27, T24b, 2-60; Fe-b, *B*, SGA-h)

1024-Q.* ML-1700 Cast Turbine Bucket Alloy. R. J. Morris. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 81-94.

Room and high-temperature mechanical properties of new Co base alloy with special reference to effects of boron additions up to 0.6%; 51 out of 96 buckets satisfactorily completed 115-hr. engine test at 1700° F. Creep strength at this temperature was not entirely satisfactory. (Q-general, Q3, P12n, T24b, 2-60, 2-62; Co-b, *W, C, B, Cr*, SGA-h)

1025-Q.* Chromium-Base Alloys for High Temperature Applications. R. W. Fountain and M. Korchynsky. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 207-228.

Effects of composition and temperature on mechanical and physical properties; possibilities of developing Cr alloys suitable for high-temperature engineering applications. 52 ref. (Q-general, P-general, 2-60, 2-62; Cr-b, 17-57, SGA-h)

1026-Q.* Molybdenum, Its Alloys and Its Protection. J. J. Harwood and M. Semchyshen. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 243-272.

Solubility of some common alloying elements in Mo; physical and mechanical properties of a number of Mo alloys; unusual ductility of Mo-Re alloys; oxidation and protective coatings. 10 ref. (Q-general, L-general, R1h, 2-60, 2-61; Mo, SGA-h)

1027-Q.* Properties of Molybdenum-Alloys Turbine Buckets. R. G. Frank. Paper from "High Temperature Materials". John Wiley & Sons, New York 16, 1959, p. 273-291.

Mechanical properties of upset-forged 0.5% Ti alloy buckets produced for General Electric's J47 "hot rod" test vehicle compared with those of rolled bar stock of same composition and having optimum balance of strength and resistance to recrystallization. 4 ref. (Q-general, T7h; Mo-b, *Ti*, SGA-h)

1028-Q.* Evaluation of Vacuum-Melted Vacuum-Investment-Cast Nickel-Base Alloys. P. W. Beamer and J. J. Eisenhauer. Paper from "High Temperature Materials" John Wiley & Sons, New York 16, 1959, p. 364-377.

Melting and casting equipment and procedures; tensile and stress-rupture testing of Waspaloy, Udimet 500 and Inco 713. Stress-rupture properties obtained by vacuum investment casting are equal to, or better than, those obtained by conventional techniques, while ductility is improved. (Q3q, Q27, E15, 1-73; Ni-b, SGA-h)

1029-Q.* The Effect of Vacuum Melting on the High-Temperature Properties of Nickel-Base Superalloys. F. M. Richmond. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 407-426.

Effect of high temperature on tensile and stress-rupture properties of Waspaloy, M 252, Nimonic 90, J1570, Udimet 500 and GMR-235. 10 ref. (Q3q, Q27a, E10, 1-73, 2-60; Ni-b, SGA-h)

1030-Q.* The Effect of Environment on High-Temperature Creep Properties of Metals and Alloys. Donald A. Douglas. Paper from "High Temperature Materials". John Wiley & Sons, New York 16, 1959, p. 429-447.

Effects of oxidizing, neutral, inert, reducing and nitriding atmospheres on a variety of materials. 23 ref. (Q3, 2-62, 2-66; SGA-h)

1031-Q.* Comparison of the Creep Rupture Properties of Nickel in Air and in Vacuum. P. Shahinian and M. R. Achter. Paper from "High Temperature Materials". John Wiley & Sons, New York 16, 1959, p. 448-465.

At low stresses, Ni is strengthened in air while at high stresses it is stronger in a vacuum. There is a reversal of relative creep strengths during the course of testing. A theory is suggested to explain mechanism responsibile for differences. 13 ref. (Q3, Q3q, 1-73; Ni, SGA-h)

1032-Q.* Effect of Environments of Sodium Hydroxide, Air and Argon on the Stress-Rupture Properties of Nickel at 1500° F.

H. T. McHenry and H. B. Probst. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 466-485.

At 1500° F., Ni tubes have longer stress-rupture lives in air than in argon. Sodium hydroxide reduces stress-rupture lives of tubes tested in air. Response to environment of relatively simple shapes such as bars and tubes is probably different. 13 ref. (Q3q, 2-62, 2-66; Ni, SGA-h)

1033-Q.* The Effect of Testing Atmospheres on the Creep-Rupture Properties of Molybdenum-Base Alloys at 1800° F. D. D. Lawthers and M. J. Manjoine. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 486-497.

Rupture strength and rupture time of Mo-base alloys when tested in vacuum are greater than when tested in dry-tank helium containing impurity gases. Rupture ductility may also be improved. Rupture strength or time can be increased by stepped loading in impure helium atmosphere. (Q3, Q3q, 2-66, 1-73; Mo-b, SGA-h)

1034-Q.* (English.) Effect of Shot-Peening on the Fatigue Strength of Metals. Pt. 3. Effect on Steel With Notch. Sakae Takeuchi and Tsuneo Homma. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Apr. 1959, p. 94-101.

Influence of shot-peening on fatigue strength of U-notched and V-notched specimens of Si-Mn spring steel heat treated to a tensile strength of 140 kg. per sq. mm. 6 ref. (Q7a, G23n, 3-73; ST, SGA-b)

1035-Q.* (French.) Fatigue Failure. *Revue de la Soudure Lastijdschrift*, v. 15, no. 2, 1959, p. 90-99.

How improved design avoids fatigue failure observed in welded structures in tankers. (Q7, K1a, T22g; ST, 7-51, 17-51)

1036-Q.* Malleable Iron Resists High Temperature. Hans J. Heine. *Foundry*, v. 87, Aug. 1959, p. 94, 96.

Tests show that ferritic and pearlitic malleable irons possess exceptional physical and mechanical characteristics at elevated temperatures. (Q-general, P-general, 2-62; CI-s)

1037-Q.* X2219-T6 High Temperature Aluminum Alloy. Paul L. Hendricks. *Light Metal Age*, v. 17, June 1959, p. 11-12, 30.

Tensile properties at room temperature and at 300-500° F. after 100 hr. exposure. Microstructure, resistance to stress-corrosion, stress-rupture properties and fatigue strength of extrusions. Effect of specimen orientation. (Q27a, 2-62, Q3q, Q7a, 3-72, R1b; Al-b, *Cu, Mn, V, Zr*, SGA-h)

1038-Q.* X-Ray Diffraction for Residual Stress Measurements of Restrained Weldments. E. H. Kinelski and J. Alfred Berger. *Norelco Reporter*, v. 6, May-June 1959, p. 65-68.

Stresses in Monel alloy plate weldments prepared by the metal-arc, gas-shielded tungsten-arc and gas-shielded consumable-electrode welding processes. The residual-stress patterns in the weldments are compared for two conditions of preheat and interbead temperatures (room temperature and 300° F.). The X-ray diffraction method measures the strain existing in the specimen by measuring the change in the interatomic distance between planes of atoms. 7 ref. (Q25h, K1, M22g; Ni-b, 7-51)

1039-Q.* High-Temperature Properties of Ceramics and Cermets. E. Glenny and T. A. Taylor. *Powder Metallurgy*, no. 1-2, 1958, p. 189-226.

Resistance of oxides, oxide-metal cermets, carbide-metal cermets, molybdenum disilicide and silicon nitride to creep, fatigue, oxidation, thermal shock and impact. 25 ref. (Q-general, R1h, 2-62; Cr, Mo, Ni, 6-70, SGA-h)

1040-Q. Hot Hardness Tests on Thorium and Some Thorium-Rich Alloys. R. C. Burnett and J. R. Murray. *United Kingdom Atomic Energy Authority*, AERE M/M 217, Jan. 1959, 20 p.

Investigations of three samples of Th and on several Th-Al, Th-U and Th-Zr alloys in the as-cast, solution treated and aged conditions. Results suggest that Th-Al alloys can be hardened by precipitation of Th_2Al, that U additions up to 3 at.% do not improve the hot hardness of Th significantly and that Zr additions within the alpha Th solid solution range lead to solution hardening. 10 ref. (Q29p, 2-60, 2-64; Th-b, *Al, U, Zr*)

1041-Q. Metallurgical Examination of a Failed Electro-Magnetic Liquid Metal Pump Channel. G. H. Broomfield. *United Kingdom Atomic Energy Authority*, AERE M/M228, Mar. 1959, 8 p.

A pump channel, which failed by cracking after approximately 950 hr. service in an isothermal loop containing

Pb-Bi eutectic, examined by metallography, radiography and analysis for causes of failure. Data indicate that the Cr steel tube failed in fatigue, probably accelerated by liquid metal corrosion. (Q7, R6m, W13d; AY, *Pb, Bi*)

1042-Q. Tensile Creep Properties of Aluminum Containing 0.2 at.% Magnesium in the Temperature Range 200-350° C. R. Doldon. *United Kingdom Atomic Energy Authority*, IGR-TN/C-993, Mar. 23, 1959. 18 p.

The addition of Mg in amounts less than the limit of solid solubility results in an increase in creep strength; the first addition of Mg has a larger proportional effect than subsequent additions at each temperature; the increase in creep strength brought about by alloying is greater the lower the temperature. 5 ref. (Q3m, 2-60, 2-61; Al-b, *Mg*, AD-q40)

1043-Q. Effects of Hydrogen Embrittlement on Metals: 1952 to Present. Patricia E. Bell. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission*, LAMS-2283, June 3, 1959, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Some 160 literature references, mainly concerned with the action of hydrogen on steel and Ti. (Q26s; ST, Ti, *H*)

1044-Q. Crack Propagation Tests of Some High-Strength Sheet Steels. J. E. Srawley and C. D. Beachem. Naval Research Laboratory. *U. S. Office of Technical Services*, PB 151352, Jan. 1959, 28 p. $.75.

Results for eight high-strength steels using 1/2-in. wide center-cracked tensile specimens. Relation of fracture stress and appearance to testing temperature. Influence of thickness and heat treatment on ductile-to-brittle transition temperature. (Q26q, Q23r, 2-64, 2-61; ST, 4-53, SGB-a)

1045-Q.* Physical Metallurgy of Titanium Alloys. R. I. Jaffee. Paper from "Progress in Metal Physics". v. 7. Pergamon Press Inc., New York, 1958, p. 65-163.

Effects of composition and temperature on mechanical properties, electrical conductivity, hardness and structure of Ti alloys in relation to some 26 alloying elements. 169 ref. (Q-general, P15g, M26, 2-60, 2-61; Ti-b)

1046-Q.* The Stored Energy of Cold Work. A. L. Titchener and M. B. Bever. Paper from "Progress in Metal Physics". v. 7. Pergamon Press Inc., New York, 1958, p. 247-338.

Stored energy resulting from cold deformation is determined by both the extent and temperature of deformation and by material composition. 180 ref. (Q24, 2-61, 2-60)

1047-Q.* Temperature Dependence of the Hardness of Secondary Phases Common in Turbine Bucket Alloys. J. H. Westbrook. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York, 1959, p. 95-115.

Indentation hardness measurements were made on samples of representative carbide and intermetallic compound structures prepared by cold crucible arc melting followed by homogenization and equilibration anneals. Except for Ni_3Al, all compounds studied were significantly harder at room temperature, while all were harder at 800° C. than typical high-temperature alloys. 68 ref. (Q29q, Q29c, 2-61; 14-68, SGA-h)

1048-Q.* Recent Developments in Sintered Titanium Carbide Compositions. J. Wambold and J. C. Redmond. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York, 1959, p. 125-139.

Procedures and equipment used for elevated-temperature testing in tension at Kennametal Laboratory. Properties of high-temperature, high-strength compositions supplied commercially under trade name Kentanium. Fabrication techniques for cemented carbide compositions. (Q-general, 2-62; Ti, 6-69, SGA-h, SGB-a)

1049-Q.* Relations of High Temperature Properties of a Nickel-Base Precipitation-Hardening Alloy to Contamination by Crucibles. R. F. Decker, J. P. Rowe and J. W. Freeman. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York, 1959, p. 388-406.

Trace amounts of B and Zr introduced into a heat resistant TiAl-hardened Ni-base alloy through reaction with crucible refractories during melting improve hot working characteristics and creep-rupture properties to a marked extent. Data for zirconia, alumina and magnesia crucibles. 9 ref. (Q3q, Q23q, E10b, W18h, 2-60, 2-62; Ni-b, *Zr, B*, SGA-h)

1050-Q.* (English.) Structure and Low-Temperature Annealing Effect in Cold-Rolled Alpha Brass. Pt. 1. Structure and

Change in Hardness. Osamu Izumi. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Apr. 1959, p. 120-130.

Hardness change in cold rolled 70-30 brass with different grain sizes and reductions when annealed at 150-450° C. (Q29n, J23p, 2-59, 2-64, 3-68; Cu-n)

1051-Q.* (French.) Sound Waves Produced in Plastic Deformation and the Brittle Fracture of Mild Steel. J. B. Lean and J. Plateau. *Memoires Scientifique de la Revue de Metallurgie*, v. 56, June 1959, p. 91-99.

Measurement of sound waves produced in plastic deformation when Piobert lines are produced. Brittle fracture is preceded by the formation of Piobert lines. 7 ref. (Q24c, Q26s; CN)

1052-Q.* (German.) Properties of Uranium and Its Processing. G. Schneider. *Metall*, v. 13, July 1959, p. 625-630.

Importance of process annealing in cold deformation. 28 ref. (Q-general, F-general, G17, 3-68, J23p, 2-61; U)

1053-Q.* (German.) Elastic Limit of Deep Drawing Steel Sheet After Further Rolling and Aging. Werner Lueg and Paul Funke. *Stahl und Eisen*, v. 79, no. 14, July 9, 1959, p. 969-976.

Determination of the elastic limit of low-carbon steel aged after rolling, following subsequent rolling or without previous deformation. The aging effect decreases in proportion to the number of re-rolling passes. 25 ref. (Q21e, N7a, F23, 3-68; CN-g, 4-53)

1054-Q.* (Russian.) Residual Stresses in I-Beams and Channels. I. V. Gunin, D. I. Piryazev and F. P. Volchek. *Stal'*, June 1959, p. 544-546.

Longitudinal residual stresses in flanges of standard and lightweight I-beams and channels greatly affect their bending strain. These stresses are about the same in lightweight as in standard weight shapes. The longitudinal residual stresses in the web of the substandard weight I-beams is somewhat higher than in the standard beam. (Q25h; ST, 4-57)

1055-Q. (French.) Welded Girders Exposed to Bending Stress. P. Guiaux. *Revue de la Soudure Lastijdschrift*, v. 15, no. 2, 1959, p. 61-81.

Distribution of stress; stress concentrations causing failure along a welded joint. (Q5m, 3-66; ST, 7-51)

1056-Q. (German.) Tensile Strength and Alternate Bend Strength of Light Metal Cast Alloys. W. Buchen. *Giesserei*, v. 46, June 1959, p. 361-364.

Procedure and computation of strength values. Results prove the suitability of cast alloys for considerable mechanical loading. (Q27a, Q5g; Al-b, Mg-b, 5)

1057-Q. (Italian.) Progressive Testing. L. Locati. *Metallurgia Italiana*, v. 51, May 1959, p. 179-184.

Extension of progressive method from fatigue test to other mechanical tests. 6 ref. (Q10, Q7)

1058-Q.* Strong Tough Cermets. Thomas S. Shevlin. *News in Engineering*, v. 31, no. 2, Apr. 1959, p. 17-19, 54.

Tensile strength in excess of 40,000 psi. at 2000° F. and impact energy absorption of up to 70 ft-lb. is found in lamellar cermets formed by welding Ni sheet and previously fired nonporous Ti carbide-Ni cermet strips under pressure. (Q27a, 2-62, Q6n; Ni, 6-70)

1059-Q. Improvement of the High-Temperature Strength Properties of Reactor Materials After Fabrication. R. W. Swindeman and D. A. Douglas. *Journal of Nuclear Materials*, v. 1, Apr. 1959, p. 49-57.

Improvement of Ni-Cr and Ni-Mo alloys by heat treatment, carburizing and choice of material with reference to their service environment. 7 ref. (Q3m, J28, T11, 2-62; Ni-b, *Cr*, *Mo*)

1060-Q. Effects of Heating Neutron-Irradiated Beryllium. J. B. Rich, G. B. Redding and R. S. Barnes. *Journal of Nuclear Materials*, v. 1, Apr. 1959, p. 96-105.

Effects of He, formed by exposure to irradiation. Influence on volume, hardness and bend strength of samples annealed at various temperatures and times. 8 ref. (Q29n, Q5q, P10a, 2-67, 2-64; Be, *He*)

1061-Q.* Transition Temperatures of Chromium and Chromium-Base Alloys. E. P. Abrahamson and N. J. Grant. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 229-242.

Feasibility of producing a ductile Cr by means of a simple deoxidation and denitrogenation addition to electrolytic Cr. Scavengers studied were C, B, Be, Ca, Ce, Cb, Al, Si, Ti and Zr. Results confirm that nitrogen is most significant

impurity in connection with brittle-to-ductile transition. 5 ref. (Q5g, Q23r, C5m, 3-69; Cr, AD-p, *C, B, Be, Ca, Ce, Cb, Al, Si, N, Ti, Zr*)

1062-Q.* Modes of Fracture and Slip in Cemented Carbides. N. M. Parikh. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, p. 169-181.

Modes of fracture are primarily determined by microstructure, which is in turn influenced by relative surface energies of different interfaces. 4 ref. (Q24a, Q24c, Q26; W, Ti, 6-69)

1063-Q.* (French.) Hardness of Martensite in Cast Iron as Affected by Carbon Content. Gabrielle Aubrion. *Fonderie*, no. 161, June 1959, p. 266-271.

Cast iron is held for varying periods at 900° C. and then quenched. Hardness is influenced by the holding time and reaches a maximum after 20 min. 6 ref. (Q29n, J26n, N8p, 2-60; CI, *C*)

1064-Q.* (French.) Effect of Wall Thickness on Thermal Stress in Superheater Tubes of Ferritic and Austenitic Steel. N. Salier. *Revue Universelle des Mines*, v. 15, July 1959, p. 633-649.

Stress computations for various materials under service conditions. 11 ref. (Q25p, 3-73, 2-60; SS-d, SS-e, 4-60)

1065-Q.* The Effect of Temperature Interruption on Anelastic Creep. *ASTM Bulletin*, no. 239, July 1959, p. 61-62.

Alloy steel is heated while under heavy stress to produce a frozen anelastic creep which partially counteracts the plastic creep occurring in service. (Q3, Q22, Q23, 3-66, 2-61; AY)

1066-Q.* (Russian.) Effect of Preliminary Deformation on the Pasticity of Aluminum. V. D. Kuznetsov and A. I. Laskutov. *Doklady Akademii Nauk SSSR*, v. 126, Jan. 1959, p. 70-73.

If structural defects caused by 6-25% elongation tests at 300° C. are of the reversible type, then the mechanical properties of Al are restored, after annealing at 400° C., to their original values. If the deformation is of a permanent character, mechanical properties are not restored to their original state. 12 ref. (Q23p, 2-64, 3-68; Al)

1067-Q.* Mechanical Properties of Irradiated Niobium. M. J. Makin and F. J. Minter. *Acta Metallurgica*, v. 7, June 1959, p. 361-366.

Only a moderate increase in yield strength occurred immediately on irradiation but on annealing in the range 125-175° C. there was a further large increase with the formation of a yield drop at start of deformation. Activiation energy was measured and it is concluded that the process is due to vacancy migration, the yield drop being due to the condensation on dislocations of vacancies produced during irradiation. 15 ref. (Q-general, M26s, 2-64, 2-67; Cb)

1068-Q.* (Czech.) Normalized Manganese Steel Tubes for the Oil Industry. Roman Sejnoha and Ludek Prochazka. *Hutnicke Listy*, v. 14, July 1959, p. 569-573.

Mechanical properties of tubes and strip of the same material after normalizing. Effects of austenitization temperature on grain size; curve representing impact strength for various testing temperatures. 10 ref. (Q-general, M27c, 2-64, T28; AY, Mn, 4-60, 4-53)

1069-Q.* (German.) Relations Between Heat Treatment, Residual Stress and Fatigue Strength in Flame and Induction Hardening. K. Flankenmayer. *Harterei-Technik und Warmebehandlung (Supplement to Industrieblatt)*, v. 5, June 1959, p. 273-276.

Highest fatigue strength results from heat treatment producing greatest residual stresses on the surface of parts. Stress is determined by heat flow during hardening. Stress as a function of case depth. 11 ref. (Q25h, Q7a, J2g, J2h; ST)

1070-Q.* (Hungarian.) Production of St 52 Steel With High Yield Point. Lajos Schottner. *Kohaszati Lapok*, v. 14, June 1959, p. 233-239.

Prevention of embrittlement; methods of increasing the ratio of tensile strength to yield point. (Q26, Q27; CN)

1071-Q.* (Hungarian.) Quality and Surface Defects of Bz5 and Bz8 Sheets and Strips. Zoltan Hegedus and Mihaly Stefan. *Kohaszati Lapok*, v. 14, June 1959, p. 262-267.

Micro and macroscopic investigation shows cracking, flakes and laminations to be due to failures in casting and heat treatment. 5 ref. (Q26q, E-general; 9-71, Cu-s, 4-53)

1072-Q. Atom Movements and Dislocation Structures for Plastic Slip in Single Crystals of Beta-Uranium. M. L. Kronberg. *Journal*

of Nuclear Materials, v. 1, Apr. 1959, p. 85-95.

Theoretical interpretation of slip and plastic flow. 5 ref. (Q24; U, 14-61)

1073-Q.* Creep Processes in Polycrystalline Aluminium. W. A. Rachinger. *Acta Metallurgica*, v. 7, June 1959, p. 374-375.

Plastic deformation of a polycrystalline aggregate is due to one or both of two processes—grain deformation and grain sliding. In Al slowly extended at 300° C. the surface of the specimen deforms by grain elongation while the interior deforms by grain sliding. Thus it is not possible to assume surface observations typical of the interior. (Q3, Q24; Al)

1074-Q. The Deformation of Alpha Uranium at 450 and 500° C. B. R. Butcher. *United Kingdom Atomic Energy Authority*, AERE-R 2898, 1959, 15 p.

Deformation tests on alpha uranium at 450° C. show that the deformation element characteristics are very similar to those at room temperature. Similar tests at 500° C. have revealed that twinning is much decreased, and that there is some evidence for pencil glide in a <100> direction. 9 ref. (Q24, 2-62; U)

1075-Q.* (English) Effects of Compression on the Plastic Deformation Mechanism of Metals Under High Strain Rate and at Various Temperatures. Y. Matsuura. *Waseda University, Castings Research Laboratory, Report*, no. 9, Nov. 1958, p. 49-54.

Graphs show compression stress versus strain rate under various testing conditions. Stress-wave propagation and resistance to plastic deformation. (Q24, Q28k; Al)

1076-Q.* (English.) Study of Zinc-Aluminum Alloys by Measuring Young's Modulus. I. Iitaka and T. Morooka. *Waseda University, Castings Research Laboratory, Report*, no. 9, Nov. 1958, p. 55-56.

Alloys in the alpha phase show the lowest value of the modulus. Tempering and the addition of Mg produce marked changes in Young's modulus. (Q21a, 2-64, 2-60; Zn-b, *Al*)

1077-Q.* (English.) Wear Properties of 70:30 Brass and Beta-Brass. F. Hayama. *Waseda University, Castings Research Laboratory, Report*, no. 9, Nov. 1958, p. 59-63.

Sliding wear of cast and rolled brass on hardened steel shafts is affected by sliding speed, Pb and Zn content and beta structure. (Q9, 2-60; Cu-n, *Pb, Zn*)

1078-Q.* (Czech.) Hardness Changes in Surface Hardened Rail Treads as a Function of Depth and Microstructure. Slavimir Horejs. *Hutnicke Listy*, v. 14, July 1959, p. 649-656.

Tread of rails is surface hardened by short quenching immediately following rolling and then exposed to the annealing action of the heat still present. A relative hardness minimum and hardness maximum with increasing depth is explained by the presence of an austenitic zone under the martensitic surface and transformation of the austenite into bainite. (Q29, J26n, J23, 3-71, T23g; CN)

1079-Q.* (French.) Comparison Between Results of Plasticity and Elastic Limit Tests With Reference to Iron Aged After Deformation. Regina Pankowski-Fern and Georges A. Homes. *Comptes Rendus*, v. 248, June 1, 1959, p. 3167-3169.

Plasticity tests after artificially aging of deformed specimens and tensile tests after natural aging over various periods. Different effects of aging on plasticity and tensile properties. (Q23p, N7a, J27d, Q27, 3-68; Fe-m)

1080-Q.* (French.) Techniques for Testing Brittle Fracture. *Soudage et Techniques Connexes*, v. 13, May-June 1959, p. 183-196.

Brittle fracture properties of several grades of mild steel sheet examined by Charpy impact, notched slow bend, Robertson, Pellini drop-weight, bulge explosion, crack-starter and Tipper tensile tests. 10 ref. (Q26s, 1-54, Q27; CN, 4-53)

1081-Q.* (French.) Fatigue Fracture. *Soudage et Techniques Connexes*, v. 13, May-June 1959, p. 215-230.

Origin and occurrence of fatigue fracture in relation to different grades of steel and various types of welds. Failures occurred in bulkhead stringers of tankers, engine crankshaft and in the main deck of a warship. (Q26, Q7; ST)

1082-Q. (Dutch.) Strength Behavior of Dynamically Loaded Welded Beams and Plate Constructions of Various Designs. A. A. van Douwen. *Lastechniek*, v. 25, July 1959, p. 152-157.

(Q5; 7-51)

1083-Q. (Russian.) Effect of Frequency of Loading on Strength Testing. Yu. S. Danilov and N. V. Kadobnova. *Zavodskaya Laboratoriya*, v. 25, June 1959, p. 727-731.

Strength of metals subjected to cyclic loading is determined not only by size of load and time of its effectiveness but also by number of cycles per min. 4 ref. (Q7e)

1084-Q.* Intercrystalline Fracture in Creep of Chromium and Some Chromium Alloys. G. R. Wilms. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 411-413.

Coarse slip in a grain may produce jogs along the boundary, the size of the jogs depending on number of dislocations which effectively run through the boundary to initiate accommodating slip in the adjacent grain. The remaining dislocations will remain piled-up and there will be a stress field around them at the boundary; if boundary sliding occurs concomitantly, the surfaces at the jogs may be separated to form intercrystalline voids. 9 ref. (Q26, Q3, M26s, 3-68; Cr)

1085-Q.* Recovery of Decarburized Mild Steel. H. L. Couch and J. D. Lubahn. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 433-436.

Strain hardening arising from 1/2% strain can be partly recovered by subsequent heating, even though recrystallization or grain growth does not occur. This recovery varies from 5% in 1 hr. at room temperature to 70% at 800° C. Except for the initial portion (Bauschinger effect), the stress-strain curve following recovery can be superimposed on the original curve by shifting it to the left. 8 ref. (Q22n, Q24, N7e; CN)

1086-Q. Properties of Certain Cold Rolled Austenitic Stainless Sheet Steels. R. J. Mangone, D. B. Roach and A. M. Hall. *Defense Metals Information Center*, Report no. DMIC 113, PB 151069, May 15, 1959, 52 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.)

Data on AISI Type 30, MicroMach, AISI Type 201, USS Tenelon and USS 17-5 MnV. These alloys have yield strengths in excess of 150,000 psi. with ductilities of about 10%. In the extra-hard condition, the alloys have yield strengths of the order of 200,000 psi. or more and ductilities ranging from 1 to 5%. The cold rolled austenitic stainless steels retain good strength at temperatures up to 1000 to 1200° F. (Q-general, Q27, 2-62; SS-e, 4-53)

1087-Q. Ductile-Brittle Transition in the Refractory Metals. F. R. Schwartzberg, H. R. Ogden and R. I. Jaffee. *Defense Metals Information Center*, Report no. DMIC 114, PB 151070, June 25, 1959, 72 p. (Available from U.S. Office of Technical Services, Washington 25, D. C.)

Ductile-brittle transition behavior occurs in Cb, Mo, W and Cr. Data for V suggest that brittleness at low temperatures is attributable to low strain rate hydrogen embrittlement. No brittle transition has yet been found in Ta. The transition from ductile to brittle behavior is associated with a rapid rise in yield strength occurring with reductions in temperature. Brittle behavior is observed to occur when the yield strength equals the fracture strength. 58 ref. (Q23r, Q26s; Cb, Mo, W, Cr, V)

1088-Q. Fracture Appearance of Impact Specimens Taken From Fractured Ship Plates. John A. Bennett. *Ship Structure Committee*, SSC-113, June 29, 1959, 9 p.

A correlation of service failure data on the basis of fracture appearance transitions. Brittle fracture area is determined at failure temperature. (Q26r, T22j; ST)

1089-Q. Dynamic Properties of 6061-T6 Aluminum Weldments. D. W. Grobecker. Paper from "Minutes of the Seventh Annual Atomic Energy Commission Welding Conference". U.S. Atomic Energy Commission, TID-7562, Jan. 1959, p. 209-225.

Analysis of typical Al weld defects, their cause and prevention; determination of impact properties and static strength of base metal and weld deposit; relative merits of 4043 (4.5% Si in Al), 5154 (3.5% Mg prime alloying constituent) and 5356 (5.0% Mg prime alloying constituent) filler materials. (Q27, Q6; Al-b, *Si, Al, Mg*, 7-51, 9)

1090-Q.* (French.) Two stages of Transient Embrittlement Observed With Aluminum-Zinc Alloys of High Zinc Content After Heating and Cooling. Pierre Gobin and Jean Montuelle. *Comptes Rendus*, v. 249, July 1959, p. 271-273.

Effects of heating temperature and cooling speed on transient embrittlement occurring in subsequent natural aging. (Q26s, N7a, 2-60, 2-64; Al-b, *Zn*)

1091-Q.* Effect of Surface Condition on the Initiation of Plastic Flow in Magnesium Oxide. R. J. Stokes, T. L. Johnston and

C. H. Li. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 437-444.

Dislocation half-loops, artificially introduced by sprinkling with carborundum, were subjected to stress using three-point loading. The different stages of loop expansion and multiplication were then correlated with the macroscopic stress-deflection curve. Slip was not detected on unsprinkled crystals below two-thirds of the "yield stress". 8 ref. (Q24, M26b, 3-66; Mg, NM-a34)

1092-Q.* Studies of Slugs From Explosives With Lined Cavities. Pt. 2. R. C. Deshpande and Sampooran Singh. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 497-499.

Metallographic studies of steel slugs recovered after firing shaped charges in deep containers of water. Microstructural studies of the slug completely support the general pattern of the direction of metal flow observed in cast iron and Cu slugs. In the deformed region, the maximum number of twin directions found in the etch plane of a single favorably oriented ferrite grain was four. (Q24, Q26; ST, CI, Cu)

1093-Q.* Twin Accommodation in Au Cd B' Alloys. Howard K. Birnbaum. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 508-509.

Accommodation at the tip of a twin lamella in the Au-Cd beta-prime alloys is achieved by elastic distortion of the twin and matrix. The conditions necessary for this type of twin accommodation are a small twinning shear and a high value of the yield stress. 4 ref. (Q24b; Au-b, *Cd*)

1094-Q.* Fatigue in Single Crystals of Copper. M. L. Ebner and W. A. Backofen. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 510-520.

Hardening as measured by bending moment for approximately constant plastic strain increases with accumulated strain in a way similar to the hardening under unidirectional straining. Fatigue cracks form on active slip planes and can be observed metallographically after saturation occurs. Intersecting slip on primary and secondary planes precedes the visible cracks and is always apparent with the beginning of saturation. Cracking is influenced to an important extent by the geometry of slip-band formation on the stressed surface. 20 ref. (Q7, Q26q, N7e, 3-68; Cu, 14-61)

1095-Q.* Effect of Prestrain on the Creep-Rupture Properties of High-Purity Aluminum and on Al-2% Mg Alloy. N. J. Grant, A. R. Cahudhuri, I. R. Silver and D. C. Ganow. *Metallurgical Society of AIME, Transactions,* v. 215, June 1959, p. 540-544.

Creep tests conducted at 500° F. and 1800 psi. for the pure Al and at 600° F. and 3400 psi. for the alloy. Prestraining has an effect on rupture life and creep rate which was less than a factor of 2 compared to the annealed condition, and therefore within the normal limits of test reproducibility. (Q3q, 3-68; Al-a, Al-b, *Mg*)

1096-Q. (Russian.) Distribution of Fatigue Cracks in Ship Steel. G. N. Vsevolodov. *Zavodskaya Laboratoriya,* v. 25, June 1959, p. 734-735.

From the constructed diagram of variable cyclic bend tests with various stress concentrations it is shown that the rate of crack distribution is diminished as the ultimate tensile strength and size of sample are reduced. (Q26q, 3-66, 3-73; CN, AY)

1097-Q. (Book.) Materials for Rockets and Missiles. Robert G. Frank and William F. Zimmerman. 124 p. 1959. Macmillan Co., 60 Fifth Ave., New York 11. $4.50.

Tensile strength, yield strength, tensile elongation, stress-rupture strength, endurance limit for cermets and wrought, sheet and cast alloys of Fe, Ni, Co, Al and Mo-base alloys. Erosive diffusion; effects of high-temperature brazing on thin material; brazed airfoil; brazed honeycomb structure; chipless production methods; fabrication by draw-roll forming and comparison of lightweight, high-temperature alloys. 51 ref. (Q-general, T2p, T24e, 2-62; Fe-b, Ni-b, Co-b, Al-b, Mg-b, Ti-b, Mo-b, 17-57, 7-59, SGA-h)

1098-Q. (Translation—BWRA.) Choice of Metal and Electrodes for Welded Structures to Work at Low Temperatures. I. N. Gerasimenko. *Avtomaticheskaya Svarka,* v. 66, Jan. 1959, p. 59-63.

Influence of welding on the low-temperature impact strength of 1Kh18N9T stainless steel, 12N3 alloy steel and St3 carbon steel. 4 ref. (Q6n, 2-63, W29h; CN, AY, SS, 7-51)

1099-Q.* Progress in the Development and Application of Steel Plates. W. Barr.

Iron and Steel Institute, Journal, v. 192, June 1959, p. 109-117.

Notched ductile steels, testing methods, revision of steel specifications and design codes for pressure vessels. Application of plates and typical high-temperature tensile properties. 10 ref. (Q23s, Q26s, Q27, 2-62, 2-63, T26q; AY, 4-53)

1100-Q.* An Experimental Investigation on the Mode of Slip in Face-Centered Cubic Metals. Tadami Taoka, Ko Yasukochi, Ryukichi Honda and Isao Oyama. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 1-6.

Changes in saturation magnetization of ordered Ni_3Mn and Pt_3Co alloys caused by plastic deformation. Explanation in terms of slip taking place in steps of one atomic distance on many successive planes. 10 ref. (Q24a, P16r, 3-68; Ni-b, *Mn*, Pt-b, *Co*)

1101-Q.* Effects of Raw Materials Purity and Melting Method on the Properties of Nickel-Chromium Alloys. Renpei Yoda. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 27-31.

Microstructure and mechanical properties of Ni-Cr alloys and Nimonic-80 alloys prepared by rapid or slow melting in a Tammann furnace. (Q3m, Q29n, M27b, 2-64, 3-69; Ni-b, *Cr*)

1102-Q.* Study on Austenitic Heat-Resisting Steels. Yoshikichi Konishi, Takeshi Akutagawa, Toshio Fujita, Ryuichi Nakagawa and Yasuo Otoguro. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 73.

Hardness, microstructure and creep-rupture properties of steels with 16 to 20% Ni, 16% Cr up to 25% Co and slight amounts of Mo, W, B, Ti and Al following various solution treatments and aging procedures. (Q3m, Q29n, M27d, 2-62, 2-64, 2-65; SS-e, SGA-h)

1103-Q.* Study on Several Properties of Cobalt-Base Alloys at High Temperatures. Tetsutaro Mitsuhashi, Renpei Yoda and Toru Watanabe. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 73.

Hardness and microstructure of Co-Ni-Cr-W alloys after forging, solution treatment and aging. Effect of Ni and C on high-temperature characteristics. (Q29p, M27d, 2-60, 2-62, 2-64, 2-65; Co-b, *Ni, Cr, W, C*)

1104-Q.* Study on Molybdenum Disilicide Cermet. Tetsutaro Mitsuhashi and Kiyoshi Tamura. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 74.

Density, hardness, modulus of rupture and resistance to corrosion, oxidation and thermal shock of cermets prepared by hot pressing or vacuum sintering. (Q-general, R1h, R6g, H14h, H15n; 6-70, Mo)

1105-Q.* Effect of Aluminum, Tin and Molybdenum on Hot-Hardness of Zirconium. Yuzo Hosoi and Norio Nagata. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 75.

Hot hardness of binary Zr alloys containing Al, Sn or Mo. (Q29p; Zr-b, *Al, Sn, Mo*)

1106-Q.* Abrasion Resistance of Copper Base Spring Materials. Yoshikichi Konishi and Ichiro Morimoto. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 76.

Resistance of phosphor bronze, nickel silver, brass, beryllium bronze, aluminum bronze and Cu-Ni-Mn alloy to abrasion by phosphor bronze or brass rotating rings. (Q9n; Cu-b, Cu-n, Cu-s, *Be, Al, P, Zn, Sn*)

1107-Q.* High Strength Welds in Aluminum. *Precision Metal Molding*, v. 17, Aug. 1959, p. 52-53.

Welding characteristics of Tens-50 Al alloy filler rods. Resulting tensile tests conducted with Tens-50 welded sample rods compare favorably with 4043 and 6061 alloy welds fabricated on identical parent metal. (Q27, W29h; 7-51, Al-b)

1108-Q.* (German.) Relationship Between Bar Shape, Temperature of Embrittlement and Steel Quality. Herbert Kussmann. *Stahl und Eisen*, v. 79, July 1959, p. 1065-1075.

Kuntze and Kahn methods for tension tests on notiched test bars. Embrittlement temperature was recorded in impact bending tests using test bars. Notch sensitivity as a function of chemical composition of material and grain size; embrittlement temperature as a function of the notch radius at unit impact value. (Q23s, Q26s, Q6, 2-59, 2-60; ST)

1109-Q.* (German.) Elastic Constants of Germanium. Jan Koppelmann and Gottfried Landwehr. *Zeitschrift fur Angewandte Physik*, v. 11, May 1959, p. 164-167.

Elastic constants of Ge single crystal determined by ultrasonic velocity measurements. (Q21; Ge, 14-61)

1110-Q.* (Japanese.) Stresses and Cracking in Cast Aluminum Alloys. Torao Kobayashi. *Light Metals*, v. 9, Mar. 1959, p. 29-37.

Relationship between casting stresses and composition of several types of binary Al and Cu alloys; effect of casting conditions in production of stresses; stress-relief heat treatment. (Q25h, E-general, J1; Al-b, 5)

1111-Q.* (Slovakian.) Belgian Research on the Embrittlement of Welded Structural Steels. O. L. Bihet. *Zvaracsky Sbornik*, v. 8, no. 1, 1959, p. 37-49.

Large experimental weldments of rimming, semikilled and killed steel were produced and impact tested at low and room temperatures. 16 ref. (Q26s, 2-63; ST, 7-51, SGB-s)

1112-Q. Tensile Deformation and Tensile Strength of Aluminum Single Crystal Coated With Oxide Film. Tadasuke Mukai. *Hiroshima University, Journal of Science*, Series A, v. 22, Sept. 1958, p. 99-113. (Q27a; Al, 14-61)

1113-Q. Slip Patterns on the Stretched Single Crystal Aluminum Plates. Takao Kino and Takeo Fujiwara. *Hiroshima University, Journal of Science*, Series A, v. 22, Sept. 1958, p. 111-126.

Slip patterns developed by stretching on Al single crystal plates which have definite crystallographic orientations (001), (110), (111). (Q24a; Al, 14-61)

1114-Q. (German.) Brittleness—No. 1 Problem in Steel Construction. L. Seltenhammer. *Schweisstechnik*, v. 13, Apr. 1959, p. 37-46.

Conditions of embrittlement and occurrences of failure. 19 ref. (Q26s; ST)

1115-Q. (German.) Materials Testing Machines. Gerhard Jacoby. *VDI-Zeitschrift*, v. 101, July 1959, p. 917-924.

Tensile and hardness testing equipment. (Q29n, Q27a, 1-53)

1116-Q. The All-Beta Titanium Alloy. (Ti-13V-11Cr-3Al). R. A. Wood and H. R. Ogden. *Defense Metals Information Center*, Report no. 110, PB 151066, Apr. 17, 1959, 196 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

In the annealed condition (all-beta structure), it is a medium-strength (120,000-psi. yield strength) very formable alloy. It can be hardened by an aging treatment to have yield strength in excess of 180,000 psi. Combinations of cold or warm working followed by aging produce higher strengths than are obtained by aging alone. Detailed data on heat treatment, mechanical properties, welding and forming. 34 ref. (Q-general, G-general, J-general; Ti-b, *V, Cr, Al*)

1117-Q.* The Mechanism of Thermal Fatigue. H. S. Avery. *Metal Progress*, v. 76, Aug. 1959, p. 67-70.

Metal parts exposed to fluctuating temperatures for long periods eventually deteriorate. Experimental work and theoretical analysis indicate the cause to be plastic flow induced by expansion and contraction during heating and cooling. The effect can be minimized by proper design, selection of alloys that combine high hot strength with low thermal expansion coefficients, and by favorable operating conditions. (Q7j)

1118-Q.* Copper-Titanium Alloys Have High Strength. M. J. Saarivirta and Howard S. Cannon. *Metal Progress*, v. 76, Aug. 1959, p. 81-84.

Strength exceeding 200,000 psi. can be reached with a new Cu alloy containing 4.3% Ti. After solution treating, the alloy can be cold worked more than 90%. Subsequent aging develops the properties. (Q27a, 2-60, 2-64; Cu-b, Ti)

1119-Q.* Bigger, Better and Sounder Forgings. Ernest E. Thum. *Metal Progress*, v. 76, Aug. 1959, p. 103-108.

In an effort to improve the efficiency of large electrical generators, sizes and stresses have been increased to just about the capacity of the "standard" alloy steel forgings. The behavior of large notched disks, tested to destruction by spinning, simulates actual performance. New criteria have been found for toughness and ability to prevent cracks from starting and propagating. (Q26s; AY, 4-51)

1120-Q. Improvement of the High-Temperature Strength Properties of Reactor Materials After Fabrication. R. W. Swindeman and D. A. Douglas. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission*, ORNL-2687, June 15, 1959, 26 p.

Creep and tensile data for Inconel, Hastelloy B and INOR-8. Depending on material and service conditions, improvements in strength can be brought about by annealing or aging, carburization and environmental control during service. (Q3, Q27, 2-64, 2-65; Ni-b, SGA-h)

1121-Q. Observations on the Effect of Surface and Structure on the Tensile Strength of Iron Whiskers. Helmut Weik. *Wright Air Development Center,* Technical Note, 58-369, May 1959, 21 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.)

Fe whiskers were prepared under different conditions by reduction from iron chloride. The shape and mechanical properties of the whiskers depend very much on the growth conditions. Different tensile behavior of the surface layers of the whiskers compared to that of the whisker core leads to the conclusion that the whiskers are not perfect crystals with a center screw dislocation as the only lattice imperfection. It may well be that the whiskers consist of layers or shells. 39 ref. (Q27a, 3-73; Fe, 14-61)

1122-Q.* (Czech.) Magnetic Methods for Checking Steel Parts After Heat Treatment. B. H. Zitka. *Strojirenstvi,* v. 9, Jan. 1959, p. 41-42.

Quality control of heat treated parts based on determination of their mechanical properties from their magnetic behavior. Determination of hardness of heat treated bolts was checked by the magnetic method. Factors influencing the determination include magnetic remanence, permeability and hysteresis losses. (Q10, Q29, P16, 2-64; ST)

1123-Q.* (Czech.) Strain Determination With Strain Gages in Liquids Under Pressure. J. Havlik. *Strojirenstvi,* v. 9, Jan. 1959, p. 62-70.

Strain determination in pressure vessels exposed to hydrostatic pressure. Effects in strain gages for which correcting factors have to be considered include effects on temperature, presence of moisture and pressure. Examples of measurements with strain gages carried out in pressure vessels with various fluids. (Q25, T26q, X28j)

1124-Q.* The Effect of Phosphorus on the Mechanical Properties of Flake Graphite Cast Iron. G. N. J. Gilbert. *British Cast Iron Research Assoc., Journal,* v. 7, June 1959, p. 692-724.

Phosphorus up to approximately 0.8% increases tensile strength, and this is associated with a decrease in eutectic cell size; 1% phosphorus increases the Brinell hardness by approximately 40 points. The generally accepted relationship between tensile strength, hardness, modulus of elasticity and chemical composition requires modification to account for the effect of phosphorus. 11 ref. (Q-general, 2-60; CI, *P,* AD-q40)

1125-Q. The Properties of Magnesium-Thorium Alloys. R. J. Jackson. *Defense Metals Information Center,* DMIC Memo. 20, May 29, 1959, 28 p.

Analysis of tensile properties and creep strength of HK31A, HM21A, HM31A, HZ32A, ZH62A, HM11XA and HZ21 alloys. 13 ref. (Q27a, Q3m; Mg-b, *Th*)

1126-Q.* Radiation Damage in Ferrous Metals. D. E. Thomas. *Journal of Metals,* v. 11, Aug. 1959, p. 523-527.

Irradiation increases strength and decreases ductility. In general, the yield stress is increased proportionately more than the ultimate stress, accompanied by a reduced strain-hardening capacity and decreased uniform elongation. 14 ref. (Q-general, 2-67; Fe)

1127-Q.* High Silicon Aluminum Casting Alloy. Oldrich Tichy and Rolf Kissling. *Modern Metals,* v. 15, July 1959, p. 42-46.

Mechanical properties at room temperature of die, chill and sand-cast Al-Si alloy in as-cast and heat treated conditions. Effect of Si content on tensile strength and coefficient of thermal expansion. Response to aging; dimensional stability. (Q27a, Q29n, P11g, 2-60, 2-64; Al-b, *Si,* 5)

1128-Q. Tensile Properties of Titanium Alloys at Low Temperatures. F. C. Holden, F. R. Schwartzberg and H. R. Ogden. Defense Metals Information Center. *U. S. Office of Technical Services,* PB 151062, Jan. 1959, 47 p. $1.25.

Factors affecting low-temperature properties are alloy composition, interstitial content and microstructure. Sensitivity to notches generally increases as the temperature is lowered. Reasonable ductilities at -320° F. usually can be obtained, provided the interstitial content is kept low. Ductility at low temperatures is higher when the microstructure is equiaxed, rather than transformed.

1129-Q. Development of a Heat Treatable Titanium Sheet. C. R. Lillie and D. W. Levinson. Armour Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151279, Aug. 1958, 92 p. $2.25.

Ti-3Al-7Mo-0.25Be alloy with room-temperature yield strength of 160,000 psi.

for 0.2% offset. High-temperature stability. Value of Be for strengthening alpha-beta alloys. (Q27a, Q3m; Ti-b, *Al, Mo, Mn, Be,* 4-53)

1130-Q. Development of Wrought Beryllium Alloys of Improved Properties. Pt. 1. J. G. Klein, L. M. Perleman and W. W. Beaver. Brush Beryllium Co. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151711, Feb. 1959, 154 p. $3.

Rolled and extruded metal of commercial purity was evaluated with regard to its mechanical properties from room temperature to 1200° F. Structurally modified Be was compared with the commercial Be with regard to fabrication by extrusion and rolling, crystallographic and metallographic structures and mechanical properties. Preferred crystallographic orientation improves tensile properties in the direction of work. Recrystallization and grain growth must be avoided in cross rolling from extruded bars. (Q-general, M26, Q27a, F23, F24; Be)

1131-Q. An Investigation of the Mechanical Properties of Cermets as Related to the Microstructure. J. Binder and R. Steinitz. Firth Sterling, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151722, Jan. 1959, 95 p. $2.25.

Report of basic research in correlating changes in the microstructure of cermets with changes in physical properties with a view toward the possibility of eliminating cermet brittleness by changing microstructure. Using 60% TiC, 40% Ni as the test material, test groups were formulated, comprising changes in original particle size, processing procedure and controlled binder addition. Average grain size plays a distinct role in physical properties. (Q-general, M27, P-general, 2-59; Ti, Ni, 14-68, 6-70)

1132-Q. Development of Active Eutectoid-Base Titanium Alloys. R. F. Bunshah, D. Osterberg, E. Ence and H. Margolin. New York University College of Engineering, Research Division. *Wright Air Development Center,* Quarterly Progress Report no. 4, May 1959, 13 p.

Some 76 complex compositions based on alloys with 5% Cu, with 6% Cu, 6% Ni, 2% Cu, 2% Ni and 2% Cu, 4% Ni with various combinations of alpha strengtheners Al, Zr and Sn were produced. Short-time room and elevated-temperature tensile tests were carried out, in addition to stability evaluations for exposure at 1000° F. under no load. (Q27, 2-62; Ti-b, *Cu, Ni, Al, Zr, Sn,* AD-q, 40)

1133-Q. Energy of Crack Formation and Crack Propagation Under Impact. W. B. Triplett and C. Wells. Carnegie Institute of Technology Metals Research Laboratory. *Wright Air Development Center,* Progress Report no. 4, July 15, 1959, 22 p.

Crack formation and regular impact transition curves; 4340 steels, HY80 steel containing Ni, Cr, Mo, and T-1 steel containing Ni, Cr, Mo together with Cu, V, and B. 9 ref. (Q26q, Q6; CN-g, *Ni, Cr, Mo, Cu,* V, B)

1134-Q.* Mechanical Properties of Metals. A. M. Freudenthal. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 1-30.

Concepts of metal structure; structural mechanisms of deformation; mathematical idealization of mechanical response to applied forces. Significance of mechanical testing and interpretation of results. (Q-general, M25, M26)

1135-Q.* Hardness and Its Measurement for the Metallurgist. V. E. Lysaght. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 35-90.

Significance of hardness testing. Brinell, Rockwell, diamond Pyramid, portable and microhardness testing equipment. Problems in hardness testing. (Q29)

1136-Q.* Plastic Behavior of Metals Under Simple and Combined Stresses. Evan A. Davis. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 91-110.

Mathematical treatment of elastic and plastic behavior. General expressions for distribution of strain in a plastic body and the shape of stress-strain diagram. 10 ref. (Q21, Q23, Q24, Q25n)

1137-Q.* Creep Resistance and High-Temperature Properties of Metals. G. V. Smith. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 111-125.

Fracture of metals at elevated temperatures; evaluation and extrapolation of creep and creep-rupture data; relaxation phenomena; effect of notches, environment and fatigue. Relation between hot hardness and rupture properties. (Q3, Q26, Q7a, 2-62, 3-73; ST, SS, Al-b)

1138-Q.* Fatigue Strength of Metals. Thomas J. Dolan. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 127-162.

Mechanism of progressive fracture; statistical nature of fatigue; influence of production processing; stress raisers; temperature and frequency; effect of mean stress and fluctuations in amplitude of alternating stress on accumulation of damage. Corrosion and fretting fatigue. 27 ref. (Q7a, R1e, R1f, 3-66; ST, Al-b, Ti-b, Cu-b)

1139-Q.* Statistical Analysis of Fatigue Data. Foster B. Stulen and H. N. Cummings. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 163-202.

Consideration of service loads and stresses; fatigue testing procedures; statistical techniques for analyzing fatigue data. 17 ref. (Q7, S12)

1140-Q.* Modern Fatigue Testing Machines and Their Applications. Alexander J. Yorgiadis. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 203-233.

Crank and oscillator-type mechanical fatigue machines, their characteristics and applications; load control problems. 13 ref. (Q7, 1-53)

1141-Q.* Metals Under High Speed Loading. John S. Rinehart. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 235-261.

Propagation of transient stress disturbances in metals. Loading generated by explosive charges. Fracturing and plastic deformation under impulsive loading. Critical impact velocity; delay time. 11 ref. (Q24j, Q26r, Q6q)

1142-Q.* Radiation Effects on Metals. J. C. Wilson. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 263-275.

Mechanism of radiation damage in metals; effects of neutron irradiation on tensile properties and ductile-to-brittle transition temperatures. 10 ref. (Q7a, Q23r, 2-67; ST, SS)

1143-Q.* (English.) Study of the Nature of Fatigue Damage of Plain Carbon Steel by Reheating Method. Takeo Yokobori. *Tohoku University, Technology Reports*, v. 28, no. 2, 1959, p. 91-101.

Fatigue damage from overstressing in notched and unnotched specimens of plain carbon steel as measured when tested at original endurance limit. Influence of understressing, or of vacuum stress relief following overstressing, on damage. 4 ref. (Q7b, 2-64, 3-66; CN-p)

1144-Q.* (English.) Secular Change After Cold Working and Anneal-Hardening of Alpha Brass. Osamu Izumi and Tadatsugu Yoshiki. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 201-209.

Hardness and bending deflection of 70-30 brass after cold rolling and after low-temperature annealing. Variation with holding time at room temperature or at 40° C. 8 ref. (Q21, Q29n, 3-68, 2-65; Cu-n)

1145-Q.* (Japanese.) Experimental Study on the Abrasion of Martensitic Steel Weld Metal. Sukemitsu Itoh and Mitsuhiro Kawaguchi. *Japan Journal of Mechanical Laboratory*, v. 13, May 1959, p. 30-35.

Weld metal tested for abrasion factors over both a rubber and a Cu surface. The abrasive consisted of crushed quartz, both wet and dry, applied to a contact area with a load of 2.7 kg. per sq. cm. traveling at the rate of 30 or 60 m. per min. (Q9; 7-51, SS-c)

1146-Q. Steel—by Slipstick or by Slapstick. Robert E. Harvie. *Society of Automotive Engineers*, Preprint 73T, 1959, 8 p.

Inter-relationships between tensile properties, fatigue resistance, hardness, wear resistance, microstructure and formability; their importance in functional design and performance. (Q-general, T21; ST, 17-51)

1147-Q. Castings Tackle the Muscle Jobs. *Steel*, v. 145, Aug. 24, 1959, p. 84-86.

With tensile strengths as high as 300,000 psi., steel castings are moving

into competition for critical structural parts of aircraft and missiles. (Q27a, T24; ST, 5)

1148-Q.* Can Nickel-Free Stainless Compete at High Temperatures? R. R. Brady and D. T. Boughner. *Iron Age*, v. 184, Aug. 13, 1959, p. 90-92.

Tests indicate that Tenelon, (a high-Mn, high-nitrogen austenitic stainless steel which is very low in Ni) maintains its rupture strength at 900, 1050, 1200 and 1350° F. better than the rupture strength of commercial 18% Cr, 8% Ni stainless steels (AISI Types 304, 316, 321 and 347). (Q3q, 2-60, 2-62; SS-e)

1149-Q.* (Czech.) Production Technology of High-Alloy Austenitic Alloys. Z. Eminger and J. Krumpos. *Slevarenstvi*, v. 7, May 1959, p. 184-187.

Properties of Nimonic alloys and Udimet-500 compared with a new Ni-Cr-W-Mo-Ti-Al-B alloy designed for service temperatures up to 700° C. 4 ref. (Q-general, A-general; Ni-b, *Cr, W, Mo, Ti, Al, B*)

1150-Q.* (Czech.) Fatigue Strength of Gears. F. Benes. *Strojirenstvi*, v. 9, Feb. 1959, p. 119-125.

Experimental results. Various kinds of loads were applied and the failure conditions analyzed in relation to tooth shape, radius of the tooth base, material properties and qualities. (Q7a, T7a; ST)

1151-Q.* (Czech.) Brazed Hard Alloy Tool Tips. J. Houdek. *Strojirenstvi*, v. 9, Mar. 1959, p. 212-219.

Design factors in brazed tip tools; causes of stress in tips; experimental methods for normal and excessive stress measurements. (Q25p, K8, T6n; TS)

1152-Q.* Fatigue Failures in Ore Bridges. Harry C. Prince. *Iron and Steel Engineer*, v. 36, July 1959, p. 80-88.

Stresses and strains in bridge members suffering greatest number of failures. Importance of stress-raisers such as notches and rivet holes in fatigue failure. (Q7b, 3-66, 3-73; ST)

1153-Q.* Hypereutectic Aluminum-Silicon Alloys. Richard M. Smith. *Society of Automobile Engineers*, Preprint no. 65A, June 1958, 9 p.

Mechanical and physical properties, foundry characteristics and applications of Al-20 Si-2 Cu-Mg-0.5 Mn alloy. Effect of phosphorus addition on properties and primary Si particle size of permanent mold and sand castings. (Q-general, P-general, 2-60; Al-b, *Si, Cu, Mg, Mn, P*, 5-60, 5-63)

1154-Q.* Latest Developments in Impact Extruded Aluminum Alloys. R. A. Quadt. *Society of Automotive Engineers*, Preprint no. 65D, June 1958, 13 p.

Longer, larger and more complex impact extrusions in strong heat treatable alloys. Sintered Al powder impacts. Applications of high-strength extrusions. (Q-general, G5; Al-b, 4-58)

1155-Q.* Are Spot and Seam Welds Practical in Tension? Peel Tests Say Yes. *Welding Design & Fabrication*, v. 32, Aug. 1959, p. 30-31, 50-51.

Strength of spot and seam welds in stainless steel, Ti alloys and Al alloy as influenced by design configuration. (Q27a, Q2g, K9r, 17-51; SS, Al-b, Ti-b)

1156-Q.* (French.) Absorption of Ultrasonic Waves in Solids. M. Redwood. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 172-180.

Possible causes of error in determination of absorption in low damping capacity solids at frequencies between 10 and 300 magacycles per sec. Role of dislocations in experimentally observed variation of internal friction in metals as influenced by such factors as frequency and temperature. 49 ref. (Q8h, Q22, M26b)

1157-Q.* (French.) Measurement of Damping Capacity in the Study of Fatigue in Ferromagnetic Materials. K. M. Entwistle. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 224-230.

Height and position of a peak of magnetic origin in the damping capacity-vibrational strain curve was measured for Ni and several steels. Results show, in accordance with predictions based on domain theory, that alternating strain at peak damping is of the order of the average internal strain in the material. 8 ref. (Q8, Q22j, P16c; ST, Ni)

1158-Q.* (German.) Developments in the Field of Wear Resisting Materials Used in the Construction of Crushing Machines. T. E. Norman and G. E. Ott. *Giesserei*, v. 46, July 30, 1959, p. 441-447.

Production processes and properties of wear resisting cast alloys with an Fe base and their composition with special reference to an alloy containing 12% Mn and 2% Mo, heat treating of Cr-Mo steels

containing 15% Cr and 3% Mo and 3% Ni, 2% Cr and 1% Mo. Wear resistance, suitability and application of each type of material. (Q9, J-general, W15n; SS, *Mo, Ni,* SGA-m)

1159-Q.* Techniques for Creep Testing at High Temperatures. D. J. Armstrong, D. Murray and L. M. T. Hopkin. *Journal of the Less-Common Metals,* v. 1, Apr. 1959, p. 125-131.

Apparatus for testing of cermets. (Q3; 6-70)

1160-Q.* Theory of Thermal Stresses. D. M. Gilbey. *Journal of the Less-Common Metals,* v. 1, Apr. 1959, p. 139-144.

Method of calculation of thermal stresses which allows all the so-called constants to vary with temperature and which can also cope with stress-strain curves which bend over when plastic strain occurs. (Q25n, Q25p)

1161-Q.* Atmospheric Contamination of Chromium and Its Effect on Mechanical Properties. G. R. Wilms and T. W. Rea. *Journal of the Less-Common Metals,* v. 1, Apr. 1959, p. 152-156.

Cr heated in air at 950° C. for 200 hr. is contaminated to a considerable extent by nitrogen. This has a marked effect on the mechanical properties, especially the ductile → brittle transition temperature, the magnitude of the effect depending on the rate of cooling from 950° C. 4 ref. (Q23r, 2-62, 2-66; Cr, *N*)

1162-Q.* Development of Heat Resistant Titanium Alloys. Ulrich Zwicker. *Journal of the Less-Common Metals,* v. 1, June 1959, p. 165-184.

Electron-microscope photographs of the alloy $TiAl_6$ show the formation of the $alpha_2$-phase at 500° C. Aging tests were performed in order to examine the embrittlement of alloys containing more than 7% Al. Addition of 3-4% V prevents the embrittlement of an alloy with 9% Al after aging at 550° C. up to 1000 hr. 20 ref. (Q-general, Q26s, 2-65; Ti-b, SGA-h)

1163-Q.* Properties of Titanium-Aluminum-Niobium Alloys. J. Suiter. *Journal of the Less-Common Metals,* v. 1, June 1959, p. 232-236.

The addition of Cb to a binary Ti-Al alloy results in increased strength at temperatures up to 500° C. If the alloy contains 10 at. % Cb then the strength at low temperatures can be raised by heat treatment. Still higher strengths can be obtained by the use of poorer grades of sponge Ti without much sacrifice in ductility. 4 ref. (Q-general, 2-60, 2-64; Ti-b, *Al, Cb*)

1164-Q. Investigation of Fe-Mn-Cr-N-C System for Heat Resistance and Oxidation Resistance Between 1200 and 2000° F. Pt. 2. J. P. Tarwater and E. J. Dulis. Crucible Steel Co. of America. (Wright Air Development Center). *U.S. Office of Technical Services,* PB 151558, Oct. 1958, 115 p. $2.50.

Heat treated austenitic Cr-Mn-C-N steels containing strengthening elements have room and high-temperature properties and creep-rupture strengths that compare favorably with such superalloys as A286 and Inco 901. Various combinations of V, Cb, W and Mo were used as strengthening elements. Proper selection of composition and heat treatment results in adequate ductility in tension and creep-rupture, but a decrease in impact properties v s unavoidable. (Q3m, R1h, 2-64, 2-62, 2-60; SS-e, *Mn, C, N,* SGA-h)

1165-Q.* (French.) Gravity Cast Light Metal. Fernand Dabel. *Revue de l'Aluminum,* no. 266, June 1959, p. 721-728.

Mechanical properties of A-Z5G alloy castings. (Q27a, Q29n; EG-a39, *Al-b,* 5)

1166-Q.* (German.) Causes of Tool Wear. G. Ostermann. *Industrie Anzeiger,* v. 81, Aug. 4, 1959, p. 13-21.

Tool wear in relation to mechanical rubbing, bonding of hard metal and material machined, effect of diffusion, plastic deformation, structural changes and electrochemical processes during cutting. 13 ref. (Q9, T6n)

1167-Q.* Evaluation of Properties Obtained From an Air-Induction and Vacuum-Arc Melted High-Temperature Alloy. J. Bulina and J. T. Brown. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 571-577.

Quadruplicate tensile tests at room temperature and 1200° F., and quadruplicate stress-rupture tests at 1200° F., 80,000 psi., and 1300° F., 65,000 psi., on two heats of laboratory-melted W-545 alloy, one air-induction melted and the other vacuum-arc melted, and two heats of pilot-plant produced alloy. (Q27, Q3q, C5h, C5j, 1-73; Fe-b, SGA-h)

1168-Q.* The Embrittlement of Glass-Coated Silver Wire on Heat Treatment. Chikara Hirayama. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 622-624.

Fiber-glass-covered wire became embrittled when heated at temperatures at which the glass was fused. The degree of embrittlement was dependent on the temperature and on the time of exposure. When heated for 44 hr. at 740° C. the cracks in the wire were very small and comparatively few. At higher temperatures the cracks were more numerous and much larger. The embrittlement is indirectly caused by the migration of some component, typical of the glass, to the grain boundaries of the Ag. (Q26s, 2-64; Ag, 4-61, NM-f42)

1169-Q.* The Effect of Oxygen on the Tensile Properties of Titanium. C. Feng, C. Elbaum and W. C. Winegard. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 632-635.

Tensile experiments, using a soft-tensile machine, were performed on Ti and Ti-oxygen alloys. Results indicate that the previously reported increase of the yield strength with increase in oxygen concentration may be explained in terms of both an increase in the proportional limit and a very marked increase in the rate of work hardening. Results are interpreted in terms of simple dislocation-solute interaction theory. 9 ref. (Q27, 2-60; Ti, *O*)

1170-Q.* Effects of Melting and Casting Procedures on the Elevated Temperature Properties of Nickel and Cobalt-Base Alloys. M. J. Stutzman and J. W. Cunningham. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 637-647.

Stellite 31 and He 1049 alloys and Udimet 500 were each melted and cast in air and melted in vacuum and cast under argon. Tensile tests were run at room temperature, 1200, 1500 and 1700° F. Stress-rupture tests were run at 1250, 1500, 1600, 1700 and 1800° F. Oxidation resistance was determined as weight and following intermittent exposures to air at room temperature and 2000° F. 7 ref. (Q27, Q3q, 2-62, C5j, 1-73; Co-b, Ni-b)

1171-Q.* The Aging of Hydrogen-Charged Rimmed Steel. H. C. Rogers. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 666-672.

The yield point of rimmed steel sheet was eliminated by electrolytic charging with hydrogen. The activation energy for its return on aging was measured and found to be identical to that measured for the return of the yield point on aging after plastic deformation of the same steel, uncharged. It was also compared with the measured activation energy for the return of ductility to these steels embrittled by hydrogen charging. 22 ref. (Q24c, Q23p, N7, 2-65; ST-d, 4-53, *H*)

1172-Q.* Temperature Dependence of the Critical Stress for Slip in Magnesium Alloy Monocrystals. W. F. Sheely, E. D. Levine and R. R. Nash. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 693-695.

Variation with temperature of critical stress for basal slip of binary solid-solution single crystals of In and of Th in Mg. 8 ref. (Q24a, 2-61, 3-66; Mg-b, *In,* TH, 14-61)

1173-Q.* Hydrogen in Cold Worked Iron-Carbon Alloys and the Mechanism of Hydrogen Embrittlement. M. L. Hill and E. W. Johnson. *Metallurgical Society of AIME, Transactions,* v. 215, Aug. 1959, p. 717-725.

Cold working of Fe-C alloys was found to increase greatly the hydrogen solubility and to decrease the diffusivity at temperatures up to 400° C. These effects are increasing functions of both the carbon content and the degree of deformation. The hydrogen behavior is consistent with the idea that cold working creates "traps", which are concluded to be microcracks in which the hydrogen is chemisorbed. 33 ref. (Q26s, N1, 3-68, 2-60; Fe-b, *C*)

1174-Q.* Molybdenum—Vanguard Material for Space Vehicles. Alan V. Levy and Saul E. Bramer. *SAE Journal,* v. 67, Aug. 1959, p. 41-46.

High-temperature mechanical properties. Recommended methods for preventing some of Mo shortcomings at room temperature, such as cracking and oxidizing. (Q-general, P-general, 2-62, T24c; Mo, 17-57)

1175-Q.* Effect of Alpha Beta Thermal Cycling on Uranium and Its Alloys. B. R. Hayward. *Nucleonics,* v. 17, Aug. 1959, p. 74-79.

Materials of higher than 90% uranium submitted to thermal cycling through the alpha-beta transition temperature at 600° C. show dimensional instability. (Q7j, P10d; U)

1176-Q.* (Czech.) Austenitic Heat Resisting Poldi AkRN Steel. J. Vodsedalek. *Strojirenstvi,* v. 9, June 1959, p. 439-444.

Chemical composition and properties of heat resisting austenitic steel containing 30-40% Ni with W or Mo as addition agents. Mechanical properties, creep

and fatigue data, conductivity, relaxation, hardness and changes due to overheating. (Q-general; SS-e, SGA-h, *W, Mo,* Ad-q40)

1177-Q.* (Czech.) Microhardness Tests. J. Shon. *Strojirenstvi,* v. 9, June 1959, p. 453-460.

Comparison with the Vickers, Knoop and Brinell methods. (Q29q)

1178-Q. Preliminary Observations on Methods of Measuring Mechanical Properties of Solids at High Temperatures. Barry L. Mordike and Leo M. Fitzgerald. *Journal of the Less-Common Metals,* v. 1, Apr. 1959, p. 132-138.

Use of a carbon tube resistance furnace; induction and electron bombardment techniques. (Q-general, 2-62, X24j, 1-54)

1179-Q. (English.) Internal Friction of Lead. Pt. 2. Yosio Hiki. *Physical Society of Japan, Journal,* v. 14, May 1959, p. 590-596.

Internal friction of Pb single crystals measured as a function of the strain amplitude, frequency and temperature. 17 ref. (Q22, 3-68, 2-61; Pb, 14-61)

1180-Q.* Static Brittle-Fracture Initiation Yield at Net Stress 40% of Yield. C. Mylonas, D. C. Drucker and J. D. Brunton. *Australian Welding,* v. 2, May 1959, p. 21-26.

Static fractures are evidence of a lack of ductility at the point of crack initiation and occur at low average net stress. Static tests show that, under adverse notch conditions, sufficient ductility is present to allow yielding before fracturing. Stress-strain diagrams of brittle fracture tests of plates are given. The lowest average stress at fracture is 36% of the virgin field. (Q26q, Q26s, 3-66)

1181-Q.* (French.) Influence of Impurities on the Properties of Brasses. P. J. Le Thomas and D. Arnaud. *Fonderie,* July 1959, p. 323-325.

Influence of Pb, Sn, Fe, Sb, Mg, As, Ni, Al, Si, Mn and P on mechanical properties, machinability and corrosion resistance. 23 ref. (Q-general, G17k, R-general, 3-69; Cu-n, *Pb, Sn, Fe, Sb, Mg, As, Ni, Al, Si, Mn, P*)

1182-Q.* (Italian.) Corrosion and Heat Resistant Special Steels. *l'Acciaio Inossidabile,* v. 26, no. 2, 1959, p. 53-57.

Composition, mechanical properties and heat treatment procedures for UNI 4047 steel. (Q-general, J-general; SS, SGA-h, SGA-g)

1183-Q.* (Italian.) Effects of Chemical Composition on the Mechanical Properties of Steels. G. Meyer and L. H. Toft. *Nickel,* no. 79, Apr. 1959, p. 1-11.

In steels having similar microstructures after hardening heat treatment, variations in composition appear to have little effect on mechanical and tensile properties, except for a "carbon effect" on ultimate tensile strength. Ni, Mo and V improve impact properties, while Cr and Mn have the opposite effect. 5 ref. (Q-general, J-general, 2-60; ST, *Mo, V, Ni, Cr, Mn*)

1184-Q.* The Effect of Temper-Embrittlement on the Fatigue Properties and Damage Due to Fatigue Overstressing of a 3140 Steel. E. B. Mikus and C. A. Siebert. *American Society for Testing Materials,* Preprint no. 67, 1959, 10 p.

Fatigue life characteristics of 3140 steel with tough and temper-embrittled structures. Effect of short periods of appreciable overstress on subsequent life at a lower stress. 16 ref. (Q7b, 2-64, 3-66; AY)

1185-Q.* The Effect of Stress Cycling on the Static Mechanical Properties of SAE 4340 Steel. J. Marin, P. Borachia and U. A. Rimrott. *American Society for Testing Materials,* Preprint no. 68, 1959, 12 p.

Influence of precycling at different stress levels up to various percentages of fatigue life on static tensile properties of heat treated SAE 4340 steel. 10 ref. (Q27a, Q29n, Q7b, 3-66, 3-70; AY)

1186-Q.* Method for Determining the Fatigue Limit of Metals by Means of Stepwise Load Increase Test. N. Enomoto. *American Society for Testing Materials,* Preprint no. 71, 1959, 10 p.

Method for predicting the Wohler fatigue limit by progressive load increase fatigue tests using only one loading rate. 10 ref. (Q7a, 3-66; ST)

1187-Q.* Effect of Internal Heating on the Fatigue Life of Titanium. J. P. Romauldi and E. D'Appolonia. *American Society for Testing Materials,* Preprint no. 72, 1959, 8 p.

Relationship between deflection and temperature during fatigue tests conducted at different stress levels and at speeds ranging from 1000 to 10,000 rpm. under isothermal and non-isothermal conditions. 5 ref. (Q7b, 2-61, 3-66, 3-67; Ti)

1188-Q.* Tension, Compression and Fatigue Properties of Several Steels for Aircraft Bearing Applications. G. Sachs, R.

Sell and W. F. Brown, Jr. *American Society for Testing Materials,* Preprint no. 73, 1959, 23 p.

Static tensile and compressive properties and rotating beam fatigue strength at room and elevated temperature for several heats of SAE 52100 and three vacuum-melted toolsteels. Influence of heat treated hardness level. 28 ref. (Q27a, Q28g, Q7a, 2-62, 2-64, 2-60; AY, TS, SGA-c)

1189-Q.* Relationships Between Composition and Properties of Austenitic Chromium-Manganese-Carbon-Nitrogen Stainless Steels. A. Kasak, C. M. Hsiao and E. J. Dulis. *American Society for Testing Materials,* Preprint no. 74, 1959, 16 p.

Room temperature tensile properties and creep properties at 1200 to 1500° F. of austenitic steels in solution annealed condition containing 0.09 to 0.82% C, 10.3 to 15.7% Mn, 12.2 to 28.0% Cr and 0.1 to 0.8% N. Composition and design of stable austenitic steels and estimation of their properties. (Q27a, Q3m, 2-60, 2-62, 2-64; SS-e, *Mn, N,* 17-51)

1190-Q.* Property Relationships of Some Cast and Forged Chromium-Manganese-Nickel-Nitrogen Steels Containing 18% Chromium. K. Haefner, A. F. Lahr, W. L. Meinhart and J. J. Kanter. *American Society for Testing Materials,* Preprint no. 75, 1959, 12 p.

Phase relationships, nitrogen solid solubility, forgeability, castability, mechanical properties, embrittlement at 800 to 1800° F. and corrosion resistance of steel containing 0 to 18% Mn, 0 to 8% Ni, 0 to 0.5% N, 0.08% C and 18% Cr. 10 ref. (Q-general, N7, R-general, Q26s, 2-62, 2-60, N15e; SS-e, *Mn, N, O*)

1191-Q.* Effect of Composition and Processing Variables on Some Mechanical Properties of Large Nickel-Molybdenum-Vanadium Rotor Forgings. K. H. Kramer and J. E. Steiner. *American Society for Testing Materials,* Preprint no. 76, 1959, 6 p.

Multiple regression analysis to estimate coefficients in equations relating impact and tensile properties of large alloy steel forgings to composition and processing variables. (Q27a, Q23r, Q6n, 2-60, 2-64; AY, *Ni, Mo, V,* 4-51)

1192-Q.* Creep-Rupture Behavior of Notched and Unnotched Specimens of Types 304, 316, and 321 Austenitic Stainless Steels. F. Garofalo. *American Society for Testing Materials,* Preprint no. 77, 1959, 16 p.

Creep-rupture tests at 1100 and 1500° F. Factors promoting notch; embrittlement at elevated temperatures; rupture initiation and propagation. 12 ref. (Q3q, Q3p, Q23s, 2-62; SS-e)

1193-Q.* Effect of Environment on Creep and Creep-Rupture Behavior of Several Steels at Temperatures of 1000 to 1200° F. F. Garofalo. *American Society for Testing Materials,* Preprint no. 78, 1959, 10 p.

Creep-rupture tests of carbon, low-alloy and stainless steels in air in a purified atmosphere of helium plus 2% hydrogen and in vacuum. 22 ref. (Q3m, Q3n, 2-62, 2-66, 1-73; CN-g, AY, SS)

1194-Q.* A Cooperative Study of the Hardness Testing of Cemented Carbides. Betty M. Caugherty, H. T. Oatman and O. W. Reen. *American Society for Testing Materials,* Preprint no. 79, 1959, 15 p.

Tests by members of Cemented Carbide Producers Assoc. Statistical analysis of variability; influence of testing method and microstructure on hardness. (Q29, 6-68)

1195-Q.* Overstrain Tests on Thick-Walled Cylinders. S. M. Jorgensen. *American Society of Mechanical Engineers,* Paper no. 59-PET-1, 1959, 14 p.

Pressure-expansion tests on thick-walled, closed-end cylinders of carbon and low-alloy steels. Theoretical method for computing expansion and bursting strength based on both tension and torsion data. Simplified formula for ultimate pressures. (Q10b, Q27a, Q1a; CN, AY)

1196-Q.* Radiation Damage in Ferrous Materials. R. E. Smallman. *Iron & Steel,* v. 32, June 1959, p. 321-322.

Annealing of radiation damage; structural alterations produced by irradiation. 6 ref. (Conclusion.) (Q-general, M26p, 2-67; ST, Fe)

1197-Q.* The Cold Extrusion of Strong Alloys. R. A. Quadt. *Modern Metals,* v. 15, Aug. 1959, p. 26, 30, 32.

Tensile properties of Al alloy, Zr alloy, Ti, Ta, Mo and Cb cold extrusions. (Q27a; Al-b, Zr-b, Ti, Ta, Mo, Cb, 4-58)

1198-Q.* Survey Method Evaluates Residual Stresses in Gears. E. T. Bergquist and S. M. Lenhoff. *Product Engineering (Design Issue),* v. 30, Sept. 14, 1959, p. 84-86.

Strain-gage check prior to the standard beam-dissection technique employed as a short-cut method for estimating residual stresses retained at surface of gear teeth after heat treatment. Tabulated basic stress values are given for 4820, 4815, and 8620 steels. (Q25h, T7a, X28j; ST)

1199-Q.* Tentative Model for the Mechanical Wear Process. Robert Davies. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 1-15.

Energy is received by the rubbing materials in quanta of equal size. The energy quanta are added to the rubbing materials at domains randomly spaced over their surface. The quanta are added at moments randomly spaced in time and the quantized energy diffuses into the material at a known rate. (Q9, 17-56)

1200-Q.* Energy Losses of Balls Rolling on Plates. Richard C. Drutowski. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 16-35.

Data on instrument ball bearings, used to support parts, where the bearing torque is critical. Variables affecting friction torque are ball and race material, surface finish, contact stress, ball separator design and degree of fit of the parts. (Q9p, T7d)

1201-Q.* The Seizure of Metal Pairs During Boundary Lubrication. C. L. Goodzeit. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 67-83.

In simple seizure problems, the resistance of metals during boundary lubrication is determined by the strength of the junction where bare metal meets bare metal. The strength is a function of the alloying characteristics of the metal pair. The ability of the pair to form intermetallic compounds also influences the performance. (Q9q; 18-73)

1202-Q.* Recent Experimental Studies of Solid Friction. F. P. Bowden. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 84-109.

The friction and deformation of solids at high speeds in the vicinity of 30-40 mph. Physics of sliding processes at high speeds; friction of graphite and high temperatures and the behavior of graphite on metals. Lubrication by the gas phase was proved in some cases to be effective. (Q9p, 3-68, 2-62; NM-k36)

1203-Q.* Friction, Durability and Wettability Properties of Monomolecular Films on Solids. W. A. Zisman. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 110-148.

Solid surfaces, greatly changed by the absorption of a monomolecular film, are frequently encountered in friction and wear phenomena. The wettability of an absorbed monolayer is defined by the nature and packing of the atoms at the outermost terminal of each polar molecule. The friction-reducing ability is a property of the whole molecule. (Q9p, P13h; 14-62)

1204-Q.* Study of the Stick-Slip Process. E. Rabinowicz. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 149-164.

Stick-slip processes are caused when the friction force is not constant but is dependent on some other variable such as distance, time or velocity, and each produces oscillation. Analysis of the mechanism and methods of remedying stick-slip phenomena. (Q9p)

1205-Q.* Cohesion Between Two Oriented Single Crystals of Copper. Allan T. Gwathmey and Lawrence D. Dyer. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, 1959, p. 165-182.

The regular order of single crystal furnishes a reference background for the detection of movement of surface atoms and structural surface changes. 14 ref. (Q9, M26c; Cu, 14-61)

1206-Q.* (German.) Plastic Coated Steel Sheet. H. Heiner. *Schweizer Technische Zeitschrift*, v. 56, May 21, 1959, p. 438-440.

New product consists of polyvinyl coated steel sheets. Abrasion, wear and corrosion resistance and elongation stability are excellent. (Q-general, R-general; ST, 8, NM-d)

1207-Q.* Correlation Between Internal Friction and Temper Brittleness in Steel. Abdul-Fattah, K. Kaddou and P. C. Rosenthal. *American Society for Metals, Transactions*, v. 52, Preprint no. 151, 1959, 12 p.

Internal friction measurements were made with a torsional pendulum at a frequency of 1.5 cycles per sec. from room temperature to 500° F. for both embrittled and nonembrittled steels. A new theory on the basic mechanism of temper brittleness is proposed, based on a dislocation model, and it is suggested that the embrittlement results from

anchoring of dislocations by a Cottrell atmosphere, which thereby restricts slip within the grains upon impact loading. 18 ref. (Q22, Q26s, M26b; ST)

1208-Q.* Directional Grain Structures for High-Temperature Strength. F. L. VerSnyder and R. W. Guard. *American Society for Metals, Transactions,* v. 52, Preprint no. 168, 1959, 9 p.

Results of tests on an alloy whose rupture ductility is very low in the equiaxed condition show that a grain structure, where the boundaries are mainly parallel to the direction of stress, gives both higher ductility (20-40% compared to 0.3-1.5%) and longer rupture life (equivalent to 15% higher rupture strength) than for an equiaxed structure. The effect is related to the orientation of the grain boundaries and not to the preferred crystalline orientation. (Q3q, M26c, Q26)

1209-Q.* High-Strength Zirconium Alloys. R. K. Wagner and H. E. Kline. *American Society for Metals, Transactions,* v. 52, Preprint no. 169, 1959, 15 p.

Properties of Zr alloyed with Al, Sn and Mo. Data on thermal conductivity, corrosion, tensile and creep tests. The alloys demonstrate short-time elevated-temperature strength characteristics at 1050 and 1200° F. equal to or greater than those of Type 304 stainless steel. Their corrosion resistance in sodium at 1000° F. compares favorably with that for unalloyed Zr. 5 ref. (Q-general, P-general, R-general, 2-62, 2-60; Zr-b, *Al, Sn, Mo*)

1210-Q.* The Effect of Austenitizing, Tempering and Microstructure on the Properties of a Cr-M-V Steel. F. E. Werner, T. W. Eichelberger and E. K. Hann. *American Society for Metals, Transactions,* v. 52, Preprint no. 172, 1959, 20 p.

A 1% Cr, 1.2% Mo, 0.25% V steel, designed for high-temperature use, is susceptible to notch brittleness during creep unless it is properly heat treated. The maximum mechanical properties were obtained in a tempered bainitic structure. Notch sensitivity was associated with either high austenitizing temperatures or low tempering temperatures. Impact properties were relatively insensitive to austenitizing temperature. 15 ref. (Q3q, Q23s, 2-62, 2-64, Q6, M27; ST)

1211-Q.* The Influence of Pre-Existing Sharp Cracks on Brittle Fracture of a Nickel-Molybdenum-Vanadium Forging Steel. E. T. Wessel. *American Society for Metals, Transactions,* v. 52, Preprint no. 173, 1959, 21 p.

The fracture strength of samples containing sharp cracks was found to be highly temperature dependent and exhibited an abrupt transition from above, to well below, the normally measured yield strength over a narrow temperature range. This transition is associated with a change in the mode of fracture initiation from shear to cleavage. The applied stresses and temperatures at which brittle fracture will occur in the presence of a pre-existing crack are dependent upon section size and crack length. 24 ref. (Q26s, 2-61, 3-66, 3-73, 9-72, AY, *Ni, Mo, V*)

1212-Q.* Second Low-Temperature Peak in the Internal Friction of Aluminum. Edward Lax and Daniel H. Filson. *Physical Review,* v. 114, June 1, 1959, p. 1273.

Pure Al and Ag, when exposed to high frequencies of alternate shear, showed two low-temperature peaks, which is explained by kinks resulting from dislocations in a f.c.c. lattice. (Q22, 2-63, M26b; Al-a, Ag-a)

1213-Q.* Microstructure Affects Steel Fatigue Strength. *Space Aeronautics,* v. 32, July 1959, p. 85-90.

Fatigue data for critical parts of high-strength steel such as missile castings show that retained austenite in the matrix has a major effect on fatigue strength. A correlation was found between failure strength and hardness. (Q7a, T24e, N8n, M27; SS)

1214-Q. (Russian.) Effect of Vanadium, Tungsten, Chromium and Molybdenum on Internal Friction and Aging of Technical Iron. M. G. Lozinskii and A. E. Fedorovskii. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk,* Jan-Feb. 1959, p. 64-70.

Logarithmic damping decrement as a function of temperature and composition. Effect of aging at 115° C. on the value of the internal friction maximum of Fe containing V, W or Cr. 9 ref. (Q22g, N7a, 2-60, 2-61; Fe, *V, W, Cr, Mo*)

1215-Q. (German.) Mechanical Testing Equipment. H. Mintrop. *Werkstattstechnik,* v. 49, Aug. 1959, p. 440-449.

Equipment shown at the 1959 Hannover Industry Fair. 10 ref. (Q-general, 1-153)

1216-Q.* (Pamphlet.) High-Strength 5% Chromium Steels for Airborne Vehicles. Unimach no. 1 and Unimach no. 2. 29 p. 1959.

Universal-Cyclops Steel Corp., Station St., Bridgeville, Pa.

Room-temperature mechanical properties; effect of exposure at 1000° F.; stress-rupture properties; hot hardness; tensile properties at elevated temperatures; heat treatments; physical properties; fabrication; welding; surface treatments. (Q-general, 2-62, 2-64, P-general; TS)

1217-Q. (Book.) Friction and Wear. Robert Davies. 191 p. 1959. Elsevier Publishing Co., Amsterdam, Holland.

Papers and discussions of the first annual General Motors Research Laboratories' Symposium held at the Technical Center near Detroit, June 10-11, 1957. Papers abstracted separately. (Q9n, Q9p)

1218-Q. (Book.) Mechanical Properties of Metals (Their Determination, Interpretation and Significance). L. W. Hu and Joseph Marin, Editors. 296 p. 1958. Pennsylvania State University, University Park, Pa.

Proceedings of a short course held at Pennsylvania State University, July 7-11, 1958. Papers abstracted separately. (Q-general)

1219-Q.* (Translation—AIP.) The Relation Between Critical Sheer Stress, Temperature and Rate of Deformation in Zinc Monocrystals. V. R. Regel and V. G. Govorkov. *Soviet Physics Crystallography*, v. 3, Jan. 1957, p. 59-64.

Formation of cracks with a bent scale on stretched monocrystals. (Q24, 2-61, 3-66; Zn, 14-61)

1220-Q.* Effect of Stress on the Creep of Aluminum in the Dislocation Climb Range. A. E. Bayce, W. D. Ludemann, L. A. Shepard and J. E. Dorn. *American Society for Metals, Transactions*, Preprint no. 137, v. 52, 1959, 17 p.

Investigations revealed that a simple functional relationship between creep rate and stress does not exist; the effect of stress on the creep rate depended on the substructure as well as the stress. In general, the creep of Al under conditions of changes in stress can be resolved qualitatively in terms of dislocation climb models for creep. 12 ref. (Q3, 3-66, M26b; Al)

1221-Q.* Anomalous Effect of Hydrogen on the Mechanical Properties of Ti-8Mn Alloy. Albert H. Fleitman. *American Society for Metals, Transactions*, Preprint no. 144, v. 52, 1959, 11 p.

The presence of up to 300 ppm. hydrogen does not appear to affect adversely the notched or unnotched tensile or tensile stress-rupture properties of Ti-8 Mn sheet at room temperature. None of the mechanical tests, including the prestrain and age tests, caused brittle failures to occur after 150, 225 or 300 ppm. hydrogen was diffused into the test specimens cut from the rolled sheet. 14 ref. (Q26s, Q3q; Ti-b, *Mn, H*, 4-53)

1222-Q.* Effect of Cold Work on Temper Brittleness. A. S. Keh and W. C. Porr. *American Society for Metals, Transactions*, Preprint no. 152, v. 52, 1959, 13 p.

Effect of cold work on temper brittleness in a commercial and a laboratory heat of 5140 steel. Notch toughness was used as a measure of embrittlement with tensile tests being made on the laboratory heat at room temperature, -235 and -320° F. Cold work, up to 35%, before or after the embrittling treatment, greatly reduced the susceptibility to embrittlement for both steels. 9 ref. (Q26s, Q27, 2-63; ST)

1223-Q.* Experimental Survey of the Deformation of the Hard-Ductile Two-Phase Alloy System WC-Co. C. Nishimatsu and J. Gurland. *American Society for Metals, Transactions*, Preprint no. 155, v. 52, 1959, 16 p.

Deformation at room temperature of two-phase alloys of tungsten carbide and Co studied by mechanical and metallographic methods. The deformation characteristics under tension, bending and impact are related to the order of appearance and extent of plastic flow of the matrix and fracture of the carbide particles. 12 ref. (Q24; W, 6-69, Co)

1224-Q.* The Tensile and Yield Strength of Cr-Mn-N Steels at Low Temperatures. J. C. Shyne, F. W. Schaller and V. F. Zackay. *American Society for Metals, Transactions*, Preprint no. 162, v. 52, 1959, 5 p.

The strength of austenitic Cr-Mn-N steels studied as a function of test temperature and nitrogen content. Higher strength results from increased nitrogen contents and lower test temperatures. The formation of strain-induced martensite also contributes to the tensile strength under some conditions. (Q27a, 2-60, 2-61; SS-e, *Mn, N*)

1225-Q.* Growth of Grain-Boundary Voids Under Stress. D. Hull and D. E.

Rimmer. *Philosophical Magazine*, v. 4, June 1959, p. 673-687.

Effect of combined hydrostatic pressure and of uniaxial tension on the rupture time of polycrystalline Cu wire in 400-500° C. range. Proposes rupture mechanism is based on growth of void nuclei on a grain boundary by the addition of vacancies from the boundary. (Q3m, Q3q, 3-74; Cu)

1226-Q.* The Yield Point of a Super-Lattice. N. Brown. *Philosophical Magazine*, v. 4, June 1959, p. 693-704.

Theoretical calculation of the dependence of yield point on the degree of long-range order in b-c-c. super lattice. Width of an anti-phase domain boundary. Yield points of polycrystalline and single cyrstal specimens of beta-brass containing 48.6 and 49.9 at .% Zn for temperature range of -200 to +500° C. Comparison with theoretical values. 15 ref. (Q24c, Q27a, 2-61; Cu-n)

1227-Q.* Importance of Considering Welding Stresses Reviewed. R. E. Holt. *Welding Engineer*, v. 44, Sept. 1959, p. 48-49.

Stress distribution patterns resulting from welding of a Tee-joint to a wide flange beam. (Q25h, K9n; ST, 7-51)

1228-Q.* Some Metallurgical Aspects of Friction and Wear. L. F. Coffin, Jr. Paper from "Friction and Wear". Elsevier Publishing Co., Amsterdam, Holland, p. 36-66.

Interaction of materials in sliding contact. Friction effects and surface damage under repetitive sliding; qualitative measurements of the interfacial shear strength, and effects of gaseous atmosphere on the sliding process; influence of sliding velocity and of liquid environment. 13 ref. (Q9p)

1229-Q.* (French.) Abrasion Resistant Cast Irons for Mechanical Applications. *Journal d'Informations Techniques des Industries de la Fonderie*, no. 106, June 1959, p. 9-11.

Sliding and rolling friction as causes of wear. Structures and alloying elements providing abrasion resistance. (Q9n; CI-n, CI-q, SGA-m)

1230-Q. (Russian.) Method of Time-Hardness Testing by Concentric Impressions, Applied to the Composition Analysis of Alloys. V. P. Shishokin and N. A. Vikhoreva. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 165-167.

A cone of hard material is impressed into the surface of Bi, Pb and Cd alloys at a constant load, and the diameter of impression is measured after various periods of time. From the results, conclusions are drawn on the composition. 9 ref. (Q29, S11g; Bi-b, Pb-b, Cd-b)

1231-Q. (German.) Surface Stresses Measured With the Aid of Polarized Light. G. Oehler. *Industrie Anzeiger*, v. 81, Aug. 25, 1959, p. 53-54.

Surfaces are coated with a photoelastic layer. The interference patterns set up in the surface coat reproduce a stress pattern. (Q25, P17b)

1232-Q.* (German.) Harmful and Useful Residual Stresses. H. Buhler and A. Petter. *Industrie Anzeiger*, v. 81, Aug. 25, 1959, p. 55-57.

Residual stress phenomena in structural members should be judged on the basis of design function of the member and stressing of the member in actual service. The best form of stress distribution is given for rolled sections and stanchions. (Q25h; 17-51, SGB-s)

1233-Q. (Russian.) Influence of Annealing Time on Mechanical Properties of Steel. I. Z. Gordon and A. P. Gulyaev. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 220-224.

Hardness, tensile strength, yield strength, elongation and reduction of area as a function of annealing time, followed by quenching from 840-850° C. (Q29n, Q27a, Q23, 2-64; ST)

1234-Q. Test Blocks for Indentation Hardness Testing. J. G. Wood. *Engineer*, v. 2-8, Aug. 28, 1959, p. 147-149.

Methods adopted at the National Physical Laboratory for the production of standard hardness test blocks, in the range 200 to 950 HV, for the Vickers and Rockwell identation tests. (Q29, 1-60)

1235-Q.* Tensile Properties of Copper-Bearing Low Carbon Steel. G. W. Bush and R. W. Lindsay. *American Society for Metals, Transactions*, Preprint no. 140, v. 52, 1959, 10 p.

Effects of small quantities of Cu on the tensile properties of a low-carbon deep drawing steel are evaluated from true stress-true strain relationships in the plastic range. Results indicate that when Cu content exceeds a limit which lies between 0.1 and 0.2%, there is an increase in strength properties, a decrease in

elongation and in the work hardening modulus, and an alteration in the crystallographic orientation in cold rolled and annealed sheets. 22 ref. (Q27a, 2-60; CN-g, *Cu*)

1236-Q.* Supersaturation as a Factor in the Hydrogen Embrittlement of Titanium Alloys. D. N. Williams, F. R. Schwartzberg and R. I. Jaffee. *American Society for Metals, Transactions,* Preprint no. 176, v. 52, 1959, 9 p.

Effect of temperature on embrittlement in hydrogen-containing 2% Mo, 2% Fe, 2% Cr alloy studied to determine the reason for absence of embrittlement at temperatures above the embrittlement range. The upper recovery temperature can be satisfactorily explained on the basis of the hydrogen solubilities in alpha and beta Ti. The proposed explanation for the recovery phenomenon requires that a measurable amount of hydrogen supersaturation be present before embrittlement will occur. 7 ref. (Q26s, 2-61; Ti-b, *Mo, Fe, Cr, H*)

1237-Q.* Magnesium and Related Low Alloys. J. Bernard, R. Caillat and R. Darras. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 69-87.

Corrosion and mechanical behavior of various alloys considered as potential materials for uranium canning. 17 ref. (Q-general, R-general; Mg-b)

1238-Q.* The Effect of Small Columbium Additions to Semikilled, Medium Carbon Steels. C. A. Beiser. *American Society for Metals, Transactions,* Preprint no. 138, v. 52, 1959, 24 p.

Small amounts of Cb result in a significant reduction in ferritic grain size. The mechanical properties of the normalized steels reflect this grain refinement. The yield strength is increased, the tensile strength is relatively constant and high, the ductility is improved slightly and the impact transition temperature is lowered materially. In the hot rolled condition, a grain boundary network of carbide is present that results in a larger increase in yield strength, increased tensile strength and a reduction in ductility and impact properties. 6 ref. (Q27a, Q6n, M27c, 2-60; CN-p, *Cb*)

1239-Q.* Properties of Refractory Alloys Containing Rhenium. Chester T. Sims and Robert I. Jaffee. *American Society for Metals, Transactions,* Preprint no. 164, v. 52, 1959, 14 p.

Fabrication and properties of the refractory alloys of Mo, W and Ta with Re. Mo-Re and W-Re show a considerable tensile strength advantage over the base metal at elevated temperatures. In the recrystallized condition, the alloys are significantly more ductile. Re additions to Ta do not promote fabricability although the extent of the alpha solid solution field is broad. 8 ref. (Q27a, N5; EG-d, Mo, W, Ta, Re)

1240-Q. Survey of Literature on the Effect of Testing Temperature on the Properties of Wrought Copper Base Alloys. H. R. Pritchard. Frankford Arsenal. *U. S. Office of Technical Services,* PB 151306, Feb. 1958, 92 p. $2.25.

At low temperatures, the tensile and yield strengths, elongation, modulus of elasticity, hardness and fatigue strength increase while electrical resistivity decreases. At elevated temperatures, the tensile and yield strengths, modulus of elasticity and hardness decrease, while the thermal conductivity and electrical resistivity increase. (Q-general, P15, 2-61, P11h; Cu-b)

1241-Q. Testing for Notch Sensitivity in Welded Joints. C. E. Hartbower. Watertown Arsenal. *U. S. Office of Technical Services,* PB 151630, n. d., 24 p. $.75.

Study shows that it is possible to evaluate notch toughness in a welded joint as well as in the unwelded base metal. The V-notch Charpy impact test provides an excellent means for evaluating the relative toughness of weld, heat affected zone and base metal, providing that certain procedures are followed and that a significant criterion of performance and definition of temperature are selected. (Q23, Q6; 7-51)

1242-Q.* (English.) An Experimental Investigation on the Mode of Slip in Face-Centered Cubic Metals. T. Taoka, K. Yasukochi, R. Honda and I. Oyama. *Physical Society of Japan, Journal,* v. 14, July 1959, p. 888-893.

Homogeneous slip is defined as that occurring on a number of neighboring atomic planes. Changes of spontaneous magnetization are criteria for slip, being homogeneous or inhomogeneous. For ordered Ni_3Mn alloys, magnetization decreases with elongation; for ordered Pt_3Co, magnetization increases with compression. From consideration of the

Curie points, both cases are homogeneous. (Q24a, P16; Ni-b, Mn, Pt-b, *Co*)

1243-Q. (Russian.) The Relative Damping of Torsional Alternate Stress in 50A and U7A Steels After Heat Treatment. M. A. Krishtal and S. A. Golovin. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 173-175.

Samples are quench hardened and then annealed at various temperatures. Effects of stresses present after heat treatment and annealing temperature on damping properties. (Q8g, 2-64; 3-66, CN-r)

1244-Q. (Russian.) Investigation on the Alloy Ni_3Mn by Measuring Internal Friction. Yu. S. Avraamov and S. O. Mezhennaya. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 189-193.

Changes of internal friction caused by various heat treatments, carburizing and cold deformation. 5 ref. (Q22, 2-64, 2-60, 3-68, 2-61; Ni-b, *Mn*)

1245-Q.* The Effect of Initial Increments of Hot Working on the Mechanical Properties of Certain Ferrous Materials. H. J. Wagner and J. W. Spretnak. *American Society for Metals, Transactions,* Preprint no. 170, v. 52, 1959, 17 p.

Forging of Fe and AISI 4340 steel to an initial-to-final height ratio as great as 2.1 had no significant effect on the tensile strength. On the other hand, ductility, as measured by reduction of area in the tensile test, is influenced by the degree of forging. The maximum ductility of specimens in the axial direction is reached at a height ratio of 1.4. Forging reductions ranging up to a height ratio of 2.1 improved the ductility (as measured in the radial direction) of AISI 4340, but not of Fe. 9 ref. (Q27a, Q23p, F22; ST)

1246-Q.* Bigger, Better and Sounder Forgings. Pt. 2. Ernest E. Thum. *Metal Progress,* v. 76, Sept. 1959, p. 121-126.

Service performance simulated by bored and notched 2-ft. disk spun to destruction. Tough steel should have transition temperature of 100° F. or lower as judged by Charpy tests having 50% or more fibrous fracture. Vacuum casting of refined basic electric steel has improved the soundness of forging ingots. (Q26s; AY, 4-51)

1247-Q.* Low-Temperature Transverse Impact Test. John Zotos. Digest of "Effect of Phosphorus and Sulphur Content on Ductility and Toughness of Cast Low-Alloy Steels". *Metal Progress,* v. 76, Sept. 1959, p. 176-, 178, 180.

Ductility and impact resistance of the steel improved by reduced sulphur. Impact test for comparing some basic properties in heats of high-strength steels is demonstrated. (Q23p, Q6, 2-60; AY-n, *S, P,* SGB-a)

1248-Q.* Some Investigations Into the Fundamental Characteristics of and Some Simulative Tests for Aluminum Sheets for Deep-Drawing. C. R. Vassel. *Sheet Metal Industries,* v. 36, Aug-Sept. 1959, p. 543-546, 556.

Deep-drawing properties of Al sheet are correlated with tensile strength data and simulative (flat-and round-bottom cup) tests. 21 ref. (Q27, G4, 17-52; Al, 4-53)

1249-Q.* Problems of Design Associated With the Use of Cold-Rolled Sections for Structural Purposes. E. Griffin. *Sheet Metal Industries,* v. 36, Aug-Sept. 1959, p. 577-594, 612.

Strength factors in relation to design specifications of cold rolled mild and high tensile steels. (Q-general; 17-51, 4-59, SGB-a, CN)

1250-Q.* (German.) Examples of the Behavior of Lead Under Service Conditions. W. Hofmann and H. V. Malotki. *Metall,* v. 13, Aug. 1959, p. 747-749.

Flow and creep tests with Pb under compression. Internal pressure testing of cable sheaths. Bulging degree at failure as a function of bulging velocity. Cracking of Pb claddings on a steel plate after thermal cycling. 5 ref. (Q3r, Q10b, Q7e, 3-74; Pb, 8-66, ST)

1251-Q.* (German.) Precipitation and Hot Strength. H. Klemm. *Metall,* v. 13, Aug. 1959, p. 752-759.

Hot strength is explained by the effect of precipitates preventing crystal slip. Since the influence of grain boundaries becomes more important at high temperatures, steel with coarse grain is preferred. Decarburization zones along wide angle boundaries are thought to cause failure. 7 ref. (Q27a, N7, M27f; SS, SGA-h)

1252-Q. (Russian.) Hydrogen Brittleness of Low Carbon Steel Caused by Exposure to Dilute Nitric Acid. S. A. Balezin and I. V. Nikol'skii. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 224-226.

Wires are loaded with hydrogen by immersion in nitric acid of various concentrations. Some of the wires were subsequently heat treated 3 hr. at 150-170° C. Effects of acid concentration and heat treatment on torsion properties. 5 ref. (Q26s, Q1a, 2-64; CN-g, 4-61)

1253-Q.* (Russian.) Cold Brittleness of Commercial Iron. A. I. Paisov, L. N. Podvoiskii and Yu. A. Skakov. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 245-249.

Structure, fracture and coercivity of commercial Fe are investigated both for the state of tendency to cold brittleness (i.e., after annealing at 780° C. following hot rolling) and for the state after annealing at 920° C. and slow cooling. 8 ref. (Q26s, P16a, 2-64; Fe)

1254-Q. Embrittlement in Steels. G. T. Brown. *Iron & Steel*, v. 32, July-Aug. 1959, p. 385-387.

Includes temper embrittlement, 500° F. embrittlement, sigma and "475" embrittlement and embrittling effects of certain hardening processes. Removal of brittleness by reheating is suggested. The presence of a chromium iron phase in embrittled sample is presumed. 30 ref. (Q26s; ST)

1255-Q. (Russian.) Determination of Stresses Present in the Deformation of Metals by Pressure. I. Ya. Tarnovskii, A. A. Pozdeev, V. P. Kotel'nikov and S. G. Puchkov. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 131-135. (Q24, Q25)

1256-Q. (Russian.) Plastic Deformation of Metals. I. Ya. Tarnovskii and A. A. Pozdeev. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 136-139.

7 ref. (Q24)

1257-Q. (Russian.) Approximate Determination of Conditions for the State of Plasticity. E. F. Sharapin. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 140-144.

7 ref. (Q23p)

1258-Q. (Russian.) Stress Concentration Caused by Defects. I. M. Pavlov and A. V. Krupin. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 150-157.

5 ref. (Q25k, 9)

1259-Q. (Russian.) Method for the Testing of Properties and Phase Compositions of Alloys. E. M. Strug and E. V. Panchenko. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 252-255.

Method based on measurements of the thermo-e.m.f. (Q-general, P15g, M24, 1-54)

1260-Q.* Electrode Weld Metal for Fabrication of Dynamically Loaded Shipboard Missile Launching Systems. J. S. Kobler. *American Society of Naval Engineers, Inc., Journal*, v. 71, Aug. 1959, p. 543-551.

Brittle failure of arc welded joints over a wide range of service temperatures is evaluated in terms of notch sensitivity for a multiple-alloy high-strength weldment. Suitable electrode material for this application is considered. Possibility of a notch-sensitive zone occurring at the weld-base metal interface in relation to stress-relief. (Q23s, Q26s, K1a, 3-66, K9r; SS-c, 7-51)

1261-Q.* A Survey of Data on the Fatigue Properties of D.T.D. 363 and L.65 (D.T.D. 364) Aluminum Alloys. J. Y. Mann. *Australian Defense Scientific Service, Aeronautical Research Laboratories*, note 248, Nov. 1958, p. 1-20.

Rotating cantilever and direct stress fatigue data for Al alloys are summarized for both unnotched and notched conditions. Insufficient data are available to indicate which of the two alloy groups has better fatigue properties. (Q7c; Al-b)

1262-Q.* The Plastic Flow and Fracture of a 'Brittle' Material (Grey Cast Iron) With Particular Reference to the Effect of Fluid Pressure. B. Crossland and W. H. Dearden. *Institution of Mechanical Engineers, Proceedings*, v. 172, no. 26, 1958, p. 805-820.

Static torsion, tension and compression tests were performed upon specimens of gray cast iron at pressures to 35 tons per sq. in. A pressure vessel of special design was used for torsion tests. Tests in torsion on rubber-coated specimens indicate that the shear-stress-strain diagram is raised as pressure is increased. (Q1e, Q27a, Q27g, 3-74; CI-n)

1263-Q.* The High Temperature Properties of Four Wrought Steels Used in the Chemical Industry. B. J. Connolly and G. Boyd. *Institution of Mechanical Engineers, Proceedings*, v. 172, no. 31, 1958, p. 889-900.

Short-time, high-temperature tensile, stress-rupture and creep properties are given for low-carbon and medium-carbon 1% Cr-Mo steels and 18-10-Mo-Ti Cr-Ni austenitic stainless steel. Development

of sigma phase in austenitic steel by prolonged heating. (Q27a, Q3q, 2-62, N6p; CN, *Cr, Mo, Ti, Ni,* SS-e)

1264-Q.* A Study of Some Mechanical, Physical and Corrosion Properties of Iodide Hafnium. J. G. Goodwin and F. R. Lorenz. *Nuclear Science and Engineering,* v. 6, July 1959, p. 49-56.

Five iodide hafnium ingots were fabricated into strip. Tensile, impact, hardness, corrosion test, weight gain, electrical resistivity and chemical analysis values were obtained. The mechanical, physical and corrosion property measurements for the unirradiated and irradiated samples showed no physically significant differences attributable to chemical analysis. (Q-general, P15g, R6k; Hf, *I,* 5-59, 4-53)

1265-Q. Fatigue Studies of Inconel. Raymond G. Carlson. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1355, June 26, 1959, 20 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.). $.75.

Fatigue strength of Inconel as a function of temperature and frequency; data obtained for range 1300-1500° F. and 10^3-10^5 cycles. Stress-strain and fatigue lifetime relationships. (Q7, 2-61, 3-66; Ni-b)

1266-Q.* Designing Joints for High Temperature Creep Conditions. *U. S. Dept. of Commerce, National Bureau of Standards, Technical News,* STR-2306, Sept. 1959, 6 p.

Methods for calculation of the creep-rupture strength of joints under static conditions and subject to tension loadings. Effects of various loads and temperatures in relation to design of joints. (Q3, 2-62, 3-68; 7, 17-51)

1267-Q.* (German.) Damping Properties of Steel After Hardening and Annealing. Erich Scheil, Ernst Wachtel and Gobind Gurbaxani. *Archiv fur das Eisenhuttenwesen,* v. 30, Aug. 1959, p. 497-501.

Effects of hardening temperature, annealing temperature and time and testing temperature on the damping and magnetic saturation of carbon steel, mild steel and of a 9.44% Ni iron alloy. (Q8, 2-64, 2-61, P16; CN, Fe-b, *Ni*)

1268-Q.* (German.) Kuprodur, a Material Used Successfully in the Construction of Trolley Lines. K. Dies. *Draht,* v. 10, Aug. 1959, p. 364-368.

Tensile strength, elastic limit, elongation and hardness of the material are listed for the ductile state before cold working and for the states after cold working and artificial aging. Relationships between temperature and time of aging. Effect of aging temperature and time on electrical conductivity and hardness. Strength at low and hardness at high temperatures. Corrosion resistance. (Q27a, Q21e, Q23p, Q29n, 3-68, J27d, P15g, 2-62, 2-63, R6; Cu-b, *Ni, Si*)

1269-Q.* (German.) Fundamental Standardization of Structural Sections. Zygmunt Wusatowski. *Freiberger Forschungshefte,* v. B36, May 1959, p. 5-47.

Rolled sections were checked for dimension deviations. Only a slight deviation from the theoretical values was found. Method gives a theoretical solution based on the composition of the steel melt. (Q24, P10d; 4-57, ST)

1270-Q.* (German.) Properties of Several High-Strength Malleable Magnesium Alloys. W. Rosenkranz. *Metall,* v. 13, Sept. 1959, p. 824-830.

Effect of various heat treatments on structure, tensile strength, elastic limit, elongation, impact strength and creep strength of extrusions. (Q27a, Q21e, Q23p, Q6n, Q3m, 2-64, 3-71; Mg-b, 4-58)

1271-Q.* (German.) Properties of Ti-6Al-4V and Ti-14Al-4V Alloys at Elevated Temperatures. U. Zwicker. *Metall,* v. 13, Sept. 1959, p. 830-837.

Effect of temperatures from 350 to 500° C. on tensile strength, elastic limit, elongation, reduction of area, hardness, impact strength and creep strength. 18 ref. (Q27a, Q21e, Q23p, Q29n, Q6n, Q3m, 2-62; Ti-b, *Al, V*)

1272-Q. Effect of Irradiation on Creep. M. L. Rudee. *American Society of Naval Engineers, Inc., Journal,* v. 71, Aug. 1959, p. 453-456.

Review. (Q3, 2-67)

1273-Q. Investigations of Residual Grinding Stresses. L. M. Kubsh. *Machinery (London),* v. 95, Sept. 16, 1959, p. 531-534.

Residual surface stresses can be reduced after the main stock removal by correctly dressing the wheel face and finishing with smaller unit feeds. (Q25h, G18)

1274-Q.* Low-Temperature Tensile Properties of Copper and Four Bronzes. R. M. McClintock, D. A. Van Gundy and R. H. Kropschot. *ASTM Bulletin,* no. 240, Sept. 1959, p. 47-50.

Effects of temperatures between 20 and 300° K. on tensile strength, yield strength and modulus of elasticity of high-conductivity Cu, beryllium bronze, beryllium cobalt bronze, silicon bronze and grade C phosphor bronze. (Q27a, Q21, 2-63; Cu, Cu-s, *Be, Si, Co*)

1275-Q.* A New Steel for Aircraft and Missile Honeycombs. Allen C. Gilbraith. *ASTM Bulletin*, no. 240, Sept. 1959, p. 51.

Hardness and strength, corrosion and heat resistance of PH 15-7 Mo stainless available in either condition A (annealed) or condition C (cold rolled). Tensile strength is 210,000 to 300,000 psi.; yield strength 200,000 to 260,000 psi. (Q27, Q29n, R-general, 2-62; SS, Mo, 7-59, 17-57)

1276-Q.* Structure and Properties of Zirconium Alloys. O. S. Ivanov and V. K. Grigorovich. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 34-51.

Phase diagrams, mechanical properties at 20 and 500° C., creep and corrosion of binary alloys with Fe, Cr, T, Be, Al, Sn, Ti and Cb. (Q-general, Q3, R4, M24c; Zr-b, *Cb, Cu, Fe, Mo, Sn, Ta, Al, Ti*)

1277-Q.* Mechanical Properties of Zirconium Binary and Ternary Alloys With Tantalum and Niobium at Room and Elevated Temperatures. V. S. Emelyanov, Y. G. Godin and A. I. Evstyukhin. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 69-74.

Hardness and tensile strength of cast and heat treated alloys. 8 ref. (Q29n, Q27b, 2-61, 2-62; Zr-b, *Cb, Ta*)

1278-Q.* Use of Magnesium, Aluminum and Their Alloys as Structural Materials. J. Bernard, B. Boudouresques, L. Alfille and R. Klersy. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 157-207.

Mechanical properties and microstructure at high temperatures and after corrosion of Mg and Al alloys and cermets. Influence of irradiation and formability; weldability. 21 ref. (Q-general, R-general, T11, 2-62, 2-67, 2-60; Mg-b, Al-b, *Zn, Zr, Mn, Ce, Th, Cu, Ni, Fe, Ti*, 17-57, SGB-s)

1279-Q.* Mechanical and Physical Properties of Magnesium and Niobium Canning Materials. T. J. Heal. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 208-219.

Thermal cycling experiments with simulated lengths of fast reactor fuel element assemblies demonstrate the restraining action of Cb cans and ductility under complex stress systems. 10 ref. (Q-general, P-general, T11g, 2-62, 3-66; Mg, Cb, *Zr, Be, Al*)

1280-Q.* Mechanical Properties of Alloys of Magnesium and of Zirconium. G. C. E. Olds, J. H. M. Draper, G. A. Geach. J. E. Harris, O. P. Hartree, T. Raine, R. R. Roberts and T. B. Smith. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 249-260.

Ductility, creep strength and microstructure of Mg-Mn alloys and Mg-Ce-Mn alloys at 350-500° C. Properties and corrosion resistance of Zr-Cu-Mo alloys and Mg-Zn-Zr-Mn alloys. 5 ref. (Q-general, M27, 2-62; Mg-b, Zr-b, *Cu, Be, Ni, Mo, Ce, Mn, Zn*)

1281-Q.* Thermal Stress Determination Methods Applicable to Reactor Materials. J. Bernard, A. Gautier and A. Peres. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 266-287.

Methods by which thermal stress fields, their time variations and their validity are determined. 21 ref. (Q25p, T11, 1-54, 3-67)

1282-Q.* Effect of Thermal Cycling on Dimensional and Structural Stability of Various Metals and Alloys. A. A. Bochvar, A. A. Gulkova, L. I. Kolobneva, G. I. Sergeev and G. I. Tomson. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 288-299.

Thermal cycling causes Al, Cu, Ni, Zn, U, Armco iron, Cu-Zn alloys, Fe and Ni-base alloys and Al-Zn alloys to undergo residual dimensional changes if the cycle varibles have correct values. 16 ref. (Q7j, P10d, 2-62; Al-b, Fe-b, Ni-b, Cu-b, U, *Zn*)

1283-Q.* High Boron Steels. J. Hochmann and A. Desestret. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 396-402.

Mechanical properties of steels containing 0.12-4.5% boron. Methods of manufacturing 4% boron steel. 12 ref. (Q-general, 2-60; AY, SS, *B*)

1284-Q.* Mechanical Properties, Embrittlement and Metallurgical Stability of Irradiated Metals and Alloys. M. J. Makin, A. T. Churchman, D. R. Harries and R. E. Smallman. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 446-456.

Mechanism of irradiation hardening in steels, welded thick plates of pressure vessel steels, Ti, Zr, Cu and Mg alloys at 20 to -195° C. 19 ref. (Q-general, Q26s, 2-63, 2-67; ST, Ti-b, Zr-b, Cu-b, Mg-b, Ni-b)

1285-Q.* Effect of Neutron Irradiation on the Mechanical Properties of Structural Materials. N. F. Pravdyuk, S. T. Konobeevsky, A. D. Amayev and Y. I. Pokrovsky. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 457-465.

Influence of temperature on tensile properties of irradiated materials at 80-600° C.; effect of the intensity of the total neutron flux on the static and impact properties of materials; influence of neutron irradiation on internal friction in metals. 11 ref. (Q-general, 2-62, 2-67; ST, Ni, Ta, SGB-s)

1286-Q.* Radiation Effects in Structural Materials at Elevated Temperatures. J. C. Wilson. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 488-499.

Effect on mechanical properties; combined effects of irradiation, stress and high temperatures. 36 ref. (Q-general, T11, 2-67, 3-66, 2-62; SGB-s)

1287-Q.* Effects of Radiation on Mechanical Properties of Solids. M. J. Makin. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 500-530.

Effect on creep, hardness, tensile properties (yield strength, etc.), ductile-brittle transition temperature, elastic constants, internal friction and annealing behavior of a number of metals. 71 ref. (Q-general, 2-67)

1288-Q.* Strength and Creep of Uranium Alloys. B. Boudouresques and M. Englander. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 621-631.

Creep data and tensile properties of U-Zr, U-Al and U-Ti alloys. 7 ref. (Q3, Q27a; U-b, *Al, Ti, Zr*)

1289-Q. (German.) Small-Load Hardness Tester. K. Potyka. *Industrieblatt*, v. 59, Aug. 1959, p. 385-387.

Description and use of the instrument. (Q29, 1-53)

1290-Q.* Cubic-Hexagonal Transformation in Single Crystals of Cobalt and Cobalt-Nickel Alloys. P. Gaunt and J. W. Christian. *Acta Metallurgica*, v. 7, Aug. 1959, p. 529-533.

Kinetic and crystallographic observations on the natural and stress-induced transformations. The shape deformation has been measured for the stress-induced transformation in alloys; the habit plane is not determined by a maximum resolved shear stress condition. 13 ref. (Q24m; 14-61, Co-b, *Ni*)

1291-Q.* The Dissipation of Energy During Plastic Deformation. J. F. Nicholas. *Acta Metallurgica*, v. 7, Aug. 1959, p. 544-548.

Various mechanisms are considered for the dissipation of heat of the mechanical energy of deformation in a cold worked metal. Since dislocations seem to account for at most 10% of this dissipation, the creation and annihilation of point defects is considered. 7 ref. (Q24, P12a)

1292-Q.* Low-Cycle Fatigue of Two Nickel-Base Alloys by Thermal-Stress Cycling. F. J. Mehringer and R. P. Felgar.

American Society of Mechanical Engineers, Paper no. 59—A-58, 1959, 10 p.

Cast DCM and cast Udimet 500, two Ni-base alloys, were tested in a thermal-stress-cycling device of the Coffin type. The strains induced by the thermal stresses were analyzed in several ways in an attempt to relate the plastic strains to cyclic life. The plastic strains were too small to permit calculating them with sufficient accuracy to correlate with cyclic life. The stress range did correlate reasonably well with the number of cycles to failure. 11 ref. (Q7j; Ni-b)

1293-Q.* Tensile and Short-Time Creep Properties of N-155 Alloy Sheet. Eugene C. Bernett. *American Society of Mechanical Engineers,* Paper no. 59—A-27, 1959, 18 p.

At rapid strain rates, the high-temperature tensile strengths of Haynes N-155 alloy were up to 300% higher than those obtained at conventional testing speeds. At high temperatures and high stress levels, however, creep rates were shown to be extremely rapid, and in most cases, the creep strength became a critical factor. Application of rapid-strain-rate tensile data and high-stress creep data in short-life designs. 4 ref. (Q27a, Q3, 3-66, 3-68; Co-b)

1294-Q.* Stresses in Wrought-Steel Wheel Rims and Their Relation to Wheel Life. M. S. Riegel. *American Society of Mechanical Engineers,* Paper no. 59-A-241, 1959, 5 p. $.80.

Basic types of wheel failures. Type A-40 and F-36 diesel wheels are stressed to extremely high levels as a result of heating. Stresses produced at certain locations on the wheel plate apparently exceeded the static yield point of the steel and there are strong indications that heat stresses may be a major factor in wheel failures. (Q25, T23, ST)

1295-Q.* Fatigue Tests on Butt Welded Joints in Aluminium Alloys HE.30 and NP.5/6. R. P. Newman. *British Welding Journal,* v. 6, July 1959, p. 324-332.

Fatigue properties of butt welded joints made by improved techniques in types of high-strength heat treatable Al alloys. Tests were confined to HE.30 and NP.5/6 alloys containing transverse butt welds made by manual argon-arc and self-adjusting processes with some tests also on metal-arc welded specimen. (Q7, K9s; Al-b)

1296-Q.* Some Aspects of Inhomogeneous Deformation in Polycrystalline Metals. Ajit K. Mallik and Rajendra Kumar. *Indian Institute of Metals, Transactions,* v. 12, June 1959, p. 119-126.

Local elongation in coarse-grained specimens of Al and decarburized mild steel. Effect of grain boundaries and tri-crystal junctions on deformation. 6 ref. (Q24f, 2-59; CN-g, Al)

1297-Q.* Theory and Experiment of Press Forging Axisymmetric Parts of Aluminum and Lead. S. Kobayashi. *Journal of Engineering for Industry (ASME Transactions, Series B),* v. 81 Aug. 1959, 228-238.

Theory for simple geometry with axial symmetry of relations of forging pressure, flash height, and die friction. Good agreement is shown to experimental data for pure Pb and Al. (Q23q, F22j, 3-68, 3-74; Al-a, Pb-a)

1298-Q.* Evaluation of Adhesion of Thick Electrodeposits. Hyman Chessin and John G. Poor. *Plating,* v. 46, Sept. 1959, p. 1037-1038.

Pushing out the end of lined holes in specimens allows classification of adhesion of Cr and other electrodeposits on cast iron, steel or Al alloys. 5 ref. (Q10c; CI, ST, Al-b, *Cr,* 8-62)

1299-Q. Grain Size Effects on Fatigue and Their Relationship to Notch Geometry, Stress Gradient and Size of Specimens. F. H. Vitovec. University of Minnesota. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151598, Dec. 1958, 39 p. $1.

Effect of grain size, size of specimen and stress gradient on the direct stress fatigue strength of a 2.5 Al-Mg alloy at room temperature. Specimens with 3 different grain sizes and 7 notch sizes were used. The fatigue strength of unnotched specimens increases linearly with the parameter one divided by the square root of average grain size. For specimens with the same theoretical stress concentration factor and the same grain size, fatigue strength increases linearly with decreasing ratio of notch root radius versus grain size. (Q7a, 3-73, 2-59, 3-66; 1-60)

1300-Q.* The Strength of Arc Welded Joints. *Welding Design & Fabrication,* v. 32, Sept. 1959, p. 62-65.

Principles involved in calculated nominal stresses in welded butt, tee and lap joints. (Q27a, Q25k, 7-51, 17-51)

1301-Q.* Effect of Specimen Geometry on Charpy Low-Blow Transition Temperature.

George M. Orner. *Welding Journal,* v. 38, Aug. 1959, p. 315-s-323-s.

Effect of striking the crack-initiating low blows at room temperature instead of at the temperatures selected for crack propagation. Results indicate that this modification of the testing technique has no measurable effect on the temperature at which the low-blow transition occurs. (Q6, Q26, 3-73)

1302-Q.* (German.) Determination of the Toughness of High Hardness Steels by the Bending Test. K. Bungardt, O. Mulders and W. Schmit. *Stahl und Eisen,* v. 79, Sept. 1959, p. 1258-1263.

With the one point loading method, the maximum bending strength and bending elongation limit was reached at a drawing temperature of 200 to 300° C. The elastic and plastic bending strength and elongation were established for the one and two-point loading method. Plastic deflection and bending yield point indicate toughness of the steel. (Q5j; CN)

1303-Q.* (Russian.) High-Strength Weldable Steels. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 56-60.

Effect of alloying elements on the strength properties of the ferritic phase and rate of spontaneous cooling from approximately 700° C. Relationship between transformation temperature and tensile strength. (Q27a, 2-61, N8; AY-n, SGB-a)

1304-Q.* (Russian.) Improving the Wear Resistance of Rolls Used in Continuous Light Gage Rolling. A. E. Krivosheev, L. S. Rudnitskii, Ya. N. Taran and I. E. Lev. *Stal',* July 1959, p. 629-636.

Highest hardness is reached with 3.8-4.3% Ni. Increasing Cr content up to 1.0% improves the hardness so long as the concentration of Ni does not exceed 3.8-4.3%. The highest wear resistance is found in those having a double layer (chilled and mottled) with a 78-85 hardness scale. (Q9n, W23k, Q29h)

1305-Q.* (Russian.) Properties of Aluminum Oxidized Al2A Steel. I. P. Zhetvin, P. A. Prokopovich, V. P. Tunkov, I. B. Tseitlin, E. E. Glazunov and G. L. Eisenberg. *Stal',* July 1959, p. 643-648.

Due to its reduced carbon, Mn and phosphorus amounts, and almost no Mn, Al2A steel has a better roll bite, less cracks during the cooling of ingots and less fissures and laminae during rolling. 7 ref. (Q-general, F23; CN-g, 9-72)

1306-Q. A System for Automatic Processing of Fatigue Data. A. J. Belfour and W. S. Hyler. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151596, Jan. 1959, 195 p. $3.

System provides a means of entering on IBM punch cards descriptive and quantitative information necessary to completely describe a fatigue test and its results. Such useful data as basic material and fabrication, mechanical properties of the material, specimen design and methods of preparation and type of test and associated testing procedure can be coded. The system is useful for coding information from basic fatigue studies of materials as well as component and structural fatigue studies. (Q7, A9p)

1307-Q. Effects of Low Neutron Exposures at Low Temperatures on Hardness and Tensile Properties of Natural Uranium. A. L. Bement. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission,* HW-60326, June 2, 1959, 59 P. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

Irradiation and testing techniques. Increases in hardness and yield strength and a decrease in unit elongation were observed. Annealing at 400° C. resulted in virtually complete recovery of original properties. 24 ref. (Q27a, Q29n, 2-67; U)

1308-Q.* (French.) Cracking and Failure of Steel in the Presence of Hydrogen. Paul Bastien. *Archiwum Hutnictwa,* v. 4, no. 2, 1959, p. 93-121.

Effect of hydrogen absorbed during electrolysis or the attack by an acid, on the reduction of area, damping properties and tensile strength at various testing temperatures and deformation rates. Influence of the rate of hydrogen absorption and storing time on area reduction. Laminated structures were found to be more sensitive to embrittlement than granulated structures. 41 ref. (Q26s, Q23p, Q8g, Q27a, 2-61, 3-67, 3-71; ST, *H*)

1309-Q.* Improvement of the Fatigue Strength of Large Cylindrical Shafts With Radial Holes. M. P. Troitskaya. *Metallovedenie i Termicheskaya Obrabotka Metallov,* no. 8, 1959, p. 12-14.

Fatigue testing of crankshaft pins after hardening by surface rolling or surface hardening by high-frequency induction. Effect of hardening process on strength. (Q7a, T7, G23s, J2g, 2-64; CN-p)

1310-Q.* Fatigue Strength of Carbon Steel as Affected by a Melt of the Eutectic Alloy Pb-Sn. M. I. Chaevskii. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 14-20.

Fatigue testing in Pb-Sn melts at temperatures between 200 and 400° C., and for comparison in air. In the melt, the average fatigue strength was 40% higher. 14 ref. (Q7a, 2-66; CN, 14-60)

1311-Q.* Failure of Babbitt Under Compression. S. E. Gurevich. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 24-27.

Cylindrical samples of babbitt metal are deformed by compression. The deformation and failure mechanism is tested microscopically. (Q28g, 2-60; SGA-c)

1312-Q.* Relationship Between the Hardness of Metals and Alloys and Resistance to Seizure. A. D. Kuritsyna. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 27-31.

The tendency to seizure of binary Cu alloys containing Si, Sn, Al, Ni and Zn is tested by compressing thin specimens between dies. Hardness and pressure necessary for seizure as functions of the composition. 9 ref. (Q9q, Q29n, 2-60; Cu-b, *Si, Sn, Al, Ni*, Zn)

1313-Q.* Effect of the Temperature of Second Quenching After Cementation on the Fatigue of Steels and Repeated Impact. S. S. Ermakov and V. I. Kochnev. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 49-50.

After cementation, the samples were quenched in oil, heated up to 720-860° C., and again oil quenched. Effect of the temperature of this second treatment on structure and impact fatigue. (Q7a, Q6n, 2-61, 2-64; ST)

1314-Q.* Embrittlement of Steel 20 and Steel 20KH After Electrolytic Loading With Hydrogen. K. V. Popov and V. A. Yagunova. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 51-52.

Samples were exposed to a current in diluted H_2SO_4 and then mechanically tested. Influence of the quantity of hydrogen absorbed on the reduction of area. (Q26s, N15, 1-68, Q23p; ST, *H*)

1315-Q.* Effect of Cold Deformation on the Hot Strength of KHN80T Alloy. D. Ya. Kagan and V. I. Kolchinskii. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 52-54.

Cr-Ni-Ti alloys for service between 550-600° C. were subjected to tensile deformations of 4-15%. Effect of deformation on tensile strength, elongation and creep strength at 550 to 750° C. (Q3m, Q27a, 2-62, 3-68; SGA-h, Cr-b, *Ni, Ti*)

1316-Q.* Effects of Neutron Irradiation on Mechanical Properties of Ferritic Steels and Iron. L. P. Trudeau. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 475-480.

Effect of composition and microstructure as controlled by heat treatment on the magnitude of the radiation-induced change in properties. Impact energy transition curves and tensile test results reported for subsize specimens; the correlation between results for subsize samples and those for full-size samples given for the unirradiated materials. (Q-general, 2-60, 2-67; Fe-b, CN, AY, SS-d)

1317-Q.* Effect of Gases Produced in Reactor Materials by Irradiation. R. S. Barnes and G. W. Greenwood. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 481-485.

Gas produced during irradiation causes fragmentation of brittle materials. Ductile materials increase volume at elevated temperatures with internal formation of gas. Precipitation of helium bubbles within both Be and Cu suggest that vacancy diffusion is the controlling mechanism. 11 ref. (Q26r, 2-67; Be, Cu)

1318-Q.* Fuel Element Behavior Under Irradiation. V. W. Eldred, G. B. Greenough and P. Leech. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 510-520.

Magnox, Al and uranium are studied for surface wrinkles, creep and turning during irradiation. 5 ref. (Q3, M28, T11g, 2-67; U, Al, Mg-b)

1319-Q.* Assessment and Testing of Fuel Elements. H. K. Hardy and H. Lawton. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5.

Properties of Reactor Materials". United Nations, Geneva, 1958, p. 521-531.

Sources of strain, irradiation effects, wrinkling, creep, swelling, thermal creep, thermal cycling of uranium and can. 22 ref. (Q7j, P10d, Q3, Q25p, T11g, 2-67, 3-68; U)

1320-Q.* (Rumanian.) Effect of Heat Treatment of Superheated Steel After Secondary Austenitization, on the Tendency to Temper Brittleness. Butu Rotenstein and Nicolae Dragan. *Studii si Cercetari de Metalurgie,* v. 4, no. 2, 1959, p. 127-138.

After a first quenching from 1200° C. the samples are heated and quenched a second time and then annealed at 850-1000° C. Effect of annealing temperature on fracture and embrittlement. 6 ref. (Q26s, 2-64; CN-p)

1321-Q. (Book.) Elevated-Temperature Properties of Chromium Steels (12-27%). American Society for Testing Materials STP no. 228, 1958, 113 p. $4.25.

Curves and data on various mechanical properties for 23 steels ranging from 12-27% Cr. (Q-general, 2-62; SS)

1322-Q. (Translation—Brutcher no. 4690.) Mechanical Properties of Cold Worked Austenitic 18-8 Cr-Ni Steels at Low Temperatures. N. N. Lyulicheva and N. V. Pisareva. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 217-220.

Yield and tensile strength of 1Kh18N9 steel at various degrees of cold deformation are recorded for the testing temperatures +20 and -183° C. Relationship between crystal structure and strength. 8 ref. (Q23b, Q27a, M26, 3-68, 2-63; SS)

1323-Q. (Translation—Brutcher no. 4712.) Effect of Sulphurizing on the Wear Resistance of Parts From Antifriction Malleable Cast Iron. Ya. G. Lifshits. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 221-223.

Influence of service temperature and sulphurizing on wear resistance of machine parts. (Q9, T7d, J28, 2-61; CI-s, SGA-c)

1324-Q.* Spontaneously Induced Brittle Fractures in Welded-Steel Disks. A. Vinckier. *Welding Journal,* v. 38, Sept. 1959, p. 354s-359s.

A simple test is used to demonstrate how fractures take place. Factors governing the initiation and propagation of fracture. 12 ref. (Q26s, 1-54; 7-51, ST)

1325-Q.* Micromechanism of Brittle Fracture in a Low-Carbon Steel. G. T. Hahn, W. S. Owen, B. L. Averbach and M. Cohen. *Welding Journal,* v. 38, Sept. 1959, p. 367s-376s.

Tensile data, elastic limit measurements, standard Charpy data and observations of slip, twinning and microcracking in relation to brittle fracture in coarse and fine-grained steels. 32 ref. (Q26, Q27, Q24; CN-g)

1326-Q.* Analysis of Fatigue. Louis S. Clock. *Machine Design,* v. 31, Oct. 15, 1959, p. 167-169.

How to construct and use modified Goodman diagrams for maximum stress determinations with fluctuating and steady loads. (Q7a, 3-66, 3-74)

1327-Q.* Cast and Wrought Alloy Steels—Elevated Temperature Properties. R. K. Buhr and W. A. Morgan. *Modern Castings,* v. 36, Oct. 1959, p. 61-67.

Low-alloy high-strength steels investigated by means of static mechanical properties, fatigue strength and hardness for both cast and wrought forms. Secondary hardness caused by precipitation of fine alloy carbides. (Q27a, Q6n, Q7a, Q29n; AY-b, 1-60, 2-60, 2-61, 2-64)

1328-Q.* Magnesium Casting Alloy EK31XA. K. E. Nelson. *Modern Castings,* v. 36, Oct. 1959, p. 71-83.

Mg alloy containing 3.2% didymium and 0.6% Zr discussed in terms of castability, weldability, heat treatment for optimum properties, tensile strength, creep strength and corrosion characteristics. (Q27a, Q3m, R11j; Mg-b, 2-63, 5-60)

1329-Q.* (French.) Effect of a Low Arsenic Content on Mechanical Properties of Deep Drawing Steel Sheet. A. Kohn and J. Stremsdoefer. *Revue de Metallurgie,* v. 51, July 1959, p. 101-112.

Mechanical and structural testing of steel containing up to 0.080% As. Effect of As on the heterogeneous distribution of components and deep-drawing properties. 8 ref. (Q27a, Q21e, Q23p, M27; ST, 4-53, As)

1330-Q.* The Structure of Steel. E. Gregory and E. N. Simons. *Edgar Allen News,* v. 38, Aug. 1959, p. 177-179.

Physical and mechanical properties of both heat resisting and austenitic stainless steels. Corrosion, work hardening and forging characteristics. (Q27a, Q29n, Q6n; SS-e)

1331-Q.* Low Temperature Properties of Ferrous Materials. *Society for Automotive Engineers,* Preprint no. TR-169, 1959, 9 p.

Notch toughness behavior with respect to welding, design, fabrication, composition, microstructure of steels. 47 ref. (Q6, Q26, Q23s, 2-63, 2-59, 2-60; AY, SS)

1332-Q. Effect of Hardness, Surface Finish and Grain Size on Rolling Contact Fatigue Life of M50 Bearing Steel. R. A. Baughman. *American Society of Mechanical Engineers,* Paper no. 59-LUB-11, 1959, 11 p. $.80.

Bearing fatigue of M50 increases by increasing hardness, decreasing surface and increasing grain size. The optimum life identified occurs at hardness of Rockwell C-64, 1.5 surface finish and a grain size of ASTM 2. (Q7b, 2-59, Q29n; CN, SGA-c)

1333-Q.* Creep of Cold-Drawn Nickel. William D. Jenkins and Carl R. Johnson. *Journal of Research of the National Bureau of Standards,* v. 63C, July-Sept. 1959, p. 1-18.

Creep of cold drawn Ni specimens in tension under constant loads at 300 to 1200° F. Effect of stress and temperature on strain-time relations, on second-stage creep rate and fracture time. Influence of temperature and creep rate on ductility and fracturing characteristics and resulting structures. 23 ref. (Q3, Q23p, 2-62, 3-66, 3-67, 3-68, Q24; Ni-a)

1334-Q.* Temper-Embrittlement. T. P. Singh. *Metal Treatment and Drop Forging,* v. 26, July-Aug. 1959, p. 275-283.

Temper embrittlement of low-alloy and plain carbon steels; displacement of ductile-to-brittle transition temperatures. Metallographic evidence; nature of fracture; kinetics of embrittlement. 37 ref. (Q23r, Q26s, N8a, J29; ST)

1335-Q.* (Japanese.) "Melt Quality" and Fracture Characteristics of 85-5-5-5 Red Brass. Shigeo Oya and Umeo Honma. *Japan Foundrymen's Society, Journal,* v. 31, Aug. 1959, p. 699-707.

Microstructure, macrostructure and fracture in relation to various melting conditions. (Q26, M28, E10; Cu-n)

1336-Q.* (Japanese.) Structure and Tensile Strength of Vacuum Melted Silicon Cast Iron. Masao Kikuchi. *Japan Foundrymen's Society, Journal,* v. 31, Aug. 1959, p. 713-718.

Tensile strength is influenced by the graphitization after vacuum melting. (Q27a, N8; CI, *Si*)

1337-Q.* Pick-Up of Copper and Duralumin on Bonded Tungsten Carbide. J. Golden and G. W. Rowe. *British Journal of Applied Physics,* v. 10, Aug. 1959, p. 367-371.

Transfer of metal in sliding wear as determined by radioactive tracers; significance of pick-up in analysis of wear. (Q9n, 1-59; Cu, Al-b, W, 6-69)

1338-Q.* Selection of Precipitation-Hardening Stainless Steels. M. E. Holmberg. *Machine Design,* v. 31, Oct. 29, 1959, p. 139-140.

Short-time high-temperature tensile properties and corrosion rates of 17-4 PH stainless. (Q27a, 2-61, R-general; SS)

1339-Q.* The Stress-Dependent Damping Capacity of Ferromagnetic Metals. G. Sumner and K. M. Entwistle. *Iron and Steel Institute, Journal,* v. 192, July 1959, p. 238-245.

Stress-dependent damping arises from the irreversible movement of magnetic domain boundaries. A simple analysis using domain theory predicts a relation between stress for peak damping and magnetizing field for maximum susceptibility which is found experimentally to be valid. (Q8, P16, 3-66, Fe-b)

1340-Q.* Mechanical Properties of Hardened High-Speed Tool Steels. J. Clayton Cave and E. Ineson. *Iron and Steel Institute, Journal,* v. 192, July 1959, p. 248-252.

Tests to determine ductility, fatigue limits and other "toughness" properties of hardened toolsteels under various conditions. (Q29n, Q7a, Q23p; TS)

1341-Q.* Some Recent Experiments on the Friction, Wear and Deformation of Solids. F. P. Bowden. *Society of Automotive Engineers,* Preprint no. 17R, 1959, 7 p.

Frictional behavior of metallic carbides at high temperatures and high speeds; damage to solids by liquid impact at high speeds and deformation. (Q9, Q24; 6-69)

1342-Q.* Use of Bench Wear Tests on Materials Development. G. H. Robinson, R. F. Thomson and F. J. Webbere. *Society of Automotive Engineers,* Transactions, v. 67, 1959, p. 569-579.

Studies on a tappet machine show that wear resistance of Fe alloys is affected by formation of surface films. 10 ref. (Q9; Fe-b)

1343-Q. Physical and Mechanical Properties of Nine Commercial Precipitation-Hardenable Stainless Steels. D. A. Roberts, D. B. Roach and A. M. Hall. Defense Metals Information Center. (Battelle Memorial Institute.). *U. S. Office of Technical Services,* PB 151068, May 1959, 83 p. $2.25.

The three classes studied are martensitic (stainless W and 17-4 PH); semi-austenitic (17-7 PH, PH 15-7 Mo, AM 350, and AM 355); and austenitic (A-286, 17-10P, and HNM). Among their desirable characteristics are ease in hot working, machining, forming and joining. The alloys possess good properties at moderately high temperatures (up to 1400° F. for some), along with good oxidation and corrosion resistance. (Q-general, 2-62, R1h, G17, K-general; SS)

1344-Q. Properties of Certain Cold-Rolled Austenitic Stainless Sheet Steels. R. J. Mangone, D. B. Roach and A. M. Hall. Defense Metals Information Center. (Battelle Memorial Institute.) *U. S. Office of Technical Services,* PB 151069, May 1959, 62 p. $1.75.

Physical and mechanical properties of five cold rolled austenitic stainless sheet steels being used or considered for airframe construction. Included are AISI Type 301, MicroMach, AISI Type 201, USS Tenelon and USS17-5 MnV. In the full-hard condition these alloys have yield strengths exceeding 150,000 psi., with ductilities of about 10%. Yield strengths increase to 200,000 psi. in the extra-hard condition, while ductility decreases to 5% or below. (Q23b, Q23p; SS, 4-53)

1345-Q. Studies of the Effect of Dynamic Preloads on the Mechanical Properties of Steel. R. C. Smith. U. S. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 151685, May 1959, 15 p. $.50.

Low-carbon steel specimens were dynamically preloaded and their mechanical properties were determined to analyze the yielding phenomenon. Upper and lower yield stresses and the inelastic microstrain which preceded gross yield on the retest were used to evaluate the extent of damage and recovery. The most interesting results occurred during the static tests of elastically shocked specimens where the materials showed no permanent deformation even when subjected to stresses greatly exceeding the static yield. (Q-general, 3-68, 3-66; CN-g)

1346-Q. (Russian.) Effect of Gas Content on Hot Brittleness of Aluminum Alloys. G. A. Korol'kov and I. I. Novikov. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo,* no. 2, 1959, p. 19-23.

Melts of various composition, both in the original state and after increasing the hydrogen content by treatment with steam, were tested for hot shortness. Reducing effect of hydrogen on linear shrinkage and ductility. 13 ref. (Q26s, N15e, P10c, Q23p; Al-b, *H*)

1347-Q. (Russian.) Deformation of Nickel in Creep. E. A. Minkina, N. V. Preobrazhenskaya and V. M. Rosenberg. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo,* no. 2, 1959, p. 48-55.

Creep tests performed at 400-800° C. Effects of time and temperature on crystal slip and displacement of the whole crystal along the grain boundary. Relationship between total elongation, elongation resulting from crystal slip and elongation caused by displacement along the grain boundaries. 16 ref. (Q3, Q24a, 2-61; Ni)

1348-Q.* Solders for Nuclear and Space Environments. Alvin B. Kaufman. *Electronics,* v. 32, Sept. 4, 1959, p. 50-51.

Applications and tensile properties of soft and Ag solders subjected to heat, cold and radiation. 9 ref. (Q27a, 2-61, 2-67; SGA-f, Sn-b, *Pb,* Ag-b, *Zn, Cu*)

1349-Q.* The Practical Realization of the HV and HR Scales of Hardness. R. S. Marriner. *Machinery (London),* v. 95, Sept. 2, 1959, p. 405-410.

Influence of indenter misalignment and imperfections and error. speed and duration of loading on hardness values determined with new dead weight Vickers machine. (Q29c, 3-67)

1350-Q.* 500,000 Psi. Steel. Ford Leaps the Tensile Barrier. *Steel,* v. 145, Sept. 21, 1959, p. 84-86.

Heavy working of a modified SAE 4340 steel from 800-1050° F., followed by quenching and tempering, results in a fine martensitic structure and extraordinarily high strength and ductility. (Q27a, N8p; AY, SGB-a)

1351-Q.* Extruding Costly Metals Cuts Scrap, Ups Physicals. *Steel*, v. 145, Sept. 21, 1959, p. 88-90.

Tensile strength, yield strength and elongation of Ti, Zr, Cb, Ta and Mo in the annealed state and following cold extrusion. (Q27a, G5; Ti, Zr, Cb, Ta, Mo, Al)

1352-Q.* Prestrain, Size and Residual Stresses in Static Brittle Fracture Initiation. C. Mylonas. *Welding Journal*, v. 38, Oct. 1959, p. 414s-424s.

Mechanism of static initiation of brittle fracture based on the concept of exhaustion of ductility in relation to static fractures of steel plate at stress levels as low as 12% of virgin yield. As a rule, the ductility of sound structural steels is sufficient to prevent appreciable influence of localized residual stresses. 37 ref. (Q25h, Q26s, Q23p, 3-68; ST, 7-51)

1353-Q. (Russian.) Effects of Thermal Stress Present Between the Phases of Cast Iron During Transition Through the Eutectoid Point. V. F. Zubarev and F. K. Tkachenko. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 113-115.

Dilatometric measurements on white cast iron of various composition and a pearlitic steel. Effect of interphase stress on graphitization and micropores. 8 ref. (Q25p, N11h, N8, 9-68; CI-p, AY)

1354-Q.* (Russian.) Correlationship Between Creep and Relaxation. I. A. Oding and G. F. Lepin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 2-8.

Creep and relaxation as functions of load and time. 17 ref. (Q3, 3-67)

1355-Q.* (Russian.) Effect of Heat Treatment on the Heat Resistance of Boiler-Turbine Steel 12KhMF. I. N. Bogachev and Kh. D. Reshetnyak. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 8-12.

Effect on structure and creep strength. 6 ref. (Q3m, 2-64, 3-71; SS, SGA-h)

1356-Q.* (Russian.) Effect of the Sigma-Phase on the Mechanical Properties of Heat Resistant Alloys. E. E. Levin, E. M. Pivnik and P. M. Libman. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 17-19.

Behavior of the sigma-phase during deformations at elevated temperatures. After quenching from 1200° C. and aging at 800° C., samples were heated by passing a current and simultaneously subjected to deformation. (Q27a, Q23p, 2-60, 2-62, 2-65; SGA-h)

1357-Q.* (Russian.) Anomalies of the Initial Stage of Plastic Deformation. Ya. R. Rauzin. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 23-29.

Investigation of Al, Fe and steel. Effects of grain size and degree of purity. 14 ref. (Q24, 2-59, 2-60; Al, Fe, ST)

1358-Q.* (Russian.) Influence of Alloying With Chromium and Manganese on the Tendency of Low Carbon Steel to Brittle Fracture. V. G. Savitskii, K. V. Popov, V. F. Zakharov and G. M. Grigor'eva. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 49-51.

Bend and impact bend testing at temperatures from -200 to 0° C. Some of the samples were previously annealed at 860° C. while others were quenched from 880° C. and tempered at 600° C. (Q26s, Q5g, Q6, 2-64, 2-60, 2-63; CN-g, *Cr, Mn*)

1359-Q.* (Russian.) Influence of High Temperature Heating in Hydrogen on the Brittleness of Weldments. L. S. Livshits, L. P. Bakhrakh, I. D. Grebeshkova and V. P. Teodorovich. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 52-55.

Effect of changes in the Mn and Cr contents on the brittleness of welded samples held through 900 hr. at 510-550° C. in a hydrogen atmosphere. (Q26s, 2-66, 2-60, 2-62; AY, 7-51, *Mn, Cr, H*)

1360-Q.* (Russian.) Effect of a Fine-Grained Surface Layer on the Cold Shortness of Steel. P. S. Cakharov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 55-57.

A fine-grained layer is produced on the surface of the alloy steel 1Kh25Yu5 by hot rolling. Bend tests at -40 to 90° C. show that a fine-grained surface reduces the cold shortness tendency. 4 ref. (Q26s, 3-71; AY)

1361-Q.* (Russian.) Reasons for the Development of Hydrogen Brittleness in the Pickling of Steel Sheet. P. G. Kovtun. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 58-59.

Effect of heat treatment temperature and time on the brittleness behavior after pickling in diluted H_2SO_4. Tensile tests and Erichsen cupping tests. (Q26s, 2-64, L12g, 2-66, Q27a, Q23q; ST, 4-53, *H*)

1362-Q. (Russian.) Application of Formulas Showing Relationships of Temperature and Other Parameters for the Process of Creep. N. N. Geminov. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Sept. 1959, p. 19-22.
10 ref. (Q3, 2-61)

1363-Q.* Comparisons Between the Shearing Properties of Alpha-Brass as Derived From the Cutting Process and From Static and Impact Torsion Tests. S. S. Chang and W. B. Heginbotham. *American Society of Mechanical Engineers*, Paper no. 59—A-38, 1959, 9 p.
Tests carried out on standard specimens at various loads and speeds and shear stresses, shear strains and Merchant constant derived from various methods. 11 ref. (Q2g, Q6, Q8g; Cu-n)

1364-Q.* A Test to Anticipate the Performance of Steam Piping at 5000 Psi. and 1200° F. George C. Wiedersum, Jr. *American Society of Mechanical Engineers*, Paper no. 59-A-230, 1959, 8 p.
Tests on Type 316 stainless steel piping covering ultrasonic behavior, transverse tension, ductility, liquid penetration, impact, hardness, microscopy and temperature-stress cycling properties. 9 ref. (Q-general, 2-62, 1-53; SS, 4-60)

1365-Q.* High-Stress, Low-Cycle Fatigue Properties of Notched Alloy Steel Specimens. S. Yukawa and J. G. McMullin. *ASTM Bulletin*, no. 241, Oct. 1959, p. 38-40.
Data on tension-only (zero stress ratio) fatigue loading applied at nominal stresses of 50% or more of static strength. 10,000 load applications at about 50% of static strength caused failure. (Q7, 3-66; AY)

1366-Q.* Boron-Treated Cast Steels. W. J. Jackson. *Iron and Steel Institute, Journal*, v. 192, Aug. 1959, p. 350-361.
Effect of boron additions in low-alloy and medium-carbon Mo steels on impact values, hardenability, tensile strength and ductility. Hardenability showed an increase, but no improvement in impact properties. 25 ref. (Q27a, Q6n, Q23p, 2-60; AY, CN-p, *B*)

1367-Q. High-Temperature-Strain Fatigue Testing With a Modified Direct-Stress Fatigue Machine. W. F. Anderson and C. R. Waldron. Atomics International. *U. S. Atomic Energy Commission*, NAA-SR-4051, Oct. 1, 1959, 34 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.
Strain fatigue tests conducted on Type 304 stainless steel at room temperature and 1000° F. to determine its capacity to withstand thermally induced cyclic strain. (Q7j, Q23, Q27, Q21, 2-62; SS-e)

1368-Q.* (English.) Sintered Intermetallic Compound NiAl as High-Temperature Materials. Pt. 2. Yunoshin Imai and Masuji Kumazawa. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 312-316.
Oxidation resistance, axial rupture by compression, transverse rupture by bending and absorption energy by Charpy tests. (Q-general, R1h; Ni, Al, 6-71, 14-68, SGA-h)

1369-Q.* (Japanese.) Effects of Heat Treatment on Mechanical Properties of Nickel-Base Heat Resisting Alloys. Pt. 4. Studies on Nickel-Base Heat Resisting Alloys. Taro Hasegawa. *Tetsu to Hagane*, v. 45, June 1959, p. 622-626.
Influence on the stress-rupture, tensile and hardness properties of Inconel X-550, Inco 739, Nimonic 90 and Inco 700. (Q3q, Q27a, Q29b, 2-64; Ni-b, SGA-h)

1370-Q.* Survey of Various Special Tests Used to Determine Elastic, Plastic and Rupture Properties of Metals at Elevated Temperature. F. Garofalo. *American Society of Mechanical Engineers*, Paper no. 59—A-112, 1959, 14 p.
Techniques depend on static or dynamic measurements. A comparison and analysis of test results determined by these two methods. Effect of composition, grain size and various transformations on the elastic moduli or their temperature dependence. (Q23, Q21, Q3q, 2-60, 2-62, 2-59, 1-54)

1371-Q. Bibliography on Thermal Stresses and Low Cycle Fatigue. D. R. Miller. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission*, KAPL-2048, Aug. 20, 1959, 29 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.
Some 200 references concentrating mainly on U. S. literature. (Q7j, 11-65)

1372-Q. Deformation Modes of Zirconium at 77, 300, 575 and 1075° K. E. J. Rapperport and C. S. Hartley. Nuclear Metals, Inc. *U. S. Atomic Energy Commission*, NMI-1221, Aug. 12, 1959, 33 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

The only slip system observed at any of the temperatures was of the form $(10\bar{1}0)$ $[\bar{1}2\bar{1}0]$ with a critical resolved shear stress of about 1.0 kg. per sq. mm. in tension at 77° K., 0.65 kg. per sq. mm. in compression at 300° K., 0.20 kg. per sq. mm. in tension at 575° K., and 0.02 kg. per sq. mm. in tension at 1075° K. The active twin planes were $\{10\bar{1}2\}$, $\{11\bar{2}1\}$, $\{11\bar{2}2\}$ and $\{11\bar{2}3\}$ with varying frequencies at the different test temperatures. (Q24a; Zr)

1373-Q.* Strain Hysteresis, Energy and Fatigue Fracture. Charles E. Feltner. *University of Illinois, Dept. of Theoretical and Applied Mechanics*, Report no. 146, June 1959, 53 p.

Portion of hysteresis energy is an index of fatigue failure; relationship between plastic hysteresis energy and fatigue failure. 71 ref. (Q26r, Q7, 3-68; ST)

1374-Q.* Micro-Plastic Strain Hysteresis Energy as a Criterion for Fatigue Fracture. C. E. Filtner and J. Morrow. *University of Illinois, Dept. of Theoretical and Applied Mechanics*, Report no. 576, May 1959, 42 p.

Relationship between stress amplitude and number of cycles to failure depending on material properties obtained from the static true stress-strain tension test. Determination of S-N curves for soft SAE 4340. 13 ref. (Q26r, Q7, Q24, 3-66; ST)

1375-Q.* (Japanese.) Behavior of Pure Iron Under Impact Tensile Loading. Seita Sakui and Masanobu Omori. *Tetsu To Hagane*, v. 45, Apr. 1959, p. 415-423.

Yield stress and tensile strength were larger and total elongation smaller than those under static test. By increasing the strain rate, both yield stress and tensile strength increased while total elongation decreased slightly. The rate of increase of yield stress was greater than that of tensile strength. 14 ref. (Q27b, Q27a; Fe-a, CN-g)

1376-Q.* (Japanese.) Effect of Ti and Al on Mechanical Properties of Nimonic 80 A. Pt. 6. Taro Hasegawa. *Tetsu to Hagane*, v. 45, Apr. 1959, p. 432-437.

Effects of Ti, Al and gas content on stress-rupture characteristics at 750° C. and 25 kg. per sq. m. Stress-rupture life increased with an increase of Ti + Al. Stress rupture life depends also on the amount of nitrogen and oxygen or hydrogen. The increase of gas content causes much precipitation around grain boundaries and tends to soften the material during stress-rupture testing by overaging, so that stress-rupture life decreases. (Q3q, 2-60; Ni-b, *Ti, Co, Al, Cr*)

1377-Q. (Russian.) Decomposition and Heat Resistance of the Alloy KhN80T. B. G. Livshits and N. N. Kossakovskaya. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 433-450.

Effect of the rate of cooling after holding at 1080° C. on hardness, heat resistance, precipitation of alpha' phase and on the size of alpha' particles. 10 ref. (Q27a, 2-61, Q29n, M26, N7, 3-67; Ni-b, *CR*)

1378-Q. (Russian.) Elastic Properties of Fe-V Alloys. G. M. Ashmarin and B. N. Finkel'shtein. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 451-460.

Effects of composition ratio and various heat treatments on Young's lattice. 11 ref. (Q21e, M26, 2-60, 2-64; Fe-b, *V*)

1379-Q. (Russian.) Internal Friction of Fe-V Alloys. G. M. Ashmarin. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat Moscow, 1958, p. 461-475.

Influence of various heat treatments, composition ratio and testing temperature on internal friction. 8 ref. (Q22, 2-64, 2-60, 2-61; Fe-b, *V*)

1380-Q. (Russian.) Effect of Tempering on the Shear Modulus and Internal Friction of Quench Hardened Carbon Steel. I. N. Chernikova and B. N. Finkel'shtein. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 476-482.

Influence of annealing after quench hardening. Effect of carbon content and testing temperature. (Q21d, Q22, 2-64; 2-61; CN)

1381-Q. (Russian.) Effect of Small Additions of Boron, Calcium, Columbium, Zirconium and Cerium on Structure and Properties of a Heat Resistance Alloy With a High Nickel Content. N. T. Gudtsov, R. I.

Trubetskova and M. L. Bernshtein. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 495-516.

Effects on primary crystallization, aging behavior, heat resistance and creep strength. 6 ref. (Q3m, N12, N7a, 2-60, 2-61; SS, *B, Ca, Cb, Zr, Ce,* SGA-h)

1382-Q. (Russian.) Yttrium and Its Alloys. E. M. Savitskii and V. F. Terekhova. *Tsvetnye Metally,* no. 1, 1959, p. 48-53.

Composition, hardness, tensile strength, elongation and compression properties. 8 ref. (Q29n, Q27a, Q23p, Q28g, 2-61; Y)

1383-Q. (Russian.) Properties of Cu-Ti Alloys. K. P. Kalinin and M. Z. Spiridonova. *Tsvetnye Metally,* no. 1, 1959, p. 82-88.

Mechanical properties, solidification shrinkage, resistivity. 6 ref. (Q29n, Q27a, Q23p, Q28g, P10c, P15g; Cu-b, *Ti*)

1384-Q. (Swedish.) Creep-Resisting Materials. S. Arwidson. *Jernkontorets Annaler,* v. 143, no. 7, 1959, p. 373-413.

Review of creep resistance of low and high-alloy steels, Ni-base alloys, Co-base alloys and cermets. (Q3; Ni-b, Co-b, AY, SS, 6-70)

1385-Q.* Engineering Properties of Inconel. *Inco Technical Bulletin* T-7, Sept. 1959, 22 p.

Physical constants, mechanical properties, corrosion resistance, working characteristics, effect of temperature on strength, general description of mill products. (Q-general, R-general, F-general, G-general, 2-61; Ni-b, *Cr, Fe*)

1386-Q.* Engineering Properties of Ni-O-Nel. *Inco Technical Bulletin* T37, Sept. 1959, 11 p.

Physical and tensile properties; use in handling acids and other corrosive mixtures; procedures for pickling, forming and welding. (Q-general, Q27a, R6g, K-general, L12g; Ni-b, *Fe, Cr*)

1387-Q.* Inconel "X". Age-Hardenable Nickel-Chromium Alloy. *Inco Technical Bulletin T38,* Aug. 1959, 31 p.

Physical and mechanical properties. Effects of heat treatments, aging processes and working processes on properties and behavior of sheet, strip, bars, wire, springs and forgings. (Q-general, P-general, 2-64; Ni-b, *Cr,* 4-51, 4-53, 4-55, 4-61)

1388-Q.* On Model Studies of Metallic Surface Asperities. F. F. Ling and R. C. Lucek. *Journal of Applied Physics,* v. 30, Oct. 1959, p. 1559-1563.

Mechanical wear model consisting of two conical contact tips interfering with each other. Effects of lubrication, apex angle, size; theory in terms of both interlocking and adhesion. (Q9n, 3-66, 3-73; Cu-n)

1389-Q.* (Japanese.) Influences of Cu, Sn and Other Factors on Hot Workability. Pt. 1. Study of the Hot Workability of Special Steel Shapes. Eiichiro Asano and Akizi Suseki. *Tetsu to Hagane,* v. 45, Jan. 1959, p. 27-34.

Tests show that the presence of Cu or Sn as impurities lowers the hot workability of steel. 8 ref. (Q23q, 1-66, 3-69; ST, *Cu, Sn*)

1390-Q.* (Japanese.) Relationship Between High-Temperature Ductility and Bendability of As-Cast Structures of Timken 16-25-6. Pt. 2. Forgeability of Transformation-Free Alloy Ingots. Toshimi Yamane and Genjiro Mima. *Tetsu to Hagane,* v. 45, Jan. 1959, p. 21-26.

Dynamic and static tensile and bending tests at high temperatures. Elongation is better under static testing. Least elongation is obtained when tensile stress is applied transversely and when bending stress is applied longitudinally to the columnar axis. 4 ref. (Q23p, Q5g, 3-71, 3-66; SS, *Ni, Cr*)

1391-Q.* (Japanese.) Effect of Nitrogen on Ni-Cr Alloys. Pt. 1. Nitrogen as an Alloying Element in Heat Resisting Materials. Masazo Okamoto and Renpei Yoda. *Tetsu to Hagane,* v. 45, Jan. 1959, p. 34-40.

Small amounts of nitrogen strengthen Nichrome without decreasing ductility, increase electrical resistance and coefficient of expansion. Nitrogen is detrimental to Nimonic alloys. 8 ref. (Q-general, P-general, 2-60; Ni-b, *Cr,* SGA-h)

1392-Q.* (Japanese.) Tensile Strength of Die Quenched Alloys. Hiroshi Asada, Kichizo Koike and Saburo Morimoto. *Light Metals,* v. 9, July 1959, p. 38-42, 21.

Tensile strength of quenched Al alloys is dependent upon pretreating and Mn and Cr present. (Q27a, J26; Al-b, *Mn, Cr*)

1393-Q.* (Japanese.) Age-Hardening Characteristics of Nickel-Base Heat-Resisting Alloys. Pt. 1. Studies on Nickel-Base

Heat-Resisting Alloys. Taro Hasegawa. *Tetsu to Hagane,* v. 45, Jan. 1959, p. 40-45.

Age hardness and solution-treated hardness. Age hardening is much faster than with carbide-precipitation type alloys. Maximum hardness is attained at 750° C. and decreases at higher temperatures. 7 ref. (Q29n, J27a, J27d; Ni-b, SGA-h)

1394-Q.* (Japanese.) Improved Magnesium Alloys. Yoshitsugu Mishima and Naoaki Takahashi. *Light Metals,* v. 9, July, 1959, p. 43-47.

Mechanical properties of Magnox-E Mg alloy in relation to heat treatment, and Zr, Zn and Bi additions. (Q-general, 2-60, 2-64; Mg-b, *Zr, Zn, Bi*)

1395-Q.* (Japanese.) Magnesium Casting Alloys. Pt. 5. Makoto Tsukuda. *Light Metals,* v. 9, July 1959, p. 48-60.

Castability, mechanical properties and microstructure of ZK61 and EZ33 Mg alloys. (Q-general, E25p, M27; Mg-b)

1396-Q.* (Japanese.) Magnesium Casting Alloy. Pt. 6. Makoto Tsukuda. *Light Metals,* v. 9, July 1959, p. 61-73.

Mechanical properties; hardness; heat treatment and effect of alloy additions. (Q-general, Q29n, 2-64, 2-60; Mg-b, 5-60)

1397-Q.* (Japanese.) Effect of Heat Treatment on Mechanical Properties of M252. Pt. 3. Studies on Nickel-Base Heat-Resisting Alloys. Taro Hasegawa. *Tetsu to Hagane,* v. 45, May 1959, p. 522-527.

The optimum temperature of solution treatment to get high stress-rupture life is 1065° C. Solution treatment at temperatures higher than 1065° C. causes grain coarsening and overaging during long-time testing and decreases the resistance to creep rupture. Specimens solution treated at 1065° C. have superior creep-rupture life to the specimens solution treated and aged at 750° C. But the life in stress-rupture testing of the former becomes inferior to the latter at longer testing time. 4 ref. (Q3q, 2-64, 2-62; Ni-b, SGA-h)

1398-Q.* (Japanese.) Effect of the Normalized Structure in Medium Carbon Steel on Mechanical Properties and Ultrasonic Propagation. Mamoru Nishihara, Taira Nakano and Minoru Makioka. *Tetsu to Hagane,* v. 45, Aug. 1959, p. 709-803.

Study of the relationship between microstructure and mechanical properties (ductility and toughness) to clarify the effect of acicular pearlitic structure found in normalized medium-carbon steel on its mechanical properties. 6 ref. (Q-general, M27, Q21f, 1-74; CN-p)

1399-Q.* (Japanese.) Comparison of Mechanical Properties at Elevated Temperature of Some Commercial Ni-Base Heat Resisting Alloys. Pt. 5. Studies on Ni-Base Heat-Resisting Alloys. Taro Hasegawa. *Tetsu to Hagane,* v. 45, July 1959, p. 712-716.

Effects of Co, Mo and Cb on mechanical properties. Co was found effective to increase strength at high-temperature and long-time tests and increased ductility. M252 which contained 10% Mo was found to have a lower creep-rupture strength above 750° C. than Inco 700 which contained lower Mo, but higher Ti, Al and Co content. (Q-general, 2-60, 2-62; Ni-b, *Co, Mo, Cb, Ti, Al,* SGA-h)

1400-Q.* The Stability of Metals Under Cyclic Plastic Strain. L. F. Coffin, Jr. *American Society of Mechanical Engineers,* Paper no. 59—A-100, 1959, 12 p.

Experiments for longitudinally loaded, fully reversed strain cycling, with and without external mean stress, demonstrate sensitivity of instability. Cyclic tension test shows flow stress and fracture altered by superposition of cyclic strain, particularly for 2S Al and OFHC Cu. (Q7, Q3, 3-68; Al-b, Cu)

1401-Q.* Cycle-Dependent Stress Relaxation of A-286 Alloy. A. S. Ross and JoDean Morrow. *American Society of Mechanical Engineers,* Paper no. 59—A-116, 1959, 5 p.

Tubular A-286 alloy specimens subjected to cyclic, axial fatigue loading at different fixed mean stresses and alternating strains. Data are given for cycle-dependent relaxation of mean stress, fatigue and stress-strain. Fatigue limit is raised by compressive mean stress and lowered by tensile mean stress, mostly at low-strain amplitude because of less relaxation. (Q7, 3-66 Q3; AY)

1402-Q.* The Effects of Sulfur on the Notch Toughness of Heat-Treated Steels. J. M. Hodge, R. H. Frazier and F. W. Boulger. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 745-753.

Impact energy levels decreased continuously as the sulphur content increased while there is a straight-line relationship between impact energy and sulphur content when plotted on logarithmic co-ordinates. Cross rolling raises the level of these lines for transverse

tests and lowers the level for logitudinal tests proportionately to the amount of cross rolling. (Q6, 2-64, 3-68, 2-60; ST, S)

1403-Q.* The Cyclic Straining and Fatigue of Metals. L. F. Coffin, Jr., and J. F. Tavernelli. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 794-807.

Deformation and fracture characteristics of eight metals subjected to fully reversed cyclic strain ranging from 0.2 to 50% at room temperature. Strain-hardening characteristics of these metals can in part be predicted from monotonic stress-strain behavior but many of the effects observed are unique to cyclic strain. With respect to the deformation resistance of metals under cyclic strain, each metal exhibits its own peculiar hardening characteristics associated with the effect of the cyclic-straining process on the internal structure of that metal. 27 ref. (Q7, N7e, 3-68)

1404-Q.* Yield Phenomena in Magnesium Single Crystals Containing Nitrogen. D. Geiselman and A. G. Guy. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 814-820.

Crystals of known orientation were tested in tension in an Instron machine to determine yield strength and observe whether a yield point occurred. Slowly cooled crystals or those given a solution heat treatment did not show a yield point. Crystals that were aged following a solution treatment showed a yield point for all of the nitrogen contents studied. Nitrogen causes the yield point by the Cottrell mechanism. 21 ref. (Q24c, Q23b, 2-65; Mg, 14-61, *N*)

1405-Q.* Creep of a Dispersion-Hardened Aluminum Alloy. G. S. Ansell and J. Weertman. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 838-843.

Creep behavior of an alloy hardened with a finely dispersed phase of Al oxide. The as-extruded alloy shows an approximate steady-state creep in which the creep rate depends exponentially on the applied stress. The activation energy of creep is approximately 150,000 cal per mole. 14 ref. (Q3, 3-66, N7; Al-b)

1406-Q.* Relation Between Beta Grain Size and Ductility of High-Strength Alpha-Beta Titanium Alloy. A. J. Griest, A. P. Young and P. D. Frost. *Metallurgical Society of AIME, Transactions,* v. 215, Oct. 1959, p. 844-848.

The primary cause of beta embrittlement is the large grain size which is obtained so rapidly in many alpha-beta Ti alloys when heated into the beta field. Grain-boundary alpha and acicular intragrannular alpha in the microstructure are not necessarily detrimental to the tensile ductility if the prior beta grain size is sufficiently fine. 5 ref. (Q23p, Q26s, 2-59; Ti-b)

1407-Q.* Coatings on Molybdenum for High Temperature Sliding. G. W. Rowe. *Scientific Lubrication,* v. 11, Oct. 1959, p. 12-15.

A film of Mo disulphide gives low friction up to 800° C. (1500° F.) but must be protected from oxidation. Mo disilicide resists oxidation and can prevent seizure at temperatures up to 700° C. (1300° F.) in air, but shows a higher friction. (Q9p, 2-62; Mo, 14-02)

1408-Q. Stress Relaxation in Stainless Steel During Irradiation. J. W. Joseph, Jr. E. I. du Pont de Nemours & Co. *U. S. Atomic Energy Commission,* DP-369, June 1959, 29 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Fast neutron irradiation (9×10^{20} per sq. cm.) of Type 304 stainless steel stressed at 20,000 to 39,000 psi. decreased elastic stress and ductility and increased hardness, modulus of elasticity, tensile and yield strength at temperatures below 100° C. Steel stressed at 20,000 psi. showed a negligible increase in stress relaxation at exposures in excess of 4×10^{20} fast neutrons per sq. cm. (Q23, Q3a, Q29, Q27, 2-67; SS)

1409-Q.* New Advances in Physical Metallurgy. W. R. Hibbard. Paper from "Symposium on Materials Research Frontiers". American Society for Testing Materials, STP no. 243, June 1958, p. 32-40.

Recent investigation of dislocations and imperfections influencing structure properties, experimental data on brittle fracture, behavior controlling high-temperature properties of metals. (Q-general, M26b, Q26s, 2-62)

1410-Q.* (Czech.) Fatigue Strength of Screwed and Fusion Welded Bolts. O. Puchner and S. Tesar. *Zvaranie,* v. 8, July 1959, p. 195-199.

Comparative tests on fusion welded and screwed bolts reveal no difference

with regard to their resistance to static loading. Differences were noticed in fatigue strength investigations. Rotation bending tests proved the superiority of the welded bolts, in some instances indicating a 200% increase. (Q7a, Q7c; 7-51, 7-55)

1411-Q.* (German.) Influence of the Surface Layer on the Friction of Austenitic Materials During Cold Working Taking Place in Deep Drawing. H. Wiegand and K. H. Kloos. *Metalloberflache*, v. 13, Aug. 1959, p. 229-233.

Friction occurring during deep drawing can cause surface sliding of adjacent metallic layers. Increased phase changes take place in the deformation zone. X-ray examination of martensitic structure. (Q9p, G4b, 3-68; SS-e)

1412-Q.* (German.) Influence of Galvanizing on the Notch Impact Strength of WRST 37-2 Structural Steel. H. Wiegand and F. Nieth. *Metalloberflache*, v. 13, Aug. 1959, p. 254-259.

Influence of 10% buckling on hardness retention and notch impact strength in relation to temperature. (Q6n, L16; SS, *Zn*)

1413-Q.* (German.) Strength Welds in Cylindrical Vessels. H. Heusler. *Schweissen und Schneiden*, v. 11, Aug. 1959, p. 315-318.

Dynamic and static strength properties of welds of the vessels and types of resulting rupture. Elongation studies of the weld exterior and interior in relation to varying pressures in the vessel. 6 ref. (Q3q, K9r, T26q; 7-51)

1414-Q.* (German.) Electron Diffraction Investigation of Stress in 18-8 Stainless Steel. Sh. Yamaguchi. *Werkstoffe und Korrosion*, v. 10, Aug. 1959, p. 499-501.

By mechanical abrasion of the tested 18-8 steel, surface changes from the original austenitic state into the ferritic state were observed. Changes are due to the mechanical tension phenomena similar to the corrosion process. Increasing the thickness of the changed surface layers results in diminished material quality. (Q25m, M22h; SS)

1415-Q. Mechanics of the Sheet-Bending Process. Bernard W. Shaffer and Eric E. Ungar. *American Society of Mechanical Engineers*, Paper no. 59—A-35, 1959, 7 p.

Mathematical assumptions used in fabricating processes involving the bending of sheet. (Q5; 4-53)

1416-Q. Correlation of Bendability of Materials With Their Tensile Properties. J. Datsko and C. T. Yang. *American Society of Mechanical Engineers*, Paper no. 59—A-110, 1959, 5 p.

Procedures to predict minimum or critical bend radius of a specimen involve consideration of tensile strength and percentage reduction of area. (Q5g, Q27a)

1417-Q. (French.) Rotation of Crystalline Matrix and Deformation Bands During Elongation of Aluminum Single Crystals. W. M. Baldwin, Jr., and J. T. Brown. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Oct. 1959, p. 453-462.

16 ref. (Q24c, Q23p; Al, 14-61)

1418-Q. (French.) Relation Between the Appearance of Brittle Fractures in Ductile Metals and Their Stress Condition. G. V. Oujik. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Oct. 1959, p. 505-511.

6 ref. (Q26s, 3-68)

1419-Q. (French.) Tensile Tests on Zirconium Specimens. J. Orrssaud. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Oct. 1959, p. 512-516.

(Q27, Q29n, 2-62, 2-64; Zr)

1420-Q. (French.) Fracture Appearance in Tubular Specimens Subjected to Internal Pressure Tests, Mainly at Low Temperatures. A. Krisch. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56. Oct. 1959, p. 523-528.

4 ref. (Q26q, 3-74, 2-63; CN, 4-60)

1421-Q. (Russian.) Wear of Metals in the Presence of an Abrasive Layer That Is Not Renewed. L. E. Val'dma. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 19-33.

(Q9p)

1422-Q. (Russian.) Friction and Wear of Sleeve Bearings When Lubricated With Sulphuric Acid. E. V. Lyalin. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 59-83.

(T7d, Q9p, 2-66)

1423-Q. (Russian.) Plasticity Limit in the Impression and Compression of a Cone Frustum. V. N. Marochkin. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 84-135.

Plastic behavior of a frustum pressed against or impressed into a plane surface. 12 ref. (Q23p, Q24)

1424-Q. (Russian.) Bibliography of Russian and Foreign Literature on Friction Wear and Lubrication, Published in 1955-1956. E. O. Vil'dt. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 219-266.
780 ref. (Q9, 18-73, 11-65)

1425-Q. Friction and Wear of Metals to 1000° C. E. P. Kingsbury and E. Rabinouicz. *American Society of Mechanical Engineers, Series D, Journal of Basic Engineering,* v. 81, June 1959, p. 118-122.
15 ref. (Q9n, Q9p, 2-62; Ti, Al, Cu)

1426-Q. Failure of Structural Metals Subjected to Strain-Cycling Conditions. R. W. Swindeman and D. A. Douglas. *American Society of Mechanicul Engineers, Series D, Journal of Basic Engineering,* v. 81, June 1959, p. 203-212.
9 ref. (Q7j, Q7e, 2-62; Ni-b, SGB-s)

1427-Q. The Strength of Arc Welded Joints. Pt. 2. *Welding Design and Fabrication,* v. 32, Oct. 1959, p. 29-31.
The effect and measurement of residual stress. (Q25h; 7-51)

1428-Q (English.) Approximate Determination of the Secondary Stresses Caused in Bridge Cross Girders by the Main Truss Chord Elongations. J. Szidarovszky. *Acta Technica (Budapest),* v. 25, no. 3-4, 1959. p. 335-349.
5 ref. (Q25, Q23p, T26p)

1429-Q. (English.) Fatigue Fracture of Welded Structures. Toshie Okumura. *Proceedings of the Eighth Japan National Congress for Applied Mechanics (1958),* Mar. 1959, p. 201-204.
(Q26, Q7a; ST, 7-51)

1430-Q. (English.) Anisotropy of Mild Steel by Combined Tension-Torsion Tests. Tomoya Ota, Akio Shundo and Hidekazu Fukuoko. *Proceedings of the Eighth Japan National Congress for Applied Mechanics (1958),* Mar. 1959, p. 221-224.
(Q24g, Q27, Q1; CN)

1431-Q. (English.) Creep Deformation Under Varying Stresses. Shiji Taira, Kichinosuke Tanaka and Kiyotsugu Ohji. *Proceedings of the Eighth Japan National Congress for Applied Mechanics (1958),* Mar. 1959, p. 255-260.

Transient component of recovery rate determined in carbon steel at 450° C. from the results of stress creep tests. 5 ref. (Q3a, Q24; CN)

1432-Q. (German.) Investigation of Strain-Hardening, Softening and Structural Alteration During the Hot-Rolling of Electrolytic Copper. E. Bella. *Acta Technica (Budapest),* v. 25, no. 3-4, 1959, p. 393-426.
7 ref. (Q24h, F23, 1-66; Cu)

1433-Q. (Russian.) Effects of Rolling and Annealing on the Residual Stress in Copper. D. G. Butome, N. I. Zedin and I. A. Krym. *Tsvetnye Metally,* no. 8, 1958, p. 57-67.
6 ref. (Q25h, F23, J23; Cu)

1434-Q.* The Creep Properties of Two Molybdenum-Bearing Austenitic Steels. H. W. Kirkby. *Alloy Metals Review,* v. 9, June 1959, p. 1-7.
High-temperature behavior of F.V. 555 and F.V. 548 Mo- bearing austenitic steels. Creep properties of the Mo austenitic steels are compared with plain 18/12/1Nb austenitic steel. (Q3, 2-60, 2-62; SS-e, *Mo*)

1435-Q.* Burst Strengths and Deformations of Welded Composite Turbine Wheels as Related to Weld Quality and Plasticity Calculations. A. G. Holms and A. J. Repko. *American Society of Mechanical Engineers,* Paper no. 59—A-28, 1959, 14 p.
Accuracy of predicting deformation and fracture of welded wheels by rotating disk deformation theory (finite difference plastic flow calculation method). 8 ref. (Q26, Q23, 3-68; 7-51)

1436-Q.* The Effect of Ball Bearing Steel Structure on Rolling Friction and Contact Plastic Deformation. Richard C. Drutowski and Ernie B. Mikus. *American Society of Mechanical Engineers,* Paper no. 59—Lub-2, 1959, 5 p.
Roller friction, contact plastic deformation and elastic limit for SAE 52100 steel austenitic content varied from 0-18.4%. Retained austenite content, rather than hardness, is a superior mechanism to select and to insure high quality instrument bearing materials. 7 ref. (Q9p, Q24, 3-71; AY, SGA-c)

1437-Q. Effect of Prior Creep on Mechanical Properties of Aircraft Structural Metals. J. V. Gluck, H. R. Voorhees and J. W. Freeman. Paper from "Proceedings of the Florida Conference on High-Speed Aerodynamics and Structures". v. 1. U. S.

Office of Technical Services, PB 151538, Washington 25, D. C., 1959, p. 54-60.

Tensile, compressive yield and tensile impact tests at room temperature and creep temperatures are used to evaluate the effects of prior creep in 2024-T86 Al alloy 17-7PH (TH 1050) stainless steel and C-110M Ti sheet alloys. (Q27, Q3, Q28; Al-b, SS, Ti-b, SGB-s, 4-53)

1438-Q. Materials Evaluation and Design Criteria. G. Sachs and K. N. Tong. Paper from "Proceedings of the Florida Conference on High-Speed Aerodynamics and Structures". v. 1. U. S. Office of Technical Services, PB 151538, Washington 25, D. C., 1959, p. 61-77.

Properties, specifications and methods of evaluating component behavior of 4340 steel and Mg-alloy. (Q-general, S22; ST, Mg-b, 17-51)

1439-Q. Mechanical Property Data Requirements for New Weapons Systems. D. A. Shinn and R. F. Clinger. Paper from "Proceedings of the Florida Conference on High-Speed Aerodynamics and Structures" v. 1. U. S. Office of Technical Services, PB 151538, Washington 25, D. C., 1959, p. 79-94.

Short-time tensile tests on Cu, Fe, Mo, Ta and Inconel specimens. Tensile properties are correlated with compression, bending and shear properties of the materials. (Q27a, T2; Cu, Fe, Ta, Mo, Ni-b)

1440-Q.* Technique of Hardness Testing and Its Use as a Test in the Production of Copper and Copper Alloys in the Form of Sheet and Strip. V. L. James. *Sheet Metal Industries*, v. 36, Oct. 1959, p. 639-646.

Review of dynamic tests, mainly by measuring the material resistance to indentation; scratch and static tests to achieve hardness and penetration data. Comparison of hardness numbers assessed by loss of specular reflection. (Q29; Cu-b, 4-53)

1441-Q.* A New Method for the Fatigue Tests on Steel Wires and Wire Ropes and the New Viewpoints Opened by the Results Obtained. Denis G. van de Moortel. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1317-1325.

Device and procedure for the simultaneous application of torsion, bending, abrasion and pulsation. Tests on various grades, types and diameters of strands and ropes. (Q7, Q5j, T7g; ST, 4-61)

1442-Q.* A Substitute for Silicon Bronze—Its Fabrication and Properties. Roger E. Martin. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1343-1344, 1414.

Stress-corrosion and dezincification data, effect of Si content and cold working on tensile strength of 90% Cu, 0.8-1.5% Si, balance Zn alloy. (Q27a, 2-60, 3-68, R1d, R2k; Cu-b, *Zn, Si*)

1443-Q.* (German.) The Limit Stress of ST37 Steel. I. Koranyi. *Acta Technica (Budapest)*, v. 26, no. 1-2, 1959, p. 135-151.

Limit stresses for tension and bending, modulus of elasticity and buckling effects. Tension limit stress is based on statistical data. Tensional limit stress of 1850 to 1950 kg. per sq. cm can be obtained. The mean value of the modulus of elasticity is 2113 tons per sq. cm. 4 ref. (Q3q, Q21a; ST)

1444-Q.* (German.) Modern Developments in Steel Ropes. D. van de Moortel. *Draht*, v. 10, Sept. 1959, p. 484-488.

Fatigue and wear tests of steel ropes. Bend tests and loading experiments were used to simulate practical and actually existing loading conditions during rope life. (Q7, Q9, T7g; ST)

1445-Q.* (German.) Rolled Steel Wires. *Draht*, v. 10, Sept. 1959, p. 497-499.

Chemical composition, surface quality, bending, loading and fatigue testing procedures. (Q7, Q5, 3-68; ST, 4-61)

1446-Q.* (German.) Properties and Heat Treatment of Al 17Mo 4Ti Alloy. W. Knorr. *Technische Mitteilungen Krupp*, v. 17, Sept. 1959, p. 111-123.

Influence of composition and heat treatment on the mechanical properties. Strength values at high temperatures; stability of the alloy and conditions of surface brittleness after prolonged stresses at 500° C.; hardness curves at various quenching and age-hardening temperatures. 13 ref. (Q-general, 2-60, 2-64, 2-62; Ti-b)

1447-Q.* (German.) Investigation of 6Mo 3Al Ti Alloy. W. Knorr. *Technische Mitteilungen Krupp*, v. 17, Sept. 1959, p. 124-129.

The minimal elongation at 800° C. is caused by the mechanically unstable beta phase. Mechanical properties of alloys after quenching and aging; oxidation behavior between 600 and 900° C. 6 ref. (Q-general, 2-64; Ti-b, *Mo, Al*)

1448-Q.* (Japanese.) Relationship Between Dent Size and Density Caused by Shot-Peening and Fatigue Strength. Michira Uchiyama and Kazunori Kamishohara. *Tetsu to Hagane,* v. 45, Feb. 1959, p. 105-110.

Reversed bending fatigue testing of shot peened flat steel showed that a decrease in fatigue strength is caused by increases in dent size resulting from an excess impact force and an excess of number of dents per unit area beyond a critical value. (Q7a, G23n; ST)

1449-Q.* (Japanese.) Effect of Heat-Treatment on Mechanical Properties of Nimonic 80A. Pt. 2. Studies on Nickel Base Heat-Resisting Alloys. Taro Hasegawa. *Tetsu to Hagane,* v. 45, Feb. 1959, p. 123-127.

Nimonic 80A, water-quenched after solution treatment, has greater hardness and higher short-time tensile strength up to 800° C. than the air-quenched specimens. Stress rupture life at 750° C. and Charpy impact value were lower in water-cooled specimens. (Q3n, Q27a, 2-64; Ni-b, SGA-h)

1450-Q. (French.) Properties of Copper Alloyed Steels. *Journal d'Information Techniques des Industries de la Fonderie,* no. 109, Oct. 1959, p. 12-13.

(Q21e; AY, *Cu*)

1451-Q. (Russian.) Influence of Residual Stresses and Strain on Mechanical Properties of Welds. L. I. Gladshtein. *Svarochnoe Proizvodstvo,* Oct. 1959, p. 27-29.

(Q-general, Q25h, 3-68; 7-51)

1452-Q. (Swedish.) Semi-Austenitic Steel for Airplanes. *Teknisk Tidskrift,* v. 89, Sept. 25, 1959, p. 917.

Composition, tensile strength, elastic limit and creep properties of AM350 and AM355 steels. (Q27a, Q21e, T24, Q3; SS, 17-57)

1453-Q. (Swedish.) Austenitic High-Temperature Steel With High Carbon Content. *Teknisk Tidskrift,* v. 89, Sept. 25, 1959, p. 918.

Tensile strength, yield point, elongation, area reduction and hardness of high-carbon austenitic steel at 20-590° C. (Q27a, Q23, A29n, 2-61; SS-e)

1454-Q. (Swedish.) Rhenium on a Commercial Scale. *Teknisk Tidskrift,* v. 89, Oct. 9, 1959, p. 972.

Tensile strength, elongation and hardness of commercial strip, rods and wire. (Q27a, Q23p, Q29n; Re, 4-53, 4-55, 4-61)

1455-Q. (Swedish.) Corrosion Resistant Nickel Alloy for Use at High Temperatures. *Teknisk Tidskrift,* v. 89, Oct. 16, 1959, p. 1030.

Tensile properties of Hastalloy B, Hastalloy N and Inconel at 200-870° C. (Q27a, 2-62; Ni-b, *Fe,* Cr, Cr-b, SGA-g)

1456-Q. (French.) Effect of Hard Chromium Plating Fatigue Strength. V. Linhart and J. Sulc. *Chrome Dur,* 1958, p. 72-78.

26 ref. (Q7a; L17, *Cr*)

1457-Q.* The Mechanical Properties of Heat-Treated Nickel-Tin-Bronze Sand Castings and Effect of Impurities, Especially Lead. J. E. Bowers and B. S. Munro. *British Foundryman,* v. 52, Oct. 1959, p. 425-435.

Age hardening in relation to tensile properties of sand cast bronzes containing 2-10% Ni and Sn with 2% Zn. Effects of impurities and solution treatment on tensile properties. (Q27a, J27a, J27d, 3-69; Cu-s, *Ni, Sn, Pb,* 5-60)

1458-Q.* (Japanese.) Bending and Impact Tests on Various White Cast Irons. Pt. 6. Study on Alloy White Cast-Iron. Ichiro Fukumoto. *Japan Institute of Metals, Journal,* v. 23, May 1959, p. 252-262.

Some hairline cracks were found in the eutectic cementite or along the boundaries on the tension side of the bending test pieces, when the tensile strain became about 0.1 to 0.5%. When the cracks reached the primary crystals, they developed as transcrystalline (about 70%), or as intercrystalline cracks (about 30%). The fracture stress in bending tests varied markedly. (Q6, Q5; CI-p, 9-72)

1459-Q.* (Japanese.) Observations on Plastic Deformation and Cracks in White Cast-Iron. Pt. 5. Study on Alloy White Cast Iron. Ichiro Fukumoto. *Japan Institute of Metals, Journal,* v. 23, May 1959, p. 255-259.

When subjected to tensile stress, cleavage cracks appeared mainly in the eutectic cementite and passed through the primary crystals or along the boundaries. When subjected to compression stress, the specimens with low hardness values were broken along the glide plane 45° to the compressed axes. (Q24; CI-p, 9-72)

1460-Q.* (Japanese.) Mechanical Properties of 17-7 PH Stainless Steel Containing 1% Al. To-oru Furukawa and Tomo-o Sato. *Japan Institute of Metals, Journal,* v. 23, May 1959, p. 281-284.

Mechanical properties in relation to heat treatments such as solution treatment, intermediate quenching and aging

for various temperatures and times. Steel showed better mechanical properties by aging after solution treatment and intermediate quenching. (Q-general, 2-64, 2-65; ST, *Al*)

1461-Q.* (Japanese.) Relationship Between Heat Treatment and Room-Temperature Internal Friction of Some Carbon Steels. Genjiro Mima and Michio Mizuta. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 469-473.

Internal friction of martensitic specimens exists in proportion to carbon content and is caused by stress-induced diffusion of carbon into Fe lattices. Internal friction of annealed specimens is proportional to vibration amplitude, while tempering produces a two-stage change in friction. 27 ref. (Q22, 2-64, N1, 2-60; CN)

1462-Q.* (Japanese.) Effect of Alpha + Beta Phase of 2.5% Al Magnesium Alloy on the Microhardness. Toshio Yoshino. *Journal of Mechanical Laboratory (Japan)*, v. 13, Sept. 1959, p. 229-233.

Two maximums observed with Vickers microhardness test on the alpha phase. First maximum at low load is dependent on load and is explained by hindrance from surrounding structure. Second maximum is that usually found. 4 ref. (Q29q, 3-71, 3-68; Mg-b, *Al*)

1463-Q. (Dutch.) Increased Usefulness of Sinter Alloys by the Mallory Process. C. Vollers. *Metalen*, v. 14, Oct. 15, 1959, p. 308-309.

Tensile strength, yield point, hardness, impact strength and fatigue strength of Steelmet 100, 101, 302 and 600. (Q27a, Q23b, Q29n, Q6n, Q7a; ST, 6-72)

1464-Q. (French.) Effect of Temperature on the Structure of an 18-8 Austenitic Steel Exposed to Alternate Torsional Stress. J. de Fouquet. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 357-370.

4 ref. (Q7h, Q24a, 2-61; SS)

1465-Q. (French.) Hardening of Magnesium Alloys Containing Zirconium by Heating in a Hydrogen Atmosphere. J. Herenguel and J. Boghen. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 371-378.

Effect on tensile strength, elongation, elastic limit and grain size. 15 ref. (Q27a, Q23p, Q21e, M27c, 2-61, 2-66; Mg-b, *Zr, H*)

1466-Q. (French.) Formation of Twin Crystals in Steel as Influenced by Stress, Temperature and Rate of Loading. Albert Kochendorfer. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 388-392.

9 ref. (Q24b, M27e, 3-66, 2-61, 3-67; ST)

1467-Q. (French.) Statistical Evaluation of Fatigue Tests. A. Palazzi. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 403-416.

18 ref. (Q7, S12g)

1468-Q. (French.) Intergranular Adsorption and Its Relationship to Granular Fracture. G. Henry, J. Plateau, X. Wache, M. Gerber, I. Behar and C. Crussard. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 417-426.

In some cases of granular fracture, the reduced adhesion between grains is thought to be caused by adsorption processes. 7 ref. (Q26s, M27f, P13d)

1469-Q. (French.) Brittle Fracture of Mild Steel. J. B. Lean, J. Plateau and C. Crussard. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Sept. 1959, p. 427-452.

14 ref. (Q26s; CN)

1470-Q. (German.) Further Development of AlSiMg Casting Alloys in the USA. H. Nielsen. *Aluminium*, v. 35, Oct. 1959, p. 563-567.

Variants of the heat treatable alloys AlSi7Mg and AlSi5CuMg have higher elongation. Good tensile strengths and yield points can be obtained in place of high expansion properties. 14 ref. (Q23p; Al-b, *Si, Mg*)

1471-Q. (Russian.) Statistical Theory of Tension Strain in Metals. B. M. Strunin. *Doklady Akademii Nauk SSSR*, v. 125, Apr. 1959, p. 790-793.

Suggests a mathematical pattern which permits analysis of the behavior of metals under any leading conditions where the macrostrains remain in a state of linear function. (Q25, S12j)

1472-Q. Investigation of Failures in Control Cooled Rails. R. E. Cramer. *American Railway Engineering Assoc., Transactions*, v. 60, 1959, p. 878-882.

Causes of failure in 25 rails. Examples of transverse fissures, vertical split head. (Q7a, Q26, T23q; ST)

1473-Q. Laboratory Tests of Continuous Welded Rails. R. E. Cramer. *American Railway Engineering Assoc., Transactions*, v. 59, 1958, p. 896-904.

Rolling load tests to produce failures; mechanical and bend tests of electric, acetylene and thermit welded railroad rails. (Q7, Q6, Q27, T23q, 7-51; ST)

1474-Q. Shelly Rail Studies at the University of Illinois. R. E. Cramer. *American Railway Engineering Assoc., Transactions*, v. 60, 1959, p. 941-948.

Rolling load tests of Cr-V rails, high-Si and induction hardened rails. Rails with shelling produced in railroad service. (Q6n, Q7a, Q27a, T23q; AY, *Cr, V, Si*)

1475-Q. The Tensile and Impact Strength of Annealed and Welded 5086 Aluminum Down to 20° K. R. P. Mikesell and R. P. Reed. *Proceedings of the 1958 Cryogenic Engineering Conference*, Sept. 1958, p. 101-113.

4 ref. (Q6n, Q27a, 2-63; Al-b, 7-51)

1476-Q. Mechanical Testing of Aluminum Weldments. S. A. Nuccitelli and M. W. Mote, Jr. *Proceedings of the 1958 Cryogenic Engineering Conference*, Sept. 1958, p. 114-122.

A tensile cryostat machine tested at -300 to +500° F. (Q27, 2-62, 2-63, X24b; Al-b, 7-51)

1477-Q. (Czech.) Reduction of Abrasive Wear of Turbine Blades in Metallurgical Plants. K. Lobl, and J. Vodredalek. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 879-886.

Application of hard weld deposits influences the life of combustion turbine blades. (Q9n, T7h, L24)

1478-Q. (Hungarian.) Mechanical Properties of Electrolytic Copper as Affected by Hot Rolling. Bella Ede. *Kohaszati Lapok*, v. 92, Aug. 1959, p. 354-362.

Hardness, softness and microstructural changes in relation to hot rolling. (Q29n, F23, M27, 1-66; Cu)

1479-Q. (Polish.) Fracture Tests in Boiler Plate Inspection. K. Kucia, M. Kurek and S. Kwiatkowski. *Hutnik*, v. 26, no. 7-8, 1959, p. 296-301.

(Q26, 1-54; CN, 4-53)

1480-Q. (Polish.) Susceptibility of Boiler Plates to Lamination. W. Cias. *Prace Instytutow Hutniczych*, v. 11, no. 3, 1959, p. 153-166.

Laminations detected by fracture tests are caused by silicate inclusions, sulphide inclusions in ferrite bands and brittle oxide inclusions. (Q26; CN, 9-71)

1481-Q. (Russian.) Effect of Certain Transition Elements on Structure and Properties of Copper-Beryllium Alloys. Chzhou Shi-Chan and M. V. Mal'tsev. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 133-142.

Effects on tensile strength, elongation, hardness, resistivity and thermal conductivity. (Q27a, Q23p, Q29n, P15g, P11h, M26, 2-60; Cu-b, *Be*)

1482-Q. (Russian.) Resistance to Hot Deformation of TsAM 9-1.5 Alloys. V. K. Korol' and I. L. Perlin. *Izvestiya VUZ-Tsvetnaya Metallurgiya*, no. 5, 1959, p. 159-166.

10 ref. (Q24, 3-67; Al-b, *Cu*)

1483-Q. (Russian.) Fatigue Rupture and Reasons for the Failure of Parts. D. A. Sveshnikov. *Vestnik Mashinostroeniya*, v. 39, no. 10, 1959, p. 13-18.

4 ref. (Q7b, T21c)

1484-Q. (Russian.) Ultrasonic Wave Absorption in Metals. G. L. Kotkin. *Zhurnal Experimental'noii i Teoreticheskol Fiziki Academii Nauk, SSSR*, v. 36, Mar. 1959, p. 941-942.

6 ref. (Q21f)

1485-Q. Economic Design of Light-Alloy Castings. P. A. Broadbent. *Institute of Mechanical Engineers, Proceedings*, v. 173, no. 2, 1959, p. 97-108.

Test bar specifications for Al and Mg alloys in relation to strength and weight of castings. Tensile strength on inserts and fasteners. (Q27, R-general; Al-b, Mg-b, 5-60, 17-51)

1486-Q. Temperature Dependence of Fractional Velocity Changes in a Germanium Single Crystal. F. Stein, N. G. Einspruch and J. Truell. *Journal of Applied Physics*, v. 30, Nov. 1959, p. 1756-1768.

Changes in elastic constants of Ge determined by ultrasonic interferometer technique at 30 to 170 Mc in the range -60°C. (Q21e, Q21f, 3-66, 2-63; Ge-a, 14-61)

1487-Q. Crack Behavior at a Weld Structure Discontinuity. F. J. Radd. *Nature*, v. 184, Aug. 15, 1959, p. 543-544.

(Q26q; 7-51)

1488-Q. Crack Propagation Tests of Some High-Strength Sheet Steels. J. E.

Strawley and C. D. Beachem. *Naval Research Laboratory*, Report no. 5263, Jan. 10, 1959, 26 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.
4 ref. (Q26q; AY, 4-53, SGB-s)

1489-Q. (Czech.) Creep of Steel Tubes Under Triaxial Stress. S. Lesak. *Hutnicke Listy*, v. 14, no. 10, 1959, p. 853-856.
Tests performed at temperatures up to 1000°C., 150 atm. pressure with specimens having 100 mm. diam. (Q3, 3-66; ST, 4-60)

1490-Q. (Dutch.) Mechanical Properties. *Gieterij-Centrum Berichten*, v. 7, Sept-Oct. 1959, p. 58-60.
Tensile strength, hardness and machinability of cast iron. (Q27a, Q29n, G17k; CI)

1491-Q. (English.) Mechanism for Producing Extrusions and Intrusions During Fatigue. Ryutaro Nagai. *Physical Society of Japan, Journal*, v. 14, Sept. 1959, p. 1252-1253.
Explanation of slip lines on fatigued 4% Al-Cu alloy. 7 ref. (Q24a, Q24c; Al-b, *Cu*)

1492-Q. (Russian.) Mechanical Properties of Welded R 18 and 45 Steels as Influenced by the Presence of Ledeburitic Eutectic. B. L. Aleksandrovich and Yu. I. Ivanova. *Stanki i Instrument*, no. 10, 1959, p. 36-37.
(Q27a, N8, 2-61; TS-m, 7-51)

1493-Q. (Russian.) Use of Hard X-Rays for the Investigation of Residual Stress. M. Ya. Fuks and L. I. Gladkikh. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1193-1195.
(Q25h, M22g)

1494-Q. (Russian.) Variation of Rigidity and Thermal Fatigue During Thermal Cycling. S. V. Serensen and P. I. Kotov. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1216-1223.
5 ref. (Q21d, Q7j; AY)

1495-Q. (Russian.) Classification and Development of Residual Stresses. N. P. Shchanov, D. M. Vasilev, B. M. Rovinskii and B. V. Sharov. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1224-1231.
21 ref. (Q25h)

1496-Q. (Russian.) Creep Strength Calculations. A. Z. Kontorovskii. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1232.
(Q3m)

1497-Q. (Russian.) Evaluation of Measurements of the Logarithmic Decrement. R. L. Zaidelman. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1233-1235.
Measurement of anelasticity. (Q22m)

1498-Q. (Russian.) Rapid Method for the Computation of the Vibration Decrement by Means of Oscillograms. R. I. Garber and Yu. G. Miller. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1235-1238.
Anelastic phenomena in metals. (Q22m)

1499-Q. (Russian.) Equipment for Compression Testing at Low Temperatures. M. P. Zagrebennikova, M. A. Ilyushchenkov and N. N. Sukharina. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1247-1248.
4 ref. (Q28, 2-63, 1-52)

1500-Q. (Russian.) Deformation Measurements at Low Temperatures. T. A. Volikanova and S. I. Sergeev. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1252-1254.
Behavior of transmitting elements at low temperatures. (Q24, 1-53, 2-63)

1501-Q.* Effect of Torsion on the Tensile Stress-Strain Curve of Aluminum. D. B. Holt. *Acta Metallurgica*, v. 7, July 1959, p. 446-468.
Work hardening of Al single crystals resulting from alternate tensile and torsional deformation. Increase in tensile flow stress due to twisting and its relation with prior extension, crystal orientation and amount of twist. Modes of torsional deformation in different orientation regions and corresponding dislocation mechanisms. Explanation of slip line distribution and changes in flow stress and hardening rate due to twisting in terms of dislocation theory. 45 ref. (Q23a, Q24, Q27a, Q1a, M26b; Al, 14-61)

1502-Q.* The Flow Stress of Iron and Its Dependence on Impurities. G. Schoeck and A. Seeger. *Acta Metallurgica*, v. 7, July 1959, p. 469-477.
Redistribution of solute interstitial onto lower energy lattice sites which takes place in the stress field of a dislocation. Locking of dislocations by this Snoek-effect. Calculation of locking energy and stress to free dislocations for a screw dislocation in alpha Fe. Magnitude of frictional force on a moving dislocation caused by Snoek-effect. Consideration of flow stress of alpha Fe in terms of this mechanism. 17 ref. (Q27a, Q24c, 3-69; Fe)

1503-Q.* Studies on the Susceptibility of Cathodically Protected Steel to Hydrogen Embrittlement. W. H. Bruckner and K. M. Myles. *Corrosion*, v. 15, Aug. 1959, p. 591t-595t.

Steels tested were API grades A, B and M (N-80). The presence of a reducible FeO portion of the mill scale delayed hydrogen absorption. Embrittlement of Grades A and B occurred due to notch formation when adherence of FeO to base metal was destroyed during cathodic protection. Under conditions of low pH with and without sulphide ion, cathodic protection induced hydrogen absorption, and with sulphide ions present embrittlement of steels A and B was severe. (Q26s, 2-66; ST, *H*)

1504-Q.* Elastic Constants of Alpha-Brasses: Variation With Solute Concentration From 4.2-300° K. J. A. Rayne. *Physical Review*, v. 115, July 1, 1959, p. 63-66.

Ultrasonic determination at low temperature of elastic constants and Debye temperature. Comparison with calorimetric data; effects of lattice heat capacity of alloys. (Q21f, 3-71; Cu-n)

1505-Q.* The Influence of Solute Atoms on the Damping Due to Dislocations in Iron Alloys. P. M. Robinson and R. Rawlings. *Philosophical Magazine*, v. 4, Aug. 1959, p. 938-947.

Effect of Si and oxygen in solid solution on the damping of Fe vibrating at 1.03 cycles per sec. Damping is independent of vibrational amplitude up to a critical amplitude. From the temperature variation of the critical amplitude a binding energy of 0.004 ev. between a Si atom and a dislocation is obtained. Above the critical amplitude, the damping varies with amplitude of vibration. 11 ref. (Q8, M26b, 2-60; Fe-b, 14-67, *Si, O*)

1506-Q.* Ductile Fracture in Metals. K. E. Puttick. *Philosophical Magazine*, v. 4, Aug. 1959, p. 964-969.

Cup-and-cone fracture in single-phase ductile metals appears to originate at holes formed by drawing away of material from nonmetallic inclusions. In Cu, the holes expand under the triaxial stresses in the neck and coalesce in a macroscopic fissure; in alpha Fe fine cracks are formed by the stress concentrated at the holes. In coarse-grained material shear cracks are formed on the surface of the neck. 9 ref. (Q26, 3-66; Fe, 9-72)

1507-Q.* Fatigue Studies of Plated Hot Work Tool Steels. G. William Lawless, Vernon F. Lardenoit and Bennie Cohen. *Plating*, v. 46, Nov. 1959, p. 1264-1267.

Endurance limit is drastically lowered by plated, sprayed or dipped metallic coatings in both the as-coated condition and after exposure to elevated temperatures. Both shot-peening and nitriding the steel prior to coating restore the endurance limit of the steel in the as-coated condition. (Q7; TS-k, 8-62, 8-65, 8-67)

1508-Q.* Fretting in the Light of Aircraft Experience. P. B. Walker. *Royal Aeronautical Society, Journal*, v. 63, May 1959, p. 293-298.

Fretting and its relation to fatigue. Various defects and preventive measures. (Q7, Q9q, T24)

1509-Q.* (English.) The Temperature of Rubbing Surfaces. J. F. Archard. *Wear*, v. 2, Oct. 1959, p. 438-455.

Formulation of the flash temperature theory. Graphical methods for deducing temperatures; application of the theory to new experimental results on the breakdown and wear of steels. 14 ref. (Q9n, Q9p; 2-62, ST)

1510-Q.* Effects of Radiation. Ernest E. Thum. Paper from "Metals for Nuclear Reactors". American Society for Metals, Metals Park, Novelty, Ohio, 1959, p. 32-46.

Atomic displacements and thermal spikes due to neutron bombardment. Transformation and aging effects. Influence of fission and fission products on dimensional stability and mechanical properties. Requirements of materials for cladding fuel elements. Changes in tensile properties, ductile-to-brittle transition and impact strength of metals resulting from neutron radiation. (Q-general, P10d, 2-67; SS, ST, Al, Ni, Cu, U)

1511-Q. Investigation of the Compressive, Bearing and Shear Creep-Rupture Properties of Aircraft Structural Metals and Joints at Elevated Temperature. Pt. 5. L. A. Yerkovich. Cornell Aeronautical Laboratory, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151561, Dec. 1958, 97 p. $2.

PH15-7-Mo stainless steel and 6Al 4V Ti tested from 700 to 900° F. to establish creep and rupture performance. With only slight variations creep-rupture correlation agreed with short-time strength correlations when the short-time characteristics were determined under a controlled strain rate of 0.5% per min. Both

alloys showed creep-rupture stress sensitivity in bearing and shear as well as tension. (Q28, Q3q, 2-62, 3-68; SS, Ti-b, *Al, V, Mo,* SGB-s)

1512-Q. Theory of Brittle Fracture in Steel and Its Application to Radiation Embrittlement. A. H. Cottrell. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 3-17.

Theory of yield in Fe and conditions for the nucleation of slip from cracks. Formulation of a new theory of crack nucleation in which the crack nucleus is formed at the junction of two intersecting slip planes by the coalescence of dislocations in those planes. Equations express change of ductile-to-brittle transition temperature with grain size, lattice hardness, strain rate and yield stress for notched and unnotched steel specimens. Essential features and conditions of service failures of large structural steel assemblies. Nature of radiation embrittlement and its effect on transition temperature. 48 ref. (Q23, Q24, Q26, 3-66, 3-68, 2-59, 2-67; ST)

1513-Q.* The Transition Temperature in Notched Specimens. N. J. Petch. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 18-20.

Mechanism of crack formation and propagation; equations giving criteria for brittle fracture; relationship of grain size, strength of dislocations and triaxial tension in the notch with the temperature of ductile-to-brittle transition. Comparison with experimental values for steel. (Q23r, Q23s, Q26, 2-59, 2-60, 2-61; ST)

1514-Q.* The Mechanical Properties of Steels Irradiated With Neutrons. D. Hull. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 21-22.

Effect of irradiation on notched impact values of nitrided and unnitrided specimens of low-carbon steel between -80 and 180° C. Tensile properties of fine and coarse-grained low-carbon steel at room and liquid-nitrogen temperatures after various irradiation treatments. (Q27a, Q6n, Q23r, 2-67, 2-59; CN-g)

1515-Q.* The Effect of Irradiation in a Nuclear Reactor on the Mechanical Properties of Steel. S. F. Pugh. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 23-30.

Displacement of atoms by fast neutron bombardment and changes in mechanical properties due to the interaction of point defects with dislocations and due to disordering of ordered phases or mixing of phases at the grain boundaries. Damage due to thermal neutron capture. Effect of irradiation on tensile properties and on ductile-to-brittle transition temperatures on radiation damage. 23 ref. (Q27a, Q23r, Q26n, Q5h, 2-67, 2-59, 2-61; ST)

1516-Q.* The Effect of Neutron Irradiation on the Mechanical Properties of Steels. D. R. Harries and C. Judge. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 31-34.

Influence of irradiation temperature and dose on ductile-to-brittle transition temperature for weld and parent metal specimens of Ducol W.30, Conlo 1 and Croloy steel. (Q23r, Q5h, 2-67, 2-61; AY)

1517-Q. Possible Effects of Irradiation on the Hydrogen Embrittlement of Steel. T. J. Heal. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 35-37.

Possible influence of irradiation on rate or extent of hydrogen solution and on mechanism of embrittlement of steel after entry. 10 ref. (Q26s, N15, 2-67, 3-69; ST, *H*)

1518-Q.* A Survey of Hydrogen Embrittlement of Steels. B. E. Meredith and D. White. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 38-40.

Influence of hydrogen content, ultimate tensile strength, temperature and stress on the degree of embrittlement; theories of hydrogen embrittlement. 9 ref. (Q26s, N15, 2-61, 3-66, 3-67; ST, *H*)

1519-Q.* Ductile-Brittle Transition in Non-Ferrous B.C.C. Metals. R. E. Smallman. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 41-43.

Ductile-to-brittle transition temperatures of Mo, W, Cr, Ta, Cb and V. Variation with strain rate, grain size, cold work, impurities, stress-relief and neutron irradiation. 15 ref. (Q23r, Q26, 2-61, 2-59, 2-67, 3-68, 3-69; Mo, W, Cr, Ta, Cb, V)

1520-Q.* Cleavage Fracture in Hexagonal Metals. G. B. Greenough. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 44-45.

Effect of plastic deformation, fatigue or coatings on fracture stress of monocrystalline and polycrystalline Zn. Fracture of Mg, Cd and Ge. 6 ref. (Q26n, 3-68, 2-59, Zn, Mg, Cd, Ge, 14-61)

1521-Q. The Ductility Problem of Reactor Beryllium. G. C. Ellis. Paper from "Brittleness in Metals". United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, p. 46-47.

Longitudinal and transverse tensile properties of various types of Be at elevated temperatures. Probable causes of brittle behavior. Possibilities for future improvement. (Q27a, Q23p, 2-62, 3-69; Be, 4-58, 6-72)

1522-Q. (English.) Fatigue Strength of a Copper Coating Sprayed on Steel Bars. Jaakko Salokangas and P. Lehto. *Acta Polytechnica Scandinavica*, no. 7, 1959, 21 p.

Cu layer was sprayed on the surface of a steel test bar. The stress that could be sustained for 10^7 load cycles without producing a crack, visible under the binocular microscope, was regarded as the fatigue strength of sprayed Cu. Both the wire feed and the spraying distance were within certain limits, inversely proportional to the fatigue strength of sprayed Cu. 4 ref. (Q7a, L23; ST, 4-55, 8-67)

1523-Q. (Pamphlet.) Brittleness in Metals. United Kingdom Atomic Energy Authority, I. G. Report no. 145 (RD/C), 1959, 47 p.

Theory of brittle fracture in steel; factors affecting transition temperatures; effect of irradiation on mechanical properties and hydrogen embrittlement of steels. Brittle fracture of Mo, W, Cr, Ta, Cb, V, Zn, Mg and Be. Papers abstracted separately. (Q-general, Q26s, Q23r, 2-61, 2-67, 3-67, 3-68, 3-69; ST, Mo, W, Cr, Ta, Cb, V, Zn, Mg, Be)

1524-Q. (Pamphlet.) The Tensile and Impact Properties of Plate and Welds of Aluminum Alloy 5083-H113 Between +75 and -320° F. R. D. Olleman and G. C. Wolfer. 9 p. 1959. Kaiser Aluminum & Chemical Corp., Kaiser Bldg., 1924 Broadway, Oakland 12, Calif.

Tensile tests, notched and unnotched tensile-impact tests and Charpy keyhole impact tests; evaluating resistance of plates and welds of 5083 Al alloy to brittle fracture; performance of SAE 1034 steel subjected to the same tests. 9 ref. (Q27a, Q6n, Q23r, Q26s; Al-b, ST)

1525-Q. (Pamphlet.) Engineering Properties of "S" Monel Hard Nickel-Copper Cast Alloy. (Inco Casting Data.) 9 p. 1959. International Nickel Co., Inc., Oak St., Bayonne, N. J.

Age-hardenable cast material provides unusual strength, hardness and antigalling properties up to 1100° F. in addition to the general corrosion resistance of Monel. (Q-general, P-general, 2-62; Ni-b, Cu, Si, Fe, *Mn*)

1526-Q. (Pamphlet.) Basic Data. Inconel "702" Aluminum-Containing Nickel-Chromium Alloy. 3 p. Apr. 15, 1959. International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

High-Al, low-Ti alloy for improved oxidation resistance to 2400° F. Data for composition, physical and mechanical properties, tensile and rupture strength, oxidation resistance, working properties. (Q-general, 2-62, R1h, P-general; Ni-b, *Cr, Al, Ti*)

1527-Q. (Pamphlet.) Engineering Properties and Applications of Ni-Vee Bronzes. 25 p. 1958. International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Five types of alloys with 5% Ni and 5% Sn whose as-cast properties can be elevated through simple heat treatments which control Ni-Sn-W precipitation reaction. Used for constructional and pressure castings and bearing applications. (Q-general, P-general, 2-64; Cu-s, *Ni, Sn*, SGA-c, SGB-s)

1528-Q. (Pamphlet.) 300-M Ultra High Strength Steel. 12 p. 1959. International Nickel Co., In., 67 Wall St., New York 5, N. Y.

Low-alloy steel has a higher strength at all temperatures without increase in carbon content and resists softening at a tempering temperature of 400-600° F. Its high hardenability allows light sections to be air hardened, simplifying heat treatment and minimizing distortion. (Q27a, J-general; AY, SGB-a)

1529-Q. (Pamphlet.) Ductile Iron Combines Quality With Economy for Fluid Handling Equipment. K. H. Kurgin. 16 p. 1959. International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Methods of manufacture and heat treatment; resistance to cracking by thermal and mechanical shock; tensile

properties, creep characteristics, stress-rupture levels, oxidation and growth characteristics. (Q-general, Q3, R1h, R-general, J-general; CI-r)

1530-Q. (Translation.) Indentation of a Ball. Pt. 2. Strain Figures Developed in and on the Ball Indentation Specimen. Shigehiko Yazawa and Kiyoshi Sato, Masao Unno and Go Yaguchi. *Journal of Mechanical Laboratory of Japan*, v. 5, no. 1, 1959, p. 19-23. (From *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 24-29.)
See item 790-Q, 1959. (Q29b; CN-g)

1531-Q. (Translation.) Wear of Carbon Steel Weld Metal. Pt. 2. Effect of Previous Heat Treatment of the Specimen Upon the Wear and the Structural Changed Layers of the Worn Surface. Sukemitu Ito, Kozo Honda and Kikuzo Ishiyama. *Journal of Mechanical Laboratory of Japan*, v. 5, no. 1, 1959, p. 24-29. (From *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 12-17.)
See item 788-Q, 1959. (Q9; 7-51, CN)

1532-Q. (Translation.) Wear of Carbon Steel Weld Metal. Pt. 3. Effect of the Rubbing Conditions Upon the Wear and the Structural Changed Layers of the Worn Surface. Sukemitu Ito and Kikuzo Ishiyama. *Journal of Mechanical Laboratory of Japan*, v. 5, no. 1, 1959, p. 30-34. (From *Journal of Mechanical Laboratory (Japan)*, v. 13, Jan. 1959, p. 18-23.)
See item 789-Q, 1959. (Q9; CN, 7-51)

1533-Q. (Translation.) Wear of Ni-Cr Austenitic Steel Weld Metal. Pt. 1. Study on the Wear and the Structural Changed Layer of the Worn Surface. Sukemitu Ito and Kozo Honda. *Journal of Mechanical Laboratory of Japan*, v. 5, no. 1, 1959, p. 44-51. (From *Journal of Mechanical Laboratory (Japan)*, v. 13, Mar. 1959, p. 54-60.)
See item 791-Q, 1959. (Q9; 7-51, SS, CN)

1534-Q. (Translation.) Experimental Study on the Abrasion of Martensitic Steel Weld Metal. Sukemitu Ito and Mituhiro Kawaguchi. *Journal of Mechanical Laboratory of Japan*, v. 5, no. 1, 1959, p. 52-58. (From *Journal of Mechanical Laboratory (Japan)*, v. 13, May 1959, p. 30-35.)
See item 1145-Q, 1959. (Q9; 7-51, SS-c)

1535-Q. (Translation.) Hot Working of Alloy Steels. Pt. 1. Experimental Methods. A. Gueussier and R. Castro. *Metal Treatment and Drop Forging*, v. 26, July-Aug. 1959, p. 255-260, 263. (From *Revue de Metallurgie*, no. 11, 1958, p. 1023-1041.)
See item 276-Q, 1959. (Q24, Q5, Q27, 2-61, 2-60; AY, SS)

1536-Q. (Translation.) Hot Working of Alloy Steels. Pt. 2. Essential Factors for Ductility. A. Gueussier and R. Castro. *Metal Treatment and Drop Forging*, v. 26, Sept. 1959, p. 323-327. (From *Revue de Metallurgie*, no. 11, 1958, p. 1023-1041.).
See item 276-Q, 1959. (Q24, Q5, Q27, Q23p, 2-61, 2-60; AY)

1537-Q. (Translation.) Application of Electron Microscopy. Initial Stages of Fatigue in Carbon Steels. Mirko Klesnil and Premysl Rys. *Metal Treatment and Drop Forging*, v. 26, Sept. 1959, p. 305-313. (From *Hutnicke Listy*, no. 12, 1958, p. 1116-1123.)
See item 316-Q, 1959. (Q7, M26s; CN-p)

1538-Q. (Translation—AIP.) Plasticity of Certain Alloys at High Pressures. Yu. N. Ryabinin, L. D. Livshits and L. F. Vereshchagin. *Soviet Physics, Solid State*, v. 1, no. 3, p. 429-433.
Data on duralumin, Fe and stainless steel at pressures from 1 to 32,000 kg. per sq. cm. 4 ref. (Q24, Q26, 3-74; Al-b, Fe, SS)

1539-Q. (Translation—AIP.) Temperature Dependence of the Internal Friction of Metals and Alloys. V. S. Postnikov. *Soviet Physics—Uspekhi*, v. 1, Sept-Oct. 1958, p. 29-53.
Behavior of Sn, Pb, Al, Ag, Cu, Ni and stainless steels at 0.800° C. 253 ref. (Q22, 2-61; Co, Ni, Cu, Mo, Pb, Al, Ag, SS)

1540-Q. (Translation—AIP.) Physico-Chemical Phenomena in the Deformation of Metals. V. I. Likhtman and E. D. Shchukin. *Soviet Physics—Uspekhi*, v. 1, Sept.-Oct. 1958, p. 91-112.
Theoretical treatment of mechanical properties of Zn and Cd crystals from the point of view of dislocation theory. 69 ref. (Q24, M26b; Cd, Zn, 14-61)

1541-Q. (Translation—AIP.) Brittle Fracture of Metals. V. L. Sarrak. *Soviet Physics—Uspekhi*, v. 2, Jan-Feb. 1959, p. 150-164.
Theoretical strength of metals, Griffith's theory, dislocation theory of fracture, temperature dependence of yield point, role of impurities, structure of steel and its tendency toward brittle fracture, intergranular fracture and the

propagation of cracks. 78 ref. (Q26s, Q26q, 2-61, 2-60; AY, ST)

1542-Q. (Translation—AIP.) Temperature Dependence of the Mechanical Strength and Life Under Load of Metalloceramic Bodies. B. Ya. Pines and A. F. Sirenko. *Soviet Physics, Solid State,* v. 1, no. 2, n.d., p. 247-254.

Specimens prepared from powders of Cu, Ni, Fe, Mo and W and from mixtures of powders Cu-Ni, Cu-Fe, Ni-Fe and Ni-W, tested to 1000° C. 6 ref. (Q27a, Q7a, 2-62; Cu, Ni, Fe, Mo, W, 6)

1543-Q. (Translation—Brutcher no. 4494.) Effect of Hydrogen on Structure and Properties of Titanium and Its Alloys. S. G. Glazunov, I. I. Kornilov and A. M. Yakimova. *Izvestiya Akad. Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* Jun. 1958. p. 30-36.

(Q-general, M28, 2-60; Ti-b, *H*)

1544-Q. (Translation—Brutcher no. 4736.) Effect of Molybdenum, Chromium and Aluminum on the Strength of Hard Alloys on a Nickel or Cobalt Base. A. I. Baranov, K. A. Bystrova, T. A. Novikova and V. F. Funke. *Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo,* no. 2, 1959, p. 43-47.

Correlation between the amount of Mo, Cr or Al and the quantity of cementing phase on one side and the bend strength on the other side. 9 ref. (Q5g, 2-60, 2-61; SGB-q, Ni-b, Co-b, *Mo, Cr, Al*)

SECTION R

CORROSION

1-R.* Corrosion of Aluminum. Frederick W. Fink. *Nuclear Technology Briefs*, no. TI-8, Sept. 18, 1958, 8 p.

Progress to development of Al alloys with sufficient corrosion resistance for use as cladding materials in pressurized water reactors. Nature of corrosion attack and the reduction of corrosion in high-temperature water by alloying and use of inhibitors. 22 ref. (R4, T11g; Al-b)

2-R.* (German.) Stress-Corrosion. Ludwig Graf. *Draht*, v. 9, Oct. 1958, p. 383-389.

Stress-corrosion sensitivity of supersaturated alloys with precipitation tendency can be eliminated by heat treatment, provided the alloy is not corrosion sensitive in the homogeneous state of saturation. With unsupersaturated homogeneous alloys, stress-corrosion was observed only when the alloying components of the solid solution were considerably more negative than the base metal. 19 ref. (R1d)

3-R.* (German.) Mechanism of Influence of the Surrounding Medium on Metals. G. W. Karpenko. *Zeitschrift fur Physikalische Chemie*, v. 208, Apr. 1958, p. 809-817.

Inactive media; surface active media, chemically active media and media which act on metals through diffusion. Adsorption starts corrosion, which diminishes the surface strength. Through diffusion a medium penetrates far below the surface and the following adsorption promotes corrosion which weakens the tensile strength of the metal. Relationships between physical, chemical and mechanical conditions of the metal surfaces and their reaction with surrounding mediums. 6 ref. (R1)

4-R.* (Japanese.) Galvanic Corrosion of Metals. Hiroshi Asada and Shiro Kohara. *Light Metals*, no. 31, July 1958, p. 35-39.

Corrosion tests of Cu, Fe, Zn and Al in 5.8% sodium chloride containing 0.3% hydrogen peroxide were carried out with galvanic couples formed by two metals and with contacts of three metals. Zn was corroded most severely, Fe next and Cu galvanic couples, basic metal and couple was corroded preferentially as predicted from galvanic series. In case of contact of three metals only basic metal was corroded. The protection afforded by loss of anodic metal decreased with time, corresponding to decrease in corrosion current. The decrease in corrosion current resulted from thicknening of hydrate film formed on metal surface. 14 ref. (R1a; Al, Cu, Fe, Zn)

5-R.* (Japanese.) Utilization of Aluminum and Its Alloys in the Wine and Brandy Industry. Takuichi Morinaga, Shigeo Zaima and Motoo Kagami. *Light Metals*, no. 31, July 1958, p. 40-50.

Corrosion tests in white dry wine and brandy. Effect of Al on wine characteristics. 15 ref. (R7f, T29p; Al-b, 17-57)

6-R. (Polish.) Resistance of Nonstabilized 18-8 Type Steels to Intercrystalline Corrosion in Welding Zone. Josef Nemec. *Hutnik*, v. 24, no. 9, 1957, p. 356-363.

The tendency to intercrystalline corrosion is one of the indices of the welding capacity of metal. Cooling with water during welding decreases the tendency to intercrystalline corrosion in the welding zone considerably; in 0.07% C steels water cooling completely neutralizes possibility of intercrystalline corrosion. (R2h, K-general; SS)

7-R. (Polish.) Calcium Cyanamide as an Inhibitor of Steel Corrosion in Aqueous Solutions. Stefan Pawlikowski, Iwo Pollo and Jerzy Wegiel. *Zeszyty Naukowe Politechniki Slaskiej*, no. 12, 1957, p. 107-128.

Influence of calcium cyanamide on the corrosion rate and change of the irreversible electrode potential of iron (0.3% C) in distilled and tap water and in series of salt solutions in relation to underground corrosion. Addition of 4% calcium cyanamide to tap and distilled water reduced corrosion rate ten times. Greatest inhibition was observed in $CaSO_4$ solution. Inhibition of corrosion rate in water and the majority of salt solutions by calcium cyanamide additions is caused by the hydrolysis of the latter and by the rise in alkalinity of the solutions. (R10b; ST)

8-R. (Rumanian.) Cathodic Protection of Gas Pipeline With Galvanic Anodes. M. Hamerak. *Petrol si Gase*, v. 8, no. 6, 1957, p. 309-313.

Protection of a gas pipeline 5.5 m. in diameter and 1700 m. long, with anodes of 99.9% pure Zn. Resistance of the soil was mainly in the range from 10 to 20 ohm. per m., rising to 41-45 and up to 140 in the last three sections. Anode installation was carried out in special castings of plaster-of-paris and clay. (R10d; 4-60)

9-R. (Serbian.) Corrosion of Electric Units and Other Objects in Soil by the Action of Electric Current. Pance Kirkov. *Zastita Materijala*, v. 5, no. 1, 1957, p. 5-8.

Rate of corrosion of Fe, Zn, Cu, Sn, Pb, Cu + Zn (40% Zn), Pt in the soil, conducted in a laboratory unit, in which samples were inserted in a vessel containing sand that had been treated with HCl and were polarized with alternating current. Alternating current affects to a considerable extent the rate of corrosion, depending on the duration and the manner of introducing the current into the system. (R1j; Fe, Zr, Cu, Sn, Pb, Zn)

10-R. Corrosion Studies in Dynamic Aqueous Systems at Elevated Temperature and Pressure. M. Krulfeld, M. C. Bloom and R. E. Seebold. Naval Research Laboratory. *U. S. Office of Technical Services*, PB 131775, June 1958, 14 p. $.50.

Hydrogen effusion technique for measurement of corrosion rates. Comparison with rates in static systems at this temperature showed that they are similar. Method also appears highly sensitive to local corrosion. (R11)

11-R. The Oxidation Characteristics of Several Reactor Metals. J. V. Cathcart and J. H. Frye. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/704, 1958, 21 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Behavior of V, Cb, Ta, Ti, Zr and Hf. At low temperatures they all form protective oxide films, but as the temperature is increased, a stage is reached in which there is a transition from protective to nonprotective oxidation. Electron microscopic investigations of the micro-topography of films formed on Cb have shown that the formation of small, cracked blisters in the oxide can be correlated with the transition from protective to nonprotective oxidation. (R1h; V, Cb, Ta, Ti, 2r, hf)

12-R. Radiation Effects on the Oxidation Rate and on Other Chemical Properties of Graphite. G. R. Hennig, G. J. Dienes and W. Kosiba. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1778, 1958, 12 p. (Available from U. S. Office of Technical Services, Washington, 25, D. C.) $.50.

Properties of graphite are altered by irradiation with fast particles because these produce various lattice defects such as vacancies, interstitial atoms, ions, clusters of both, and possibly dislocations. 10 ref. (R1h, 2-67; NM-K36)

13-R.* (Japanese.) Stress-Corrosion Cracking Properties of Corrosion Resisting Copper Alloy "Albrac". Rihei Kawachi and Mutsumi Okawa. *Sumitomo Metals*, v. 10, Apr. 1958, p. 105-110.

Albrac alloy tubes with different grain sizes were subjected to sinking and mercurous nitrate testing to determine the effects of grain size, plastic deformation and Si, Ti or P additions on stress-corrosion properties. Relation between percentage reduction by sinking, internal stress and resistance to cracking. Ti, Si or P addition improved resistance to

stress-corrosion. Variation of internal stress with specimen length. 9 ref. (R1d, 2-59, 2-60, 3-68; Al-b, 4-60)

14-R. A Method for Determining Corrosion Rates From Linear Polarization Data. Milton Stern. *Corrosion,* v. 14, Sept. 1958, p. 60-64.

11 ref. (R11m)

15-R. Effect of Surface Active Agents on the Formation of Boiler Scale. G. H. Ireland. *Corrosion Prevention & Control,* v. 5, Oct. 1958, p. 57-60.

Mechanism suggested for formation of the common calcite and anhydrite scales frequently found on heating and cooling surfaces of industrial plant. Types of treatment compared; advantages of specially developed organic surface active agents. Related compounds, such as antifoams, oxygen scavengers and neutralizing amines, and their applications. (R2q, R10a, R10b, T26q)

16-R. A New Problem Brings a New Primer. K. V. Hodgson. *Corrosion Technology,* v. 5, Aug. 1958, p. 260-261, 271.

Quick drying, nonpoisonous, inflammable primer protects shot blasted metal of ships and does not interfere with fabricating operations. (R10b, L26n, T22g, NM-g)

17-R. (Russian.) Texture of Iron Scale. Pt. 12. Structure Changes in Scale on Change of Atmosphere. V. I. Arkhapov, M. I. Simonova and N. A. Khatanova. *Fizika Metallov i Metallovedenie,* v. 6, no. 8, 1958, p. 444-449.

7 ref. (R2q, M27, R4; Fe)

18-R.* Stress Corrosion Cracking in Copper Alloy Weldments. Raymond T. Phebus. *American Society of Naval Engineers, Inc., Journal,* v. 70, Aug. 1958, p. 543-549.

For most metal systems stress-corrosion cracking is intergranular. However, for stainless steel, it is transgranular. Best technique for prevention is a post-fabrication anneal. 8 ref. (R1d; Cu-b, SS, 7-51)

19-R.* A Study of the Compatibility of Some Creep-Resistant Steels With Liquid Bismuth in Non-Isothermal Systems. D. W. Dawe, G. W. Parry and G. W. Wilson. *Iron and Steel Institute, Journal,* v. 190, Nov. 1958, p. 271-276.

If pure Bi alone is used, increasing the Cr content of otherwise low-alloy steels confers increasing resistance to attack by the liquid metal at temperatures up to 550° C. This can be satisfactorily explained on the basis that the protection is afforded by the presence of a thin oxide film at the steel-bismuth interface which contains increasing amounts of chromic oxide. Of the series of steels tested, the one containing 12% Cr proved to be the most resistant to attack and mass transfer, no indication of this occurrence being observed during 2500 hr. continuous testing. 5 ref. (R6m; SS-d, Bi)

20-R.* (Polish.) Corrosion Properties of Manganese Brass of the MM46 Type With Low Copper Content. Pt. 1. Jerzi Romanski and Maria Bialonczuk. *Prace Instytutow Odlewnictwa,* v. 6, no. 4, 1956, p. 15-24.

Corrosion tests of alloy composed of 47-49% Cu, 2-2.5% Mn, 2-4% Pb, 0.3-1% Fe and over 46% Zn. A solution of 5% $CuCl_2$ + 5% HCL showed that it is subject to severe dezincing. Tests showed also that Al bronze (with 9.64% Al) had a tendency to selective corrosion in the same medium. The eutectoid rich in Al was corroded, while the poorer Al phase remained intact. (R2k; Cu-n, *Mn*)

21-R.* Effect of Temperature on the Rate of Corrosion of Metals. V. V. Gerasimov and I. L. Rozenfeld. *Academy of Sciences of the USSR, Bulletin,* no. 10, 1957, p. 1192-1197.

Behavior of Cu, Fe, Ni, Mg and Zn in 1.0 N NaCl, 1.0 N NaCl + 0.1 N HCl, 1.0 N NaCl + 0.1 N NaOH, and 1.0 N NaOH, and 1.0 N NaCl + 0.1 N $KMnO_4$. 4 ref. (R6; 2-61, Cu, Fe, Ni, Mg, Zn)

22-R.* (German) Corrosive Properties of Nondrying Oils and Greases, Especially of Modern Lubricants and Preservatives. A. Bukowiecki. *Schweizer Archiv,* v. 24, Aug. 1958, p. 263-270.

Important factors: capacity of an oily substance to dissolve or emulsify water; affinity to oxygen and formation of peroxides and organic acids in aging; corrosion properties of diesel fuels and additives to oils and greases. (To be continued.) (R7e; NM-h)

23-R.* (German) Corrosion of Pressure Pipes. C. Tschappat. *Werkstoffe und Korrosion*, v. 9, Oct. 1958, p. 613-623.

Chemical and physical causes of corrosion on an underground pressure line. Changes in temperature and moisture of the surrounding air do not allow a protective film to form on the pipe surface. Cr and Cu alloy steels showed no better corrosion resistance than carbon steel. (R8, R3; ST, T26r)

24-R.* (German) Corrosion of Iron Covered by Earth. T. Markovic. *Werkstoffe und Korrosion*, v. 9, Oct. 1958, p. 623-630.

Research on the influence of water present in soil on electrochemical corrosion of iron. In a slightly acid earth of 3.5 to 4.5 pH, strong rainfall (33 in. yearly) caused corrosion while in an earth of slight basic reaction corrosion decreased with increased rainfall. Cathodic protection best. 11 ref. (R8; Fe)

25-R.* (German.) Corrosion of Tin Cans. H. Cheftel. *Werkstoffe und Korrosion*, v. 9, Oct. 1958, p. 630-636.

Corrosion on the outer surface prevented proper storing. Inner corrosion determined by three factors: composition of steel, thickness of tin coat, electrical resistance of lacquer. In the presence of acids, corrosion is promoted by high amounts of Si, P and Cu. Other influences: pH and temperature. Salts of bivalent tin act as inhibitors. 34 ref. (R-general, T29p; ST, *Sn*)

26-R. Mechanism of Corrosion. Arthur G. Keller. *Louisiana State University, Engineering Experiment Station, Bulletin* no. 62, 1958, p. 33-45.

(R-general)

27-R. How to Combat High-Sulphur-Fuel Corrosion. W. L. Nelson. *Oil and Gas Journal*. v. 56, Sept. 29, 1958, p. 61-62

(R7k, R7d)

28-R.* (Japanese.) Rust Prevention Techniques. Yoichi Yamamoto. *Metals (Supplement)*, v. 28, Oct. 1958, p. 1-6.

The techniques of rust prevention are classified as material considerations, environment amelioration, cathodic protection. Rust prevention technique: surface cleaning, application of preservative oil, application of vaporizing inhibitor, use of sealer, grease proofing and water proofing, desiccation. (R10)

29-R.* (Japanese.) List of Rust Inhibitors. Ichiro Shinozaki. *Metals (Supplement)*, v. 28, Oct. 1958, p. 7-14.

Surface cleaners and soluble rust preventive additives; petroleum derivatives; alkaline cleaning solutions; emulsions; electrolytic cleaning solutions; rust removers, soluble rust inhibitors. Preservatives; petrolatum oil; vaporizing inhibitors; sealers; anti-rust wrapping. (R10b)

30-R.* (Japanese.) Anti-Corrosive Inhibitors. Seiichi Fujii. *Metals (Supplement)*, v. 28, Oct. 1958, p. 19-24.

System which is composed of metal and water is considered to be thermodynamically unstable. If an inhibitor is added to the system the reaction rate will be decreased and metal is protected from corrosion. Inorganic inhibitors are classified into anodic and cathodic inhibitors. Organic inhibitors can hardly be classified. (R10b)

31-R.* (Japanese.) Storage of Metallic Goods. Kiyoshi Ichikawa. *Metals (Supplement)*, v. 28, Oct. 1958, p. 39-49.

To be considered for better shed storage are clean air, low humidity, prevention of bacterial growth and avoidance of contact between different kinds of metals. Preventive materials are inhibitors, water-proof paper, foil, plastics and temporary coatings. (R10)

32-R.* (Japanese.) Rust Prevention for Thin Steel Plates. Shigeru Yonezaki. *Metals (Supplement)*, v. 28, Oct. 1958, p. 55-58.

Moisture, HCl, H_2SO_4, and SO_2 gas, mist and dust are exhausted from factories. The best protection method is isolation (i. e., metallic or other layer formation or rust preventive oil covering). (R10; ST, 4-53)

33-R.* (Japanese.) Rust Prevention for Roller Bearings. T. Hashimoto and S. Ohki. *Metals (Supplement)*, v. 28, Oct. 1958, p. 59-66.

There are three periods of rusting—during the manufacturing process, during

transportation and during the working process. Preventive methods. (R10, T7d)

34-R.* (Japanese.) Rust Prevention for Machines. Masao Terasawa. *Metals (Supplement)*, v. 28, Oct. 1958, p. 72-76.

Avoid sprinkling the floor; keep out dust; paint the surface nearest the floor; prevent corrosive gases; use protective finish on part exposed; cover to prevent dew. (R10)

35-R.* Corrosion Bibliography on Cobalt and Cobalt Alloys. *Cobalt Information Center*, Feb. 1957, 12 p.

Bibliography covering period 1922-1957. (R-general; Co)

36-R.* (German.) Method for Measurement of Dissolution Velocities of Corroding Metals in Solutions Containing Air. Hans Jurgen Engell. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 553-558.

Use of a minute potential change of the electrode potential of the metal and measurement of the required current. This method is applicable, when the partial current density equation is known, which is usually the case in sea water and underground water. 3 ref. (R11m, R4)

37-R. Current Research on Corrosion and Tuberculation of Cast Iron. Thurston E. Larson and R. V. Skold. *American Water Works Association, Journal*, v. 50, Nov. 1958, p. 1429-1432.

Effects of mineral content on corrosion and tuberculation of cast iron pipe. (R2n; 4-60, CI)

38-R. Intercrystalline Corrosion of Stainless Steel. C. Edeleau. *Chemistry and Industry*, no. 42, Oct. 18, 1958, p. 1360-1361.

7 ref. (R2h; SS)

39-R. French Producers Fight Corrosion in Lacq Field. J. Grindrod. *Gas Age*, v. 122, Oct. 30, 1958, p. 17-18.

Al-Cr-Mo steel pipe undergoing field test in effort to withstand high hydrogen sulphide and carbon dioxide content of Lacq gas. (R7k; RM-m35, AY, *Al, Cr, Mo*, 4-60)

40-R. Corrosion: Here and There. F. W. Emhardt. *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 71A-72A.

Examples of stress-corrosion cracking. (R1d)

41-R. Corrosion of Buried Metal. *National Safety News*, v. 78, Nov. 1958, p. 30-31, 131-133.

Summary of 45 years of research by National Bureau of Standards includes causes, soils and burial procedures. (R8, 4-60)

42-R. Reduce Fuel-Gas-Line Corrosion. Larry Resen. *Oil and Gas Journal*, v. 56, Nov. 3, 1958, p. 107, 109.

Use water injection to combat ammonium chloride in cat reformer off-gas. (R7h; ST, 4-60)

43-R. (Japanese.) Test for Rust Inhibitors. Minoru Kashima. *Metals (Supplement)*, v. 28, Oct. 1958, p. 25-38.

Pulse polarizer method and change of surface potential of metal. (R11m, R10b)

44-R. (Japanese.) Notes on Corrosion Prevention. Kenji Murayama. *Metals (Supplement)*, v. 28, Oct. 1958, p. 50-54.

Corrosion preventives are sometimes corrosion accelerators. (R10b)

45-R. (Japanese.) Rust Prevention for Tap Dies. *Metals (Supplement)*, v. 28, Oct. 1958, p. 67-71.

Grease-covered wax paper wrapping and vaporizing inhibitor treating seem best. (R10b, R10e; T6r)

46-R.* Lead Alloy Anode for Cathodic Protection. J. H. Morgan. *Corrosion Technology*, v. 5, Nov. 1958, p. 347-352.

Method of operation of a corrosion product impressed current anode and the formation of a conducting oxide film on a P6 alloy. Two types of impressed current anode can be used in sea water —consumable anodes from which metal is dissolved by the anodic reaction and permanent anodes which are not affected by the anodic reaction. (R10d; Pb)

47-R.* Does Higher Fuel Efficiency Increase Corrosion. Nigel Seely. *Corrosion Technology*, v. 5, Nov. 1958, p. 355-356.

As the thermal efficiency of modern high-pressure, high-temperature oil burning plant increases, a similar increase in

corrosion results, since currently available residual fuel oils contain inorganic substances, among them V, Na and S. (R7d; ST, *V, Na, S*)

48-R.* Prevention of Scale and Corrosion With Phosphates and Filming Amines. *Corrosion Technology* v. 5, Nov. 1958, p. 363-364, 368.

Phosphate conditioning is now standard practice in boilers working at pressures above 200 psi. and has also found use at much lower pressures. Phosphates most commonly used for this treatment are sodium metaphosphate, disodium phosphate and trisodium phosphate. (R10b, R4c, ST)

49-R.* (Italian.) Study of Anodic Behavior of Titanium. Pt. 2. Characteristics of Protective Films Formed on Titanium. Bruno Rivolta. *Metallurgia Italiana,* v. 50, July 1958, p. 255-262.

Oxide films formed during 2-hr. treatments in solutions of HCl, NaCl, H_3BO_3, KOH, Na_2S, NaF, $HClO_4$, H_2SO_4, NaF plus HCl and NaF plus H_2SO_4 at 25, 50 and 65° C. and over 8 v. studied by electron diffraction and metallographic microscopy. Diffraction patterns of Ti surfaces chemically treated in solutions of concentrated HCl, acqua regia, boiling HNO_3 for 1/2 hr. and in HNO_3 at ambient temperature for 100 hr. 7 ref. (R1h, L19q; Ti-b)

50-R.* (Italian.) Evaluation of the Corrosivity of Waters. Pt. 2. Behavior of the Steel-Copper Galvanic Couple in Aqueous Salt Solutions. G. Bombara. *Metallurgia Italiana,* v. 50, July 1958, p. 263-272.

Break-point method used to study galvanic corrosion in extensive series of solutions of different concentrations. Corrosion currents and couple potentials, as well as conductivity, pH and redox potential values, measured under identical conditions of aeration and agitation. For some sulphate, chloride and fluoride solutions tests were repeated in presence of potassium bichromate to determine amount of inhibiting effect. 7 ref. (R1a, R10a, R10b; Cu, ST)

51-R.* (Polish.) Sulphurization of Silver-Copper Alloys in Boiling Sulphur. Lacjan Czerski, Stanislaw Mrowec, Krystyna Wallisch and Teodor Werber. *Archiwum Hutnictwa,* v. 3, no. 3, 1958, p. 149-159.

Sulphurization of alloys with 0.0 to 100% studied by exposing samples to the action of boiling sulphur. For alloys rich in Cu, the plotted sulphurization-time graphs are parabolas, for alloys rich in Ag straight lines result. The scale is composed of the sulphides of both metals with a larger amount of Ag on the contact surface of scale and sulphur and a larger amount of Cu on the contact surface of scale and alloy. 14 ref. (R7k; Ag, Cu)

52-R.* Basic Research Into the Corrosion of Steel in Salt Water. *Corrosion Technology,* v. 5, Sept. 1958, p. 295-296.

National Bureau of Standards study of electrical potentials needed to protect steel cathodically from corrosion in salt water. Optimum protection achieved when specimens were held at -0.77 volt with reference to a saturated calomel electrode. (R10d, R4b; ST)

53-R.* Stress-Corrosion Cracking of Austenitic Stainless Steels With Applied E. M. F. J. G. Hines and T. P. Hoar. *Journal of Applied Chemistry,* v. 8, Nov. 1958, 764-776.

Behavior of Cr-Ni austenitic stainless in 42% aqueous magnesium chloride solution at 150-154°, saturated with air, was studied under conditions of cathodic or anodic treatment of the metal during the induction period prior to crack initiation and/or during crack propagation. Mild cathodic polarization delays the onset of cracking and fracture, the time to fracure increasing with increasing degree of polarization. 19 ref. (R1d; SS-e)

54-R.* (French.) Investigation of the Stress-Corrosion of Mild Steels in Natural Environments. A. Hache. *Revue de Metallurgie,* v. 55, July 1958, p. 656-678.

Eight hundred specimens representing five grades of steel were tested over a period of six years in industrial, rural and marine atmospheres and by immersion in fresh, salt and sea waters. In none of these media and on none of the steels was corrosion aggravated by application of stress even up to elastic limit of material. 25 ref. (R1d, R3, R4; CN)

55-R.* (German.) Internal Oxidation of Copper-Silicon Alloys. W. Gruhl and S. von Engelmann. *Metall,* v. 12, Nov. 1958, p. 985-989.

Increased amount of free Si causes a strong increase of oxidation speed within the range beneath 200° C. (R2s; Cu-b, *Si*)

56-R.* (German.) Co-Operative Research on Corrosion Testing Methods. Pt. 2. W. Wiederholt. *Metalloberflache*, v. 12, Nov. 1958, p. 337-347.

Salt spray tests and exposure to industrial atmosphere. (R11j, R11q)

57-R. (German.) Corrosion Protection of Ship Bodies by Anodes. A. Farchadow, W Negrejew, M. Nurijew, B. Samanow, B. Kjasimow and L. Rybakow. *Schiffbautechnik*, v. 8, Aug. 1958, p. 416-418.

In experiments with painted and unpainted steel plates in sea water, the first behaved as anodes. To protect a ship against corrosion, the use of cast iron anodes of a high Si content, fastened to the ship body, is recommended. When body and anodes are exposed to a current density of 1.5 to 5 milliamp. per sq. dm. sufficient corrosion protection is established. (R10d, T22g; ST)

58-R.* (Russian.) Passivity of Iron in Hot Alkaline Solution. A. M. Sukhotin and K. M. Kartashova. *Zhurnal Phizicheskoi Khimii*, v. 32, Sept. 1958, p. 2068-2072.

The substance of the passivating film on iron in a 10 N sodium hydroxide solution of 80° C., as in acid solutions, is magnetic iron oxide. In system studied, magnetic film may attain considerable thickness but the passivating action is connected only with a very thin layer directly adhering to the metal surface. (R10c; Fe)

59-R. Criteria for Adequate Cathodic Protection of Coated, Buried or Submerged Steel Pipe Lines and Similar Steel Structures. *Corrosion*, v. 14, Dec. 1958, p. 561t.

It is recommended that a protective electric current be applied to the structure in an amount sufficient to maintain its external surface, at every point, negative by at least 0.85 v. to a copper-saturated copper sulphate half-cell in the structure's immediate proximity. (R10d; T26r, ST)

60-R. Corrosion of Refinery Equipment During Acid Cleaning. K. R. Walston and A. Dravnieks. *Corrosion*, v. 14, Dec. 1958, p. 571t-579t.

Corrosion rate increases exponentially with temperature. Maximum allowable temperature will vary depending upon the inhibitor. Around 170° F. is a generally accepted maximum for carbon steel equipment; 125° F. is the accepted limit for cast iron. 11 ref. (R7a, T29n, 2-61; CN, CI)

61-R. (Russian.) Electrochemical Corrosion of Metals. A. I. Krasilshchikov. *Khimicheskaya Nauka i Promyshlenost*, v. 3, no. 4, 1958, p. 476-482.

(R3)

62-R. (Russian.) Passivation of Metals. Ya. M. Kolotyrkin and G. M. Florianovich. *Khimicheskaya Nauka i Promyshlenost*, v. 3, no. 4, 1958, p. 483-491.

Mechanics of passivation and nature of passivation state. (R10c)

63-R. (Russian.) Corrosion Inhibitors. I. L. Rosenfeld and V. P. Persiantseva. *Khimicheskaya Nauka i Promyshlenost*, v. 3, no. 4, 1958, p. 500-504.

(R10b)

64-R.* Failure of Type 316 Stainless Steel Autoclave Components. J. P. Hugo and L. G. Nel. *Corrosion*, v. 14, Dec. 1958, p. 553t-556t.

Failure of components situated in vapor phase was attributed to stress-corrosion cracking. The active corrodant was probably chloride while the stresses that initiated failure were predominantly residual. Components suffered some degree of cold working prior to installation, the latter probably resulting from machining or fabrication. Failure was in no way due to the use at any time of excessive operating temperatures or pressures. 12 ref. (R1d, X1a; SS)

65-R.* Corrosion Properties of Tantalum, Columbium, Molybdenum and Tungsten. Clifford A. Hampel. *Corrosion*, v. 14, Dec. 1958, p. 557t-560t.

Ta, the most resistant, is inert to all acids except HF and free SO_3 at temperatures usually encountered in industrial processes. It is attacked by strong alkalis at room temperature. Cb in general is less resistant than Ta in all media. Mo shows good resistance to nonoxidizing acids and

to alkaline solutions over a wide range of temperatures and concentrations and is attacked only slightly by hydrofluoric acid. Resistance of W to acid corrosion is equal to or better than that of Mo. (R6, R7; Ta, Cb, Mo, W)

66-R.* A Polarographic Study of the Corrosion of Iron and Some Ferrous Alloys by Sulfur Dioxide. F. J. Bowen and A. H. Gropp. *Corrosion,* v. 14, Dec. 1958, p. 578t-582t.

Tests on one pure Fe and seven low-alloy steels exposed to sulphur dioxide over 12-hr. periods. Rate of consumption of sulphur dioxide by various test samples. A corrosion mechanism is outlined involving the reduction of sulphurous acid by Fe to give the sulphide. 14 ref. (R11m, R7k; Fe)

67-R.* Chloride Stress Corrosion Cracking of Austenitic Stainless Steel-Effect of Temperature and pH. L. R. Scharfstein and W. F. Brindley. *Corrosion,* v. 14, Dec. 1958, p. 588t-592t.

Overstressed U-bends of Types 304 and 347 stainless steels were exposed to water containing chloride ions. Stress-corrosion cracking in the range of 165 to 200° F. is less severe than at 500 F. and specific conditions are required for corrosion cracking to occur at all. 10 ref. (R1d; SS-e)

68-R.* Effect of Halogen Ions on the Anodic Passivation of 13 Cr Stainless Steels. Namio Ohtani and Hideo Sugawara. *Electrochemical Society of Japan, Journal,* v. 26, no. 4-6, 1958, p. E-63-E-65.

Passiviation dependent on X^-/OH^-; the effect decreases with temperature rise of solution, difference in Cl^- and Br^- from that of F^- and I^-. (R10c; SS, EG-k)

69-R.* Less Oxygen = Less Corrosion. L. C. Case and W. C. Whiteside. *Oil and Gas Journal,* v. 56, Oct. 20, 1958, p. 74-76.

O_2 in brines affects corrosion of steel. An open water-flood system equipped with aerating tower and blower, settling basin and filters, gives good results. 7 ref. (R4h, R11p; ST)

70-R.* The Prevention of Air Heater Corrosion. L. E. Hardy. *Steam Engineer,* v. 28, Oct. 1958, p. 20, 21.

Preventing acid corrosion at low-temperature zone while firing oils high in sulphur content. Solution is to raise the metal temperature of the heater elements at the cold end. (R6g, W13a)

71-R. Corrosion of Zirconium Alloys in 900° F. Steam. J. Paul Pemsler. Nuclear Metals Inc. U. S. Atomic Energy Commission, NMI-1208, Aug. 18, 1958, 24 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Zircaloy-2 and Zircaloy-3 have poor resistance at 900° F. The presence of Sn is highly detrimental to corrosion resistance. Additions of Ni, Cr and, to a lesser extent Fe, extend the life of Zr-base alloys. Quenching from the beta phase impairs the corrosion resistance of Ni and Cr alloys and extends the life of Fe alloys and the Zircaloys. (R4d; Zr-b)

72-R. (Translation—SLA, ASLIB-GB96.) Causes and Prevention of Corrosion of Packed Metal Parts. P. Gorling. *Verpackungrundschau,* v. 8, 1957, n.p.

(R10e)

73-R. (Translation—SLA, R-4847.) Type of Intercrystalline Corrosion in Welded Joints of Stabilized Steels of the 18-18 Type. Y. I. Kazennov. *Avtomaticheskaya Svarka,* v. 2, no. 41, 1955, p. 91-93.

(R2h, 7-51; SS)

74-R.* (German.) Corrosion of Iron in Sulphur Vapor. S. Mrowec and T. Werber. *Naturwissenschaften,* v. 45, no. 14, 1958, p. 335.

A thin Pt wire was attached to sheet and exposed to S vapor. Diffusion of iron sulphide scale studied. 4 ref. (R7k, N1; Fe)

75-R. Evaluation of Stress Corrosion Effects. H. P. George. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, p. 459-475.

Role of residual stress, assembly and service; detection and control of residual stresses in brass, and Al-Mg alloys. 15 ref. (R1d; Cu-n, Al-b, *Mg*)

76-R. Three Ways to Avoid Corrosion in Magnesium. Robert J. Fabian and John Stevens. *Materials in Design Engineering,* v. 48, Dec. 1958, p. 109-111.

Mg surfaces can be potential source of corrosion unless the surface is protected, materials used are compatible, joints are properly designed. (R10; Mg-b)

77-R. (English.) Corrosion Behavior of the Newer Metals. N. P. Inglis and J. B. Cotton. *Corrosion Prevention & Control*, v. 5, Nov. 1958, p. 59-63, 73.

Behavior of Ta, Cb, Zr, Ti and Be in hot sulphuric, nitric hydrochloric, phosphoric, hydrofluoric acids, in hot neutral salt and ferric chloride, cupric chloride and sodium hydroxide solutions. Corrosion prevented by applying a small positive current to the specimen in a highly corrosive medium. (R6, R10d; Ta, Cb, Zr, Ti, Be)

78-R.* (French.) Chemical and Electrochemical Aspects of Corrosion in Nuclear Reactors. G. H. Cartledge. *Corrosion et Anticorrosion*, v. 6, Nov. 1958, p. 387-401.

Behavior of fission products and radioactive products; their effect on protective surface layers of metals. 44 ref. (R1, T11, 2-67)

79-R.* (French.) Physical Properties of Soil Which Affect Corrosion of Iron in Soil. T. Markovic. *Corrosion et Anticorrosion*, v. 6, Nov. 1958, p. 402-411.

Corrosion of iron in close relationship with concentration of water in soil, as well as content of air. 11 ref. (R8; Fe)

80-R. Progress Report on Volatility Pilot Plant Corrosion Problems to Apr. 21, 1957. L. R. Trotter and E. E. Hoffman. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission* ORNL-2495, Oct. 17, 1958, 38 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Corrosion of Ni used in U recovery fluorination vessels by sulphur-containing salts during the fused-fluoride volatility process. (R7k, C19; U, Ni-b)

81-R.* (French.) Oxidation of Lead in Water in Presence of Atmospheric Oxygen. B. S. Brcic and J. Siftar. *Corrosion et Anticorrosion* v. 6, Oct. 1958, p. 342-345.

Possibilities of using this process to produce yellow and red oxides of Pb. Pure, granulated, Ag-free Pb was treated in agitated solution of distilled water into which were introduced, variously, air purified of CO_2, bottled O and nonpurified air. Speed of reaction increases with duration of process; coefficient of temperature is of same order as in phenomena of diffusion in solutions. 6 ref. (R1h; Pb-a)

82-R.* (French.) Corrosion by Condensed Humidity. A Simple Testing Procedure. S. C. Britton. *Corrosion et Anticorrosion*, v. 6, Oct. 1958, p. 346-351.

Method devised to reproduce as closely as possible conditions of exposure to which equipment, boxed or under shelter, is subjected during storage and transport. Small specimens of metal are fastened to underside of glass plate placed horizontal in open air. Method is faster than exposure tests under shelter and gives more accurate results on behavior of materials than damp chamber tests. Results on corrosion resistance of Sn plate, metallic coatings and other methods of protection. 5 ref. (R11k)

83-R.* (French.) Influence of Surface Condition of Steel on Protection by Paints With High Zinc Content. G. Binetti and G. Ghisolfi. *Corrosion et Anticorrosion*, v. 6, Oct. 1958, p. 352-362.

Electrochemical phenomena which provoke oxidation of Fe and formation of rust, with special reference to detachment of mill scale, illuminates reasons for inefficacy of Zn-rich paints under some conditions. (R1h; ST, *Zn*, 8-70)

84-R.* (French.) Electrochemical Study of Corrosion of Stainless Steels. J. M. Defranoux. *Corrosion et Anticorrosion*, v. 6, Oct. 1958, p. 363-372.

Theory of electrochemical testing; procedures and equipment. Passivity, general and localized corrosion of stainless steels; pitting. 7 ref. (R1, R11m; SS)

85-R.* (French.) Metallic Coatings as Protection Against Atmospheric Corrosion. P. Morisset. *Nature*, Sept. 1958, p. 364-369.

Application of theory of electrochemical corrosion to mechanism of protection by metallic coatings; influence of thickness and nature of coatings on their corrosion resistance; principal types of metallic coatings; methods of quality control and standards. (R1, 8)

86-R. (French.) Electrochemical Behavior of Platinum. J. van Muylder, N. de Zoubov and M. Pourbaix, *Cebelcor Rapports Techniques*, no. 63, Mar. 1958, 13 p.

Corrosion behavior of Pt studied on the base of a voltage - pH equilibrium

diagram of the system platinum-water. 19 ref. (R1; Pt)

87-R. (French.) Electrochemical Behavior of Iridium. J. van Muylder and M. Pourbaix. *Cebelcor Rapports Techniques*, no. 62, Mar. 1958, 11 p.

Corrosion behavior of Ir studied on the base of a voltage-pH equilibrium diagram of the system iridium-water. 19 ref. (R1; Ir)

88-R. (French.) Electrochemical Behavior of Osmium. N. de Zoubov and M. Pourbaix. *Cebelcor Rapports Techniques*, no. 61, Mar. 1958, 21 p.

Corrosion behavior of Os studied on the base of a voltage - pH equilibrium diagram of the system osmium-water. 27 ref. (R1; Os)

89-R. (Japanese.) Rust Prevention for Cameras. K. Yawata, N. Tachihara and M. Yuguchi. *Metals*, v. 28, Nov. 1958, p. 850-855.

(R-general; X5g)

90-R.* Determining Corrosion Aggressiveness of the Atmosphere. N. D. Tomashov, G. K. Berukshits and A. A. Lokotilov. *Corrosion Technology*, v. 5, Dec. 1958, p. 386-388.

Apparatus constructed at the Institute of Physical Chemistry of the U.S.S.R. Academy of Sciences and the I. V. Stalin Steel Institute. Used for study of a macro-model of a corrosion element which would operate in atmospheric conditions. 9 ref. (R11k, R3)

91-R.* Fundamentals of Corrosion. W. A. Koehler. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 8-26.

Electrochemical theory of corrosion; basic corrosion reactions; electromotive series; development of corrosion cells due to differences in composition, thermal treatment, strain, abrasion, matrix, composition, grain size and dissimilarities of electrolyte. Polarization, depolarization, role of oxygen in corrosion, stray-current corrosion and cathodic protection. (R1, R8, R10d)

92-R.* Demonstration of the Theory of Cathodic Protection. William J. Kretschmer. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 27-33.

Galvanic cell consisting of steel anode and Cu cathode immersed in salt solution used to demonstrate method of cathodic protection and its practical adaptability. (R10d)

93-R.* Fundamental Analysis of Stray Current Corrosion. Percy Hort. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 34-38.

Origin and detection of stray currents. Draining current back to generator. (R1j)

94-R.* Fundamental Field Practices Associated With Electrical Measurements. L. H. West. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 39-61.

Techniques of measuring current, voltage and resistance in corrosion surveys; sources of error, precautions. (R11m, R8)

95-R.* Cathodic Protection Fundamentals. E. C. Reichard. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 67-68.

Basic properties of sacrificial galvanic anodes of Al, Mg or Zn. (R10d, 17-57; Al, Mg, Zn)

96-R.* Corrosion Control Incorporated Into Pipe Line Design and Construction. William R. Curley. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 69-74.

Importance of electrical insulation between carrier pipe and casing. Cathodic protection. (R10d, R8; ST, 4-60)

97-R.* Application of Cathodic Protection. D. A. Tefankjian. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings" West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 75-83.

Principles of galvanic protection. Application of Zn anodes. Mg anodes or rectified ground beds. Current requirements and criteria for protection. (R10d, R8; ST, 4-60)

98-R.* Intermediate Analysis of Stray Current Corrosion. T. S. Watson. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 84-98.

Fundamentals of stray current theory, stray current survey; design and operation of drainage bonds to alleviate corrosion effect. (R1j; R8; ST, 4-60)

99-R.* Field Recommendations for Installing Magnesium Anodes. G. F. Donahue. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 126-130.

Installation of bare or packaged anodes; location of anodes; installation methods and equipment; connections to pipe lines. (R10d, R8)

100-R.* Rectifier Units for Cathodic Protection. B. Husock. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 131-141.

Se rectifiers, rectifier circuits and components of units. Operation and maintenance of units. 9 ref. (R10d, W11r; Se)

101-R.* Rectifier Installations and Protection. L. O. McCormick. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 171-197.

Rectifier installations for cathodic protection of underground cable system. Devices used to protect installations from lightning and other abnormal voltages. (R10d, W11r)

102-R.* Grounding and Bonding on an Electric Utility System. H. M. Spooner. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 199-205.

Problems in grounding and bonding underground cables and sheaths to provide cathodic protection. (R10d, R8, T1b)

103-R.* Fundamentals of Underground Corrosion. Kenneth G. Compton. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 206-235.

Fundamental theories, cells and reference electrodes, liquid junction potentials, polarization, underground corrosion cells, electrolysis, electro-osmosis, cathodic protection, electrical measurements and surveys, measuring instruments, corrosion terms. 12 ref. (R-general, R8)

104-R.* Practical Aspects of a Corrosion Survey of Underground Lead Cables. J. M. Fouts. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings" West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 236-252.

Types of electrical measurements and corrosive conditions to which each may be applied. Instrumentation. 10 ref. (R8, R11m, T1b; Pb)

105-R.* Practical Considerations in the Design of Corrosion Mitigation for Underground Lead Cables. J. M. Fouts. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no 4-1, Oct. 1957, p. 253-258.

Design of underground systems to minimize corrosion problems. Utilization of corrosion resistance materials; application of cathodic protection. (R8, R10d, T1b)

106-R.* Inherent Resistance of Cast Iron Pipe to Corrosion. Thomas F. Wolfe. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 259-263.

Long life of underground cast iron piping. Effects of soil pipe and conductivity, pipe coating and pipe wall thickness. (R8; CI, 4-60)

107-R.* Effect of Water Quality on the Corrosion of Pipe Lines. John P. Kleber. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 264-290.

Effect of dissolved gases, temperature, pH, flow rate, inhibitors, suspended matter, bacteria, concentration of various souble metal cations and common anions on the corrosion of iron and steel by water. 24 ref. (R4; ST, 4-60)

108-R.* Cathodic Protection of Well Casing. Y. W. Titterington. Paper from "Second Annual Appalachian Underground

Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 302-312.

Causes of external corrosion of oil well casings. Method of investigation, current requirements for cathodic protection; application of cathodic protection. 4 ref. (R10d, T28p; ST)

109-R.* Electrolysis Reverse Current Switches. R. M. Keller. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 313-318.

Switches to interrupt reverse current in underground systems bonded to d-c. power system. (R10d, R8, T1d)

110-R.* (English.) Corrosion Resistance of Stainless Steel. I. Cornea and S. Zamirca. *Revue de Metallurgie (Bucharest)*, v. 3, no. 2, 1958, p. 29-39.

Influence of heat treatment upon oxidation at high temperatures. Decrease of ferrite content leads to decrease in corrosion. Increase of grain size increases corrosion. Quenching temperature of 1100° C. recommended, but for short periods only. 5 ref. (R-general, 2-60, 2-61, 2-64, 3-71; SS)

111-R.* (French.) Corrosion of Pure Aluminum in Water at Elevated Temperatures. Jean Herenguel and Pierre Lelong. *Revue de l'Aluminium*, no. 258, Oct. 1958, p. 991-998.

Three forms of attack: (1) formation of surface layer; (2) intergranular attack; (3) local impingment. 7 ref. (R4, 2-62; Al-a)

112-R.* (Japanese.) Effects of Iron and Silicon on the Blackening of Aluminum. Yoshino Yamasaki, Hachiro Onbe, Shoji Nakamura and Hiromitu Harimoto. *Metal Finishing Society of Japan, Journal*, v. 9, Nov. 1958, p. 422-426.

Low-Si Al alloy shows slightly lighter color than with low-Fe Al alloy, but in higher Si alloy the differences in the degree of blackening are little. (R4, 2-60; Al-b, *Fe, Si*)

113-R.* Effect of Inhibitors of the Corrosion of Iron on the Air-Formed Film. P. Hancock and J. E. O. Mayne. *Chemical Society, Journal*, Nov. 1958, p. 4172-4175.

Effect of sodium benzoate, acetate, borate, carbonate and hydroxide on air-formed film on pickled mild steel, pickled iron or iron reduced in hydrogen was determined electrometrically. (R6g, R10b; CN, Fe)

114-R.* Solid Metal—Liquid Metal Reactions in Bismuth and Sodium. John R. Weeks and David H. Gurinsky. Paper from "Liquid Metals and Solidification". American Society for Metals, 1958, p. 106-163.

Dissolution of a solid metal into a liquid; redeposition of the solid; effect of oxygen in the melt; alloying; dissimilar metals in contact with melt and metallic additives to liquid metal on the rate of corrosion or mass transfer of iron, steel and other metals in liquid Bi. 44 ref. (R2a, R10b, N12, 2-60; ST, Fe, Bi-a, 14-60)

115-R.* (French.) Effect of Carbon on Oxidation of Zirconium. G. Chauvin, B. Roudouresques, H. Coriou and J. Hure. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 939-952.

The better the carbide phase is distributed, the higher the oxidation resistance. 13 ref. (R1h, 2-60, 2-61, 3-67; Zr-a, *C*)

116-R.* (French.) Corrosion Resistance of Fe-Ni Aluminum Alloys to Water at High Temperature. H. Coriou, L. Grall, J. Hure and A. Roux. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 953-967.

With alloys of more than 0.5% Fe and Ni, the dispersion of intermetallic compounds should be as great as possible. On the surface, three layers are formed by the corrosion products, the two upper of which scale off easily while the lower layer is adherent. 4 ref. (R4e, 2-60, 2-62; Al-b, *Fe, Ni*)

117-R.* (French.) Corrosion Resistance of Aluminum-Iron Alloys to Water at High Temperatures. H. Coriou, L. Grall, A. Hauptmann and J. Hure. *Revue de Metallurgie*, v. 55, Oct. 1958, p. 968-975.

Corrosion resistance increased by the Fe which is able to form compounds with the corrosion-promoting Si. 8 ref. (R4e, 2-60, 2-62; Al-b, *Fe, Si*)

118-R. Corrosion Problems With Pressure Vessels. Henry Allen. *Corrosion Technology*, v. 5, Dec. 1958, p. 390, 397.

Check systems, corrosion control techniques. (R10g, T26q)

119-R. Corrosion Prevention in Automobile Bodies. T. P. Hoar. *Current Engineering Practice*, v. 1, Oct. 1958, p. 47-53.

(R-general, T21a)

120-R. Corrosion of Mild Steel in Aqueous Monoethanolamine. H. R. Froning and J. H. Jones. *Industrial and Engineering Chemistry*, v. 50, Dec. 1958, p. 1737-1738. 27 ref. (R7f; CN)

121-R. How Cathodic Protection in Breweries Saves Money in Corrosion Prevention. John A. Michelson and Gerard L. Power. *Modern Brewery Age*, v. 58, Dec. 1958, p. 42, 45-46. (R10d, T29p)

122-R. Underground Corrosion—Cause, Effect, Cure. *Water Works Engineering*, v. 111, Dec. 1958, p. 1122-1124. Experimental data for plain ferrous pipe, Cu, brass and Pb alloys in relation to cathodic protection. (R8, R10d, 4-60, ST, CI, Cu-n, Pb-b)

123-R. Corrosion. W. F. Fair, Jr. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 5-7. General problem of corrosion control. (R-general)

124-R. Electrochemical Principles. C. M. Rutter, Jr. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 99-121. Elements of electrochemistry, mechanism of corrosion, electromotive series, galvanic series, cells of common metals and alloys. Current reversal and cathodic protection. (R1a, R10d)

125-R. Coal Tar Tapes. J. B. Casey. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 166. (R10e)

126-R. Pressure Sensitive Tapes. George F. Roberts. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct. 1957, p. 167-170. (R10e)

127-R. Corrosion Control for Gas Distribution Systems. J. J. Meany, Jr. Paper from "Second Annual Appalachian Underground Corrosion Short Course, Proceedings". West Virginia University, Bulletin, Series 58, no. 4-1, Oct.1957, p. 318-324. (R10d, R10e; ST, 4-60)

128-R.* Aluminum-Bronze Alloy Mainstay in Fight Against Chloride Corrosion. Gordon Weyermuller and Earl H. Miller. *Chemical Processing*, v. 21, Dec. 1 58, p. 36-37. Ampco metal Grade 8 does not stress crack; used for process piping and seven large crystallizers. (R6; Cu-s, *Al*, 4-60)

129-R.* Protection of Magnesium Alloys. W. F. Higgins. *Chemistry & Industry*, no. 49, Dec. 6, 1958, p. 1604-1611. Corrosion rates of A8, AZ91, Z5Z, ZRE1, RZ5 and TZb Mg alloys in relation to chromating, hard anodizing, H.A.E. process, paints and surface sealing resins. (R-general, L14c, L19, L17, L26; Mg-b)

130-R.* Corrosion Protection. Stephen Y. Scott. *Iron & Steel*, v. 31, Dec. 1958, p. 589-592. Al sprayed coatings at the National Steelworks, Aviles, Spain. Parts sprayed include gasholders, gas mains and blast furnaces. Results of accelerated corrosion tests are given from the point of view of adherence, porosity and rust staining. (R-general, L23; Al, 8-67)

131-R.* The Mechanism of Cavitation. E. G. Richardson. *Wear*, v. 2, Nov. 1958, p. 97-106. Measurements of the number and size of the gaseous nuclei which exist in water and other liquids and which give rise to cavitation and consequent erosion in hydraulic machinery. The nuclei may be removed by long standing or by application of pressure. Nuclei are detected by the absorption of an acoustic signal which they produce in a "reverberation vessel" containing the liquid. 4 ref. (R2m)

132-R.* (German.) Determination of Causes of Corrosion by Electrochemical Measurements. H. Schmecken. *Werkstoffe und Korrosion*, v. 9, Nov. 1958, p. 690-693. Semilogarithmic plots of current density versus voltage disclose nature and magnitude of corrosion currents. In mild steel, corrosion sensitivity depends strongly on chemical composition, showing marked improvement in high-carbon steels. A 18% Cr, 10.5% Ni stainless steel in commercial phosphoric acid bath generates static potentials which cause pitting of contaminated surfaces. (R11m; CN, SS)

133-R.* (German.) Causes of Stress-Corrosion Cracking in Nonferrous Metals and Steels. Ludwig Graf. *Werkstoffe und Korrosion,* v. 9, Nov. 1958, p. 693-698.

Reasons for extremely localized attack on intercrystalline grain boundaries and the effect of tensile stress on stress-corrosion of steel, Cu and Cu-Zn and Cu-Au. Tensile stress increases activity of solid solution in a state of plastic deformation, but does not cause localization of the intergranular attack. Latter effect appears in homogeneous solid solutions in the absence of stress; is traced to increased reactivity of obtuse-angled grain boundaries due to solid solution formation. (R1d; Cu-b, *Au, Zn,* ST)

134-R.* (German.) Galvanic Corrosion of Cast Iron and Brass in Acids in the Absence and Presence of Inhibitors. Willibald Machu and M. G. Gouad. *Werkstoffe und Korrosion,* v. 9, Nov. 1958, p. 699-715.

Galvanic corrosion of cast iron and brass in H_2SO_4, H_3PO_4, $HCl + H_2SO_4$, $HCl + H_3PO_4$, $H_2SO_4 + H_3PO_4$, with and without inhibitors. Galvanic corrosion independent of that caused by local cells, amounts usually to about 1% of total. Inhibitors affect local cell corrosion much more, increasing proportional effect of galvanic corrosion. Mixtures of inhibitors give better protection. Inhibition occurs at both anode and cathode of corrosion cell. 11 ref. (R1a, R1b, R6g; Cu-n, CI)

135-R.* (Russian.) Electro-Capillary Measurements in Investigation of Inhibitors of Acid Corrosion. L. I. Antropov, V. P. Grigorev and A. T. Petrenko. *Zhurnal Prikladnoi Khimii,* v. 31, Oct. 1958, p. 1497-1503.

Effectiveness of inhibitors of acid corrosion is linked to the lowering of surface tension. Reliability of the inhibitor's action increases with the increase of the surface activity. (R10b, P13h)

136-R.* Investigation of the Black Solid Formed on Reaction of Uranium Metal With Hydrochloric Acid. R. C. Young. *Journal of Inorganic & Nuclear Chemistry,* v. 7, Nov. 1958, p. 418-420.

Oxidation state of U in the black solid formed by reaction of U metal with 6 *N* HCl in an atmosphere of nitrogen found to be 2.7±0.1 by direct analysis. Only a trace of chloride was found in the solid. An oxidation state of 2.67 corresponds to an oxide, U_3O_4. X-ray analysis showed no U metal present. (R6g, R1h; U)

137-R. (English.) Products of the Corrosion of Steel in Alkaline Sulphide Solutions. Eino Uusitalo. *Suomen Kemistilehti,* v. 31, no. 11, 1958, p. 367-371.

Fe and S contents were found to vary between limits that correspond to the formulas Fe_9S_8 and FeS_2. According to the X-ray patterns the corrosion products consisted of troilite (FeS) or pyrrhotite ($Fe_{0.875}S$), and pyrite (FeS_2). The formation of kansite, Fe_9S_8, is also probable in the early stages of corrosion. 15 ref. (R6j; ST)

138-R.* (Polish.) Prolonged Corrosion of Aluminum Alloys in Floating Parts. M. Orman. *Prace Instytutow Ministerstwa Hutnictwa,* v. 9, no. 4, 1957, p. 167-171.

Light alloys affected by sea water or sea atmosphere, may also develop intercrystalline corrosion as well as surface corrosion. Addition of Cr, Ti or V to the Al-Mg and Al-Mn alloys is proposed. 3 ref. (R4b, 2-60; Al-b, *Cr, Ti, V*)

139-R. Consider Nonoxidative Corrosion. Robert V. Jelinek. *Chemical Engineering,* v. 65, Dec. 29, 1958, p. 56-60.

Solubility and solution rates explain intergranular penetration and alloying of materials in corrosive attack by liquid metals. (R6m)

140-R. (German.) Records and Protection Against Corrosion by Paints. K. A. van Oeteren-Panhauser. *Werkstoffe und Korrosion,* v. 9, Nov. 1958, p. 681-686.

Standard testing procedures and records. (R11, S22; NM-g30)

141-R.* Effects of Local Boiling on Corrosion and Crud Deposition of Zircaloy Surfaces. Richard T. Esper, Walter E. Hopkins, Jr., Clarence Jacklin and James H. Phillips. *American Power Conference, Proceedings,* v. 20, Mar. 26-28, 1958, p. 697-708.

Within a pressurized-water reactor, local boiling had no detrimental effects on Zircaloy-2. 4 ref. (R4c, T11p)

142-R.* Corrosion. D. G. Anderson. *Journal of Electronics and Control,* v. 5, Nov. 1958, p. 443-456.

General survey of main causes of corrosion in industry; more important preventive methods. (R-general, R10)

143-R. (Book.) Second Annual Appalachian Underground Corrosion Short Course, Proceedings. R. E. Hanna, Jr., Ed. *West Virginia University, Bulletin,* Series 58, no. 4-1, Oct. 1957, 350 p.

Papers on practical and theoretical aspects of the causes of underground metallic corrosion. Instrumentation, corrosion surveys, cathodic protection, pipe coatings and miscellaneous methods of corrosion control. Papers abstracted separately. (R-general, R8, R10d, L-26)

144-R. (Translation.) Passivation of Silver by Argalin Process. H. W. Dettner. *Industrial Finishing*, v. 10, Dec. 1958, p. 43-44. (From *Metalloberflaeche*, v. 12, no. 7, p. 197-199.)

See item 602-R, 1958. (R10c; Ag)

145-R. (Translation-BISI, 1082.) The Morphology of Precipitates in Titanium Stabilized Steels. V. Cihal and J. Jezek. *Hutnicke Listy*, v. 11, Mar. 1956, p. 151-154.

See item 238-R, 1956. (R2, N7; SS)

146-R. (Translation—Brutcher, 3831.) Stress Corrosion of Austenitic Stainless Steels in Low-Pressure Steam and in Hot Water. S. Brennert and H. Nathorst. *Jernkontorets Annaler*, v. 140, no. 11, 1956, p. 839-853.

Stresses in sheet samples; effect of type of water; time required for stress-corrosion cracking to start; effect of oxygen; effect of salts dissolved in hot water. (R1d, R4; SS-e)

147-R.* (Russian.) Effect of Nickel on the Electrochemical and Corrosive Behavior of Steel. G. M. Florianovich, Ya. M. Kolotyrkin and N. K. Smirnova. *Doklady Akademii Nauk SSSR*, v. 120, no. 4, 1958, p. 845-848.

Degree of passivation of steel surface of a given composition is a function of its potential. Changing chemical composition may bring a substantial change in the degree of passivation at a given potential. (R10c, 2-60; ST, *Ni*)

148-R.* (Russian.) Passivation of Iron in Acid Solutions. Pt. 2. A. M. Sukhomin and K. M. Kartashova. *Zhurnal Fyzicheskoi Khimii Akademii Nauk SSSR*, v. 32, July 1958, p. 1633-1637.

Comparison of the kinetic characteristic of the cathodic reduction of magnetite and of the passivating film substance on irons. (R10c; Fe)

149-R.* (Russian.) Thickness of Oxidizing Films on Some Metals From Data of Electronographic and Optical Studies. V. V. Andreeva and H. S. Shimakov. *Zhurnal Fyzicheskoi Khimii Akademii Nauk SSSR*, v. 32, July 1958, p. 1671-1672.

Oxidizing film, which is formed as soon as Al is in contact with air, is of the order 21-22A. at 150° F. Iron has an oxide film of 15-17 A. Pt at room temperature has no oxidizing film measured electronographically but has a film thickness of 24 A. when measured optically at normal atmospheric pressure. (R1h, Al, Fe, Pt)

150-R.* (Russian.) Anticorrosion Effect of Sodium Nitrate on Iron. N. A. Shishkov. *Zhurnal Fizicheskoi Khimii*, v. 32, Oct. 1958, p. 2281-2286.

Electron diffraction studies show that sodium nitrate crystals have a tendency to orient with their axis normal to the surface. Similar orientation capacity is possessed by iron hydroxide. (R10b; Fe)

151-R.* (Russian.) Corrosion of Stainless Steels in Region of Contact With Nonmetallic Substances. I. B. Ulanovskii and Yu. M. Korovin. *Zhurnal Prikladnoi Khimii*, v. 31, no. 9, 1958, p. 1366-1370.

One of the basic causes of failure is the activation of metal surface, because of the lowered value of pH. Rubber, Plexiglass and Textolite tested; medium was sea water at 15 to 16° C. (R4b, R7p; SS)

152-R. Measuring Corrosion by the Electrical Conductance Test Method. Eric Ford. *Corrosion Technology*, v. 5, Oct. 1958, p. 330-331.

(R11a, 1-68)

153-R. Retardation of Copper Corrosion by Light. *Corrosion Technology*, v. 5, Oct. 1958, p. 331.

(R10a; Cu, 2-67)

154-R. Evaluating Rust Prevention Greases: American Experience. Eric Ford. *Corrosion Technology*, v. 5, Oct. 1958, p. 332.

Corrosion due to condensation during period of idleness demanded tests which introduced water into lubricated anti-friction bearing. (R11k, R10f, T24b; NM-h)

155-R. (Russian.) Safeguarding Cable Joints Against Corrosion by Stray Current. L. D. Rasumov. *Electrosvyaz*, no. 10, 1958, p. 71-73.

(R1j)

156-R.* Corrosion of Valve Seat Ring Results in Flexible Metal. J. E. Prior. *Corrosion*, v. 15, Jan. 1959, p. 17.

Failure occurred in a Type-316 stainless steel valve seat ring after nine months' service in a water treating system. The ring had suffered intergranular corrosion after exposure to dilute sulphuric acid, which was presumably caused by not being given the normal homogenizing heat treatment required to properly diffuse the alloying elements throughout the casting. (R6g, 2-64; SS)

157-R.* Corrosion of Steel Weldments. J. U. MacEwan and H. H. Yates. *Corrosion*, v. 15, Jan. 1959, p. 18-22.

Weldments were subjected to 12 months' alternate immersion in 3% sodium chloride solution. Weight loss was more dependent on the type of steel than the nature of the weld, but severity of corrosion in the weld region was affected by both factors. Apparauts was designed to measure short circuit current between exposed surfaces of parent metal and weld metal. 31 ref. (R11g; ST, 7-51)

158-R.* Observations on the Mechanisms and Kinetics of Aqueous Aluminum Corrosion. Pt. 1. Role of the Corrosion Product Film in the Uniform Aqeuous Corrosion of Aluminum. V. H. Troutner. *Corrosion*, v. 15, Jan. 1959, p. 25-28.

Experiments include barrier film measurements, effect of an applied potential on corroding Al, effect of various ions and combinations of ions in dilute aqueous solutions on the uniform corrosion, X-ray diffraction studies of corrosion product films, and comparisons between air oxidation and aqueous corrosion studies. 6 ref. (R4, M22g; Al-b)

159-R.* Observations on the Mechanisms and Kinetics of Aqueous Aluminum Corrosion. Pt. 2. Kinetics of Aqueous Aluminum Corrosion. R. L. Dillon. *Corrosion*, v. 15, Jan. 1959, p. 29-32.

Corrosion of Al in high temperature deionized water in the range of 100 to 363° C. Data indicate Al corrosion successively has a logarithmic, a parabolic and a linear dependence on time as the temperature increases. Certain similarities exist between air and water oxidation. The effect of alloying additions is negligible. 13 ref. (R4, 3-67, 2-61, Al-b)

160-R.* A Critical Analysis of Pitting Corrosion. N. D. Greene and M. G. Fontana. *Corrosion*, v. 15, Jan. 1959, p. 41-47.

Pitting corrosion behavior can be related to the particular cathodic reaction which occurs during attack. Pitting in systems where 0 reduction is the major cathodic reaction demonstrates marked differences from attack in systems in which metal ion reduction is the controlling cathodic reaction. Pit sites in stainless steel appear to be almost randomly distributed in relation to metal surface structure, with some preference for grain and twin boundaries. 95 ref. (R2j; SS)

161-R. An Electrochemical Study of Pitting Corrosion in Stainless Steels. Pt. 2. Polarization Measurements. N. D. Greene and M. G. Fontana. *Corrosion*, v. 15, Jan. 1959, p. 55-60.

Artificial pit technique used to study the electrochemistry of pitting corrosion of 18/8 stainless steel in ferric chloride solutions. Pitting corrosion was proved to be a highly complex, time-dependent phenomenon. A new concept of electrochemical action during pitting, based on the mixed potential theory, is proposed. 17 ref. (R2j; SS)

162-R. Recovery of Graphitically Embrittled Nickel. *Corrosion*, v. 15, Jan. 1959, p. 112.

Heat treatment at 1800° F. is discussed as a means of restoring almost full ductility to Ni tubing that had been graphitically embrittled. Corrosion tests indicate that the Ni that is heat treated can be used subsequently for other applications in which embrittling temperatures are not encountered. (R2h, 2-64; Ni, 4-60)

163-R.* Steels for the Petroleum Industry. Pt. 1. A Comparison of British and American Qualities. F. A. Kirk and J. Williams. *Corrosion Technology*, v. 5, Oct. 1958, p. 316-318.

Compares corrosion and heat resisting steels. Advancement in design was discovery of effects of Cr upon scaling and corrosion resistance. (To be continued.) (R7k, R6, T29n; ST, Cr, 15-55)

164-R.* Mechanics of Corrosion. H. E. LaBour. *Corrosion Technology*, v. 5, Oct. 1958, p. 320-322.

Identifies and classifies different types of corrosion through illustrations showing mechanical effect on corroded parts of chemical equipment. Uses pump case castings to show dissimilar metals, gas concentration, defective casting, intercrystalline and general corrosion and erosion. (R-general, T29m; Fe, Cr, 2-61, 2-66, 2-74, 9-69)

165-R.* High-Temperature Hydrogen Sulphide Corrosion in Refinery Experience. P. W. Sherwood. *Corrosion Technology*, v. 5, Oct. 1958, p. 326-329.

Factors governing rate of corrosion. Protection against H_2S attack may be provided by using Cr-Ni steels or Al coating, or by adequate desulphurization of feedstock and recycle gas. 6 ref. (R6g, T29n; ST, Cr, Ni, Al, 8-62, 17-57)

166-R.* Some Observations on the Mechanism of Inhibition. A. C. Makoides. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 7-9.

Thiocyanic and citric acids are efficient inhibitors of dissolution of Fe in dilute HNO_3 solutions. Inhibition does not generally involve poisoning of the combination reaction between adsorbed H atoms. Observations on the kinetics of dissolution of Fe in dilute HNO_3 solutions. 12 ref. (R10b; Fe)

167-R.* Oxidation of Titanium, Zirconium and Hafnium. G. R. Wallwork and A. E. Jenkins. *Electrochemical Society, Journal*, v. 106, Jan. 1959, p. 10-14.

Metallographic study shows that alterations in the rate equations relating to oxidation may be associated with the establishment of 0 diffusion gradients in surface layers of the metal. Changes in oxidation behavior are related to observed alterations in the form of these gradients. (R1h; Ti, Zr, Hf)

168-R.* Growth and Scaling in S. G. Iron. Influence of Silicon. R. J. Maitland and I. C. H. Hughes. *Iron and Steel*, v. 31, Dec. 1958, p. 573-577.

Scaling behavior of nodular graphite irons having from 1.2 to 5.7% Si at temperatures within the 650° to 1000° C. range. Both growth and scaling proceed relatively slowly and are inhibited by increasing Si contents at temperatures below the austenite transformation range. When the critical temperature is exceeded, growth and scaling become excessive and in this field Si seems to promote growth and scaling. 15 ref. (R2q, 2-60; CI-r, *Si*)

169-R.* (Russian.) Electrochemical Properties and Corrosion of Titanium in Sulphuric Acid. V. V. Audreeva and V. I. Kozarin. *Doklady Akademii Nauk SSSR*, v. 121, no. 5, 1958, p. 873.

Dependence of speed of Ti corrosion on H_2SO_4 concentration at 40° studied in 40, 75 and 80% solutions. At 75% Ti dissolves by deoxidation of H_2SO_4 to H_2S and free sulphur and at 80% with separation of SO_4 and free sulphur. The oxidation-deoxidation process proceeds very rapidly at 75% so that concentrated H_2SO_4 acts as strong oxidizer and the ions of trivalent Ti as energetic deoxidizers. 4 ref. (R6g; Ti-b)

170-R.* (Russian.) High-Temperature Alloys of Platinum With Rhodium, Praseodymium, Aluminum and Chromium. I. I. Kornilov and R. S. Polyakova. *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 11, 1958, p. 2554-2561.

Oxidizing characteristic expressed in diagrams of composition-heat resistance which show functional relation between oxidation and composition in the systems Pt-Rh, Pt-Pr, Pt-Al and Pt-Ch. (R1h, 1-60; Pt-b, Al, Cr, Pr, Rh)

171-R.* (French.) Growth and Structure of Oxide Films on Iron at Elevated Temperatures. J. Moreau and M. Cagnet. *Revue de Metallurgie*, v. 55, Nov. 1958, p. 1091-1109.

Mechanical action between the oxides and Fe during growth and cooling led to deformations and fissures in the oxides. 21 ref. (R1h, 2-62; Fe)

172-R. An Electrochemical Study of Pitting Corrosion in Stainless Steels. Pt. 1. Pit Growth. N. D. Greene and M. G. Fontana. *Corrosion*, v. 15, Jan. 1959, p. 48-54.

Effects of solution composition, agitation, atmosphere, corrosion current interruption, chloride ion concentration and inhibitor additions in 18-8 stainless steel. Pit interaction during pit growth is determined and autocatalytic nature of pitting verified. 24 ref. (R2j; SS)

173-R. Underground Corrosion—a Summary of 45 Years of NBS Research. *Corrosion*, v. 15, Jan. 1959, p. 107-110.

Results of burial tests on metals, coatings and wrappings conducted by National Bureau of Standards. Data for plain ferrous pipe materials, openhearth iron and steel, hand-puddled and mechanically puddled wrought iron, Bessemer steel, plain carbon steel, pit cast and centrifugally cast iron. Corrosive resistance of Cu, Pb, brass and Zn. 9 ref. (R8; 4-60, ST, CI, Cu-b, Cu-n, Pb, Zn)

174-R. High Temperature Corrosion Product Films on Aluminum. V. H. Troutner. *Corrosion*, v. 15, Jan. 1959, p. 23-24.

Preparation of electron microscope replicas of the surface of corrosion product

adjacent to the metal. Electron micrographs illustrate the corrosion product films formed on samples of 1245 and X-8001 alloys during various stages of corrosion in high-purity water and in corrosion inhibited systems. (R4e, M21e, Al-b)

175-R.* Formation and Properties of Passive Films on Iron. Morris Cohen. *Canadian Journal of Chemistry*, v. 37, 1959, p. 286-291.

A unified mechanism for the formation of passive films on Fe in aqueous solutions together with the effects of water, O, and oxidizing and nonoxidizing ions. The gamma-Fe_2O_3 film is formed first by oxidation of water-formed magnetite, while further thickening of the film occurs by oxidation of diffusing Fe^{++} ion at the water surface of the oxide film. 15 ref. (R10c; Fe, 14-62)

176-R.* Chromium Plating in Relation to the Corrosion Resistance of Nickel-Chromium Deposits. Alan Smart. *Electroplating and Metal Finishing*, v. 12, Jan. 1959, p. 3-10.

Mechanism of failure of Cr-plated Ni coatings. Atmospheric exposure tests of specimens prepared by dull and bright Ni processes. Effect of Cr plating conditions on porosity and cracking of plate and relation to corrosion resistance. Optimum Cr plating conditions. Influence of physical condition of Ni on corrosion pattern. 6 ref. (R3n, R2j, L17c; ST, Zn-b)

177-R.* Investigation of the Variables Affecting the Corrosion of Copper. W. D. Robertson, V. F. Nole, W. H. Davenport and F. P. Talboom, Jr. *Electrochemical Society, Journal*, v. 105, Oct. 1958, p. 569-573.

In the presence of excess O the corrosion rate of Cu is a linear function for each of three anions ($SO_4^=$, Cl^-, $C_2H_3O_2^-$). The rate is not a simple function of anion concentration and the concentration dependence varies with pH. The effect of CO is negligible. 9 ref. (R1b; Cu)

178-R.* Galvanic Corrosion. Pt. 2. Effect of pH and Dissolved Oxygen Concentration on the Aluminum-Steel Couple. M. J. Pryor and D. S. Keir. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 629-635.

High-purity Al cathodically protects steel completely in chloride solutions within the pH range 0.2 to 14.0. Galvanic currents and weight losses of the Al anodes are at a minimum from pH 4.0 to 10.0. Within this pH range the rate of galvanic corrosion is controlled by oxygen depolarization at the steel cathodes. At higher and lower pH the rate of galvanic corrosion is much greater and is independent of the O concentration in solution. 11 ref. (R1a, R10d; ST, *Al*)

179-R.* Local Cell Action During the Scaling of Metals. Christa Ilschner-Gensch. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 635-638.

If Ni is covered by a borate melt under an O atmosphere, practically no oxidation takes place. If the Ni sample is in electrical contact with an electronic conductor, such as a noble metal gauze, which extends up to the melt-oxygen interface, Ni is attacked rapidly by local cell action. Electron transfer is accomplished by the metal gauze and ions migrate through the borate melt. 12 ref. (R2q)

180-R.* Mechanism of Passivating-Type Inhibitors. Milton Stern. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 638-647.

Passivating-type inhibitor functions by producing local-action current which anodically polarizes a metal into the passive potential region and thereby provides means of obtaining a noble mixed potential. Factors which determine whether a system exhibits passivity include electrochemical parameters for reduction of the inhibitor on the metal surface, critical anodic current and Flade potential of the metal. Data for passivation of stainless steel and Ti. 35 ref. (R10c; Ti, SS)

181-R.* A Study of Corrosion Films on Zirconium and Its Alloys by Impedance Measurements. J. N. Wanklyn and D. R. Silvester. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 647-654.

Oxide films formed on Zr and Zr alloys during corrosion in steam and water studied by impedance measurements made by immersion in electrolyte. A fall in the protective character of the film is accompanied by an increase of capacity, and measurements of the latter provide a useful method of comparing films. 12 ref. (R4d, R11a; Zr-b, 14-62, *O*)

182-R.* Reaction of Germanium With Aqueous Solutions. Pt. 1. Dissolution Kinetics in Water Containing Dissolved Oxygen. Walter W. Harvey and Harry C. Gatos. *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 654-660.

Dissolution studied as a function of oxygen partial pressure, temperature, crystallographic orientation and mobile-carrier density. Ge does not react with water, freed of O, up to 100° C. For a given O pressure the dissolution rate is approximately trebled for a 10° temperature rise. 19 ref. (R2g, R4, 2-61, 3-74; Ge, 14-61)

183-R.* (Russian.) Electromotive Forces and Electrode Potentials in Tin-Iron Systems, With Tin-Containing Flux Electrolytes. A. I. Vitkin. *Zhurnal Physicheskoi Khimii SSSR*, v. 32, July 1956, p. 1612-1617.

Electromotive force and electrode potentials show a galvanic cell Sn (flux) Fe, in which Sn is the anode and Fe is the cathode on which Sn from the electrolyte is deposited. (R1a; Fe, Sn)

184-R.* The Prevention of "Wastage". A. R. French. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 45-46.

Resistance of ships' propellers cast from Cu-base alloy containing Mn and Al to excessive metal losses by cavitation corrosion. (R2m, R4b, T22h; Cu-b, *Mn, Al*)

185-R.* Cathodic Protection of Shell Plating. J. P. O'Donovan. *Corrosion Prevention & Control*, v. 5, Dec. 1958, p. 49-50.

Cathodic protection of the under-water surface of ships with Mg anodes. (R10b, T22g; ST)

186-R.* (Italian.) Behavior of Aluminum in Contact With Cement Mortars. A. Prati. *Alluminio*, v. 27, Sept. 1958, p. 381-385.

Corrosion does not occur normally, but presence of stray currents, chlorides or metal particles in mortar, and differently aerated zones on Al surface, cause local corrosion. Protective treatments. 4 ref. (R1; Al)

187-R.* (Italian.) Corrosion of Underground Piping and Its Protection. Luigi Scuri. *Calore*, v. 29, July 1958, p. 317-323.

Factors in electrolytic and galvanic corrosion; cathodic protection; use of Mg anodes. (R8, R10; 4-60)

188-R.* (Swedish.) Reactivity of Carbon Electrodes and Its Dependence on Inorganic Catalysts and Inhibitors. G. Wranglen. *Jernkontorets Annaler*, v. 14, no. 10, 1958, p. 613-637.

The binder is the most reactive component in carbon electrodes and oxidizes preferentially. Inhibitors are described which can be used to reduce the non-electrolytic oxidation of the C anodes in Al electrolysis cells. The mechanism of the inhibitors consists partly of a neutralization of the catalyzing metal oxides and partly of a mechanical shielding effect. 83 ref. (R1h, R10b, T1f; C)

189-R.* Growth and Scaling in S.G. Iron. The Influence of Silicon. R. J. Maitland and I. C. H. Hughes. *Iron and Steel*, v. 32, Jan. 1959, p. 19-24.

Comparative scaling of irons containing 1.2, 2.0, 3.1, 4.0, 4.9, 5.7% Si after 240 hr. at 600 to 900° C. At 650° C. the irons behaved consistently and scaling rate increased with decreasing Si content. At 900° C. the order of scaling was reversed and the 5.7% Si iron showed the greatest weight increase. (To be continued.) (R2q; CI-r, *Si*, 2-60)

190-R. Anodic Passivation of Iron. Earl S. Snavely, Jr., and Norman Hackerman. *Canadian Journal of Chemistry*, v. 37, 1959, p. 268-275.

Passivation in solutions of 0.1*N* sodium sulphate at a pH of 3.0. 6 ref. (R10c; Fe)

191-R. Corrosion in Cooking Utensils. H. Kessler. *Light Metals*, v. 22, Jan. 1959, p. 14-16. (From *Aluminium*, Feb. 1957.)

(R6g, T10a, 2-61, 3-74; Al-b, *Cu, Zn*)

192-R.* Reaction Between Iron and Water in the Absence of Oxygen. *Electrochemical Society, Journal*, v. 105, June 1958, p. 322-324.

Reaction at 25, 60 and 300° C. At room temperature the primary product appears to be $Fe(OH)_2$. Formation of Fe_3O_4 occurs readily in the iron-water system at both 60 and 300° C. It is possible that the Fe_3O_4 is produced via formation and subsequent decomposition of $Fe(OH)_2$. 13 ref. (R4e; Fe)

193-R.* Chemical Factors Affecting Stress Corrosion Cracking of 18-8 Stainless Steels. H. H. Uhlig and John Lincoln, Jr. *Electrochemical Society, Journal*, v. 105, June 1958, p. 325-332.

Transgranular cracking in Type 304 specimens does not depend on rate of stressing nor on small variations in degree of plastic deformation. Addition of HCl to $MgCl_2$ decreases cracking time whereas addition of NaOH increases the time. Pre-exposure of unstressed speci-

mens to $MgCl_2$ slightly decreases cracking times of the same specimens subsequently stressed. 17 ref. (R1d; SS)

194-R.* Protective Value of Tin-Nickel Alloy Deposits on Steel. F. A. Lowenheim, W. W. Sellos and F. X. Carlin. *Electrochemical Society, Journal,* v. 105, June 1958, p. 338-346.

Outdoor exposure tests of the comparative value of Sn-Ni alloy and conventional Ni-Cr deposits on steel, with and without a Cu undercoat. Sn-Ni is comparable in protective value to Ni-Cr, not quite so good in marine but superior in industrial atmospheres. Corrosive behavior of the two deposits differs considerably. 11 ref. (R3; ST, *Ni, Cr, Sn,* 8-62, SGA-g)

195-R.* Electrochemical Properties of PbO_2 and the Anodic Corrosion of Lead and Lead Alloys. Paul Ruetschi and Boris D. Cahan. *Electrochemical Society, Journal,* v. 105, July 1958, p. 369-377.

Anodic corrosion of Pb and Pb-Sb alloys in sulphuric acid under conditions of O_2 evolution evaluated by measuring the length of the potential plateau (transition time) during the electrochemical reduction of the PbO_2 layer, with a constant current, taking into account self-discharge and degree of utilization of the PbO_2. 30 ref. (R6g; Pb-b, *Sb*)

196-R.* A Contribution to the Theory of Stress Corrosion in Al-4% Cu Alloys. William H. Colner and Howard T. Francis. *Electrochemical Society, Journal,* v. 105, July 1958, p. 377-384.

Stress cracking is greatly influenced by exposed area of the specimen (small areas showed long time-to-failure). Experiments with grain boundary-grain center couples showed that neither potentials nor couple current were influenced sufficiently by stress to account for the acceleration of failure by stress. At constantly applied anodic current, however, stress directed the attack perpendicular to applied stress. 17 ref. (R1d; Al-b, *Cu*)

197-R.* Protection of Molybdenum From Oxidation at Elevated Temperatures. Dwight E. Couch, Harold Shapiro, John K. Taylor and Abner Brenner. *Electrochemical Society, Journal,* v. 105, Aug. 1958, p. 450-456.

Good protection is afforded by composite coatings of Cr and Ni. Adhesion of Cr to Mo is obtained by anodically etching the Mo in a solution of sulphuric and phosphoric acids (1:1 volume) before plating. A coating of Cr followed by one of Ni protects Mo at 980, 1100 and 1200° C. for 1200, 500 and 100 hr. respectively. 16 ref. (R1h; Mo, 8-62, *Cr, Ni,* 2-62)

198-R.* Room Temperature Tarnishing of Silver in Bromine and Iodine. Joseph L. Weininger. *Electrochemical Society, Journal,* v. 105, Oct. 1958, p. 577-581.

Tarnishing reactions resulted in an impervious halide surface layer which contains up to 20% pores, located at random. Rate constants are given for tarnishing in the absence of water vapor and when it was present to the extent of 90% relative humidity, at room temperature. 11 ref. (R2r; Ag, *Br, I*)

199-R.* Selective Oxidation of Aluminum From an Al-Fe Alloy. Richard E. Grace and Alan U. Seybolt. *Electrochemical Society, Journal,* v.105, Oct. 1958, p. 582-585.

Al in solid solution in Fe was oxidized selectively with damp H at 700-900° C. Microbalance weight gain data followed a parabolic time law after an initial time lag. The surface oxidation product was identified by electron diffraction to be the crystalline spinel, gamma Al_2O_3. 9 ref. (R1h; Al-b, *Fe*)

200-R.* (French.) Behavior of Aluminum and Its Alloys in Different Atmospheres. Pt. 1. Andre Guilhaudis. *Revue de L'Aluminium,* no. 259, Nov. 1958, p. 1111-1118.

Exposed to sprays, to sea water, to atmosphere in industrial environment up to 12 years. (R3, R4b, R1a; Al-b)

201-R.* (Hungarian.) Processes Taking Place in Cathodes of Aluminum Electrolytic Cells. M. B. Rapaport. *Kohaszati Lapok,* v. 91, July 1958, p. 322-326.

Sodium-induced decomposition considered as main cause of reduced lifetime of cathodes. (R6j, C23n; Al-b, C)

202-R. Corrosion Control by Dehumidification. *Corrosion Prevention & Control,* v. 5, Dec. 1958, p. 46-47.

Effectiveness of dehumidification in reducing corrosion on steel surfaces of empty tanks of oil tankers. (R3p, R10a, T26q; ST)

203-R. Underground Corrosion Investigation. *Corrosion Prevention & Control,* v. 5, Dec. 1958, p. 55-58.

Program of U. S. National Bureau of Standards; basic electrochemical reactions, influence of soil characteristics and alloy compositions on corrosion. (R8; ST, CI, Al-b, Cu-b)

204-R. (Russian.) Nature of the X-Phase. F. N. Tavadze and I. A. Bairamashvili. *Liteinoe Proizvodstvo*, Nov. 1958, p. 18-20.

As compared with ordinary carbon steel, cast iron at 750-850° is characterized by high heat resistance because of formation of thick oxide layers. Heat resistance also due to oxidation of interior resulting in new grain structure and new phase state - X. Investigation also revealed X'-phase which is dark blue and is often mistaken for graphite. X' differs from X-phase by much thicker structure and contains traces of graphite. 7 ref. (R1h, R2s, N3, 2-61; CI)

205-R. Corrosion Research Laboratories. Pt. 14. F. Wormwell. *Corrosion Technology*, v. 6, Jan. 1959, p. 5-9. (R-general, A9h)

206-R. Effect of Reactor Atmosphere on Zirconium and Zirconium Alloys. R. G. Wheeler. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission*, HW-55958, May 6, 1958. 13 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.20.

Zr, Zircaloy-2 and Zircaloy-3b specimens were exposed to a 50 vol. % helium 50% carbon dioxide reactor atmosphere at a weighted average temperature of 430° C. for a total of 866 days at temperature. Corrosion rates are represented by empirical equations. Either the irradiation, or some constituent in the gas, appears to reduce the rate of reaction above 450° C. primarily by delaying the inception of breakaway corrosion. (R-general; Zr-b, 2-67)

207-R. Corrosion by Solutions Containing HNO_3, Hf, and Reducing Agents. M. LaVern Holzworth. E. I. du Pont de Nemours & Co. *United States Atomic Energy Commission*, DP-284, May 1958. 24 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Corrosion of Types 304L and 309Cb stainless steel as a function of the concentrations of the components of mixtures of nitric and hydrofluoric acids containing hydroxylamine nitrate, sulphamic acid and ascorbic acid. Methods of decreasing corrosion by addition of ferric, cupric and silver cations as inhibitors, or Al as a complexing agent. (R6g, R10b; SS)

208-R.* (Czech.) Effect of Stabilization With Columbium on the Intercrystalline Corrosion of Stainless Steel. Vladimir Cihal and Rudolf Pospisil. *Hutnicke Listy*, v. 13, Dec. 1958, p. 1092-1098.

Steels homogenized, then precipitation heated and boiled in solution of 100 g. $CuSO_4 . 5H_2O$ + 100 g. H_2SO_4. Intercrystalline corrosion studied by bend tests. Main cause is solution of columbium carbide at high temperatures, and later precipitation of chromium carbides at the grain boundaries. Effect can be eliminated by stabilizing at a certain temperature between 850 and 950° C. 20 ref. (R2h, J27; SS, *Cb*)

209-R.* Some Aspects of Refinery Corrosion Due to Crude Oil. P. W. Sherwood. *Corrosion Technology*, v. 6, Jan. 1959, p. 10-12.

Relation of chloride, acid, water and sulphur contents to corrosiveness of crude oil. Methods of evaluating corrosiveness. Use of neutralizers and inhibitors. Economic importance. 6 ref. (R7a; ST)

210-R.* Pipeline Protection in the Middle East. Pt. 1. Protective Coating and Cathodic Protection Practice. L. R. Sparrow. *Corrosion Technology*, v. 6, Jan. 1959, p. 13-18.

Corrosive conditions and problems encountered in Iraq, Syria and Lebanon with surface and buried oil pipelines. Pipe coating and cathodic protection practices. Effectiveness of protection. (R8, R10d, L26a; ST, 4-60)

211-R.* (German.) Corrosion of High-Alloy Steels by Nitric Acid. Johannes Bunger. *Werkstoffe und Korrosion*, v. 9, Dec. 1958, p. 747-755.

Corrosion diagrams for Cr and Cr-Ni steels with nitric acid of varied concentration up to 67% and at temperatures up to the atmospheric boiling point. Influence of composition. 4 ref. (R6g; SS)

212-R.* (German.) Cathodic Inhibition by Organic Substances. Hellmuth Fischer. *Werkstoffe und Korrosion*, v. 9, Dec. 1958, p. 765-768.

Cathodic inhibition, such as by beta-naphthaquinoline, N-quinoline ethyl iodide is explained by chemisorption at the double joints of heteocyclic ring shaped compounds. Cathodic anodic inhibition

also is assumed. 6 ref. (R10b; Fe, NM-b)

213-R. (Translation.) Solution of Iron in Fused Mixtures of the Chlorides of Lithium and Potassium and Sodium and Potassium. V. P. Kochergin and G. I. Stolyarova. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 184-187.

Rate of solution of Fe in fused eutectic mixture of Li and K and low-melting mixture of sodium and potassium chlorides. Increase in solution rate with increasing temperature of melts. 14 ref. (R6k; Fe)

214-R. (Translation.) Solution of Iron in Fused Chlorides of Alkali and Alkaline Earth Metals. V. P. Kochergin, M. S. Garpinenko, O. N. Skornyakova and M. Sh. Minullina. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 188-192.

Rates of solution of pure Fe and eutectic mixtures of the chlorides of Mg and K, Ca and Na, Ba and K. 24 ref. (R6k, 2-61, 2-66; Fe-a)

215-R. (Translation—AIP.) Investigation of Oxidation in Air of Single-Crystal Layers of Pb-S by Method of Electron Diffraction. T. M. Zimkina. *Soviet Physics, Technical Physics*, v. 3, May 1958, p. 930-937.

7 ref. (R1h, R3, M22h; Pb, *S*, 14-61)

216-R. (Translation—Brutcher, no. 4448.) High-Temperature Oxidation of Nickel in Sulphur Dioxide. V. V. Ipat'ev and D. V. Zheltukhin. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 42-45.

Scale-forming constant depends upon temperature, reaching a maximum at 800° C. Scale, deposited on Ni in SO atmosphere consists of 2 phases NiO and NiS. 5 ref. (R2q, R6p, 2-62; Ni-a, S)

217-R. (Translation—Brutcher, no. 4449.) Corrosion Cracking of Brass in Ammonia. A. N. Konorat'ev. *Metallovedenie i Obrabotka Metallov*, Dec. 1958, p. 45-52.

Ammonia and its compounds produce a comparatively weak general corrosion but cause highly localized damage. Presence of moisture and oxygen in an ammonia atmosphere increases corrosion. 17 ref. (R6j; Cu-n, *Zn*)

218-R. (Translation—ConBur.) Kinetics of Gaseous Corrosion of Mg Alloys. J. A. Makolkin. *Journal of Applied Chemistry of the USSR*, v. 30, Oct. 1957, p. 1608-1612.

Corrosion rate in air, CO_2, SO_2 and nitrogen. Mn, Zn and Al in alloys affect the heat resistance. 7 ref. (R3; Mg-b, *Mn, Zn, Al*, 2-66, 2-60)

219-R.* Licking the Problem of Stress-Corrosion Cracking. John F. Klement, Robert E. Maersch and Patrick A. Tully. *Metal Progress*, v. 75, Feb. 1959, p. 82-86.

High-pressure steam, either pure or containing acid or salt vapors, quickly causes intergranular cracks in aluminum bronze pressure vessels. Apparently grain boundaries are slightly enriched in Al, and this is oxidized preferentially. The trouble is permanently avoided by addition of a fractional % of tin. (R1d, R4d, 2-60; Cu-s, *Al, Sn*)

220-R.* Stress-Corrosion Cracking. L. R. Scharfstein and W. F. Brindley. Digest from "Chloride Stress Corrosion Cracking of Austenitic Stainless Steel—Effect of Temperature and pH." National Meeting of National Assoc. of Corrosion Engineers, Mar. 1958. *Metal Progress*, v. 75, Feb. 1959, p. 180, 182.

Susceptibility of austenitic stainless steels to stress-corrosion cracking in dilute sodium chloride solutions between the temperatures of 165 and 200° F., and with the pH varying from 6 to 12 in Types 304 and 347 stainless steel. (R1d; SS-e)

221-R.* (French.) Role of Micro-Organisms in Certain Corrosion Phenomena. Lucien Baudon. *Industrie Chimique Belge*, v. 23, Sept. 1958, p. 983-990.

Relationship between electrochemical and biological corrosion; bacteria capable of inducing corrosion of ferrous and nonferrous metals; protection. (R1g, R10; Fe, EG-a38)

222-R.* (Italian.) Corrosion Resistance of Stainless Steels. Intergranular Corrosion. *Acciaio Inossidabile*, v. 25, Jan-Apr. 1958, p. 5-16.

Mechanism, effects of carbide precipitation in austenitic stainless; methods of determining susceptibility to intergranular corrosion. (R2h, R11; SS)

223-R.* (Italian.) Corrosion Resistance of Stainless Steels. Intergranular Corrosion. (Continued.) *Acciaio Inossidabile*, v. 25, May-June, 1958, p. 61-72.

Heat treatment, fabrication and service conditions under which carbide precipita-

tion occurs in austenitic stainless; methods of combatting susceptibility to intergranular corrosion. (R2h; SS)

224-R.* (Italian.) Stress-Corrosion of Austenitic Stainless Steel. Stig Berg. *Acciaio Inossidabile,* v. 25, July-Oct. 1958, p. 115-130.

Theories of mechanism of stress-corrosion. Laboratory testing of steels of varying alloy content; influence of type of corrosive agent, concentration, pH, temperature, type and amount of stress, alloying elements, structure of steel. Examples of stress-corrosion of equipment in service. 9 ref. (R1d, R11s; SS)

225-R. (Russian.) Oxidation of Zirconium at High Temperature and the Structure of Initially Oxidized Film. E. S. Sarkisov, N. T. Chebotarev, A. A. Nevzorova and A. I. Zver'kov. *Atomnaya Energiya,* v. 5, no. 5, 1958, p. 550-553.

Formation of a thin film with a cubic structure, possessing a high passivity capacity; second stage is a modified monoclinical structure; next stage is the disappearence of the dark film and transition into the white film. Oxidation rate increased. 6 ref. (R1h, 2-61, 2-60; Zr-b, 14-67)

226-R. Structure and Growth of Beryllium Oxide on Single Crystals of Beryllium. V. D. Scott. *Acta Crystallographica,* v. 12, Pt. 2, Feb. 10, 1959, p. 136-142.

Formed by heating Be in air at 300-800° C. and studied by electron diffraction and electron microscopy. Oxidation increased with temperature. 37 ref. (R1h, M26r, 2-62; Be, 14-61)

227-R.* (German.) Behavior of Cast Iron Alloys Under Cavitation. Gerhard Bienia. *Freiberger Forschungshefte,* no. B31, 1958, p. 59-108.

To simulate service conditions under cavitation, for example, of turbine blades, samples were exposed to the impingement of water drops. By the addition of appropriate alloying elements, magnesium treatment, permanent mold casting, heat treatment at 300° C., the behavior under cavitation can be improved. 20 ref. (R2m, Q9, 2-60, 2-64; CI-n, Fe-b, *Mg,* AD-n)

228-R.* (Japanese.) Effect of Beryllium on Burning of Magnesium and Aluminum-10% Magnesium Alloys. Takuichi Morinaga, Yoshikazu Hosoi and Eiichi Sawato. *Light Metals,* v. 8, Nov. 1958, p. 61-64.

0.001% Be protects the molten Mg from burning for a short time; more Be does better; however, if the pit burning starts it no longer helps. This inhibition also is effective in the solid state. (R1h; Al-b, *Mg, Be*)

229-R.* (English.) Corrosion of Ti by Chloride and Sulphate Anions, Revealed by Electrode Potential Measurements. E. M. Khairy and M. M. El-Khatib. *Egyptian Journal of Chemistry,* v. 1, no. 2, 1958, p. 263-285.

Experiments with spectroscopically pure Ti rods in buffered and unbuffered hydrochloric acid-sodium chloride and sulphuric acid-sodium sulphate solutions. The corrosion is explained by the action of Cl-ions or SO_4-ions, respectively. 11 ref. (R1a; Ti)

230-R.* (French.) Exposure of Bimetallic Couples to Tropical Atmospheres. H. G. Cole. *Corrosion et Anticorrosion,* v. 7, Jan. 1959, p. 3-12.

Anodic corrosion depends not only on differences in the potential but also on the formation of insoluble corrosion products on anode surface. Metals were separated in some cases by organic protective coatings. (R1a, R3s; ST, SS, Cu-b, Ni-b, Al-b, Mg-b, NM-g31)

231-R. (French.) Faraday's Law Applied in the Anodic Dissolution of Metals. Pt. 3. Michel Froment. *Corrosion et Anticorrosion,* v. 7, Jan. 1959, p. 13-19.

10 ref. (R1a)

232-R. (French.) Cathodic Protection of Pipelines. H. M. Powell and J. H. Morgan. *Corrosion et Anticorrosion,* v. 7, Jan. 1959, p. 20-26.

Cost analysis. (R10d, 17-53, T26r)

233-R. (Japanese.) Oxide Films Formed at High Temperature on Copper Alloy Condenser Tubes. Takemichi Otsu and Shiro Sato. *Sumitomo Metals,* v. 10, July 1958, p. 167-173.

Pure Cu, 70-30 brass, Admiralty brass, Albrac, 10% cupronickel and 30% cupronickel, heated at 400 to about 700° C. in an electric furnace. (R1h, 2-61; Cu-a, Cu-n, Cu-b, *Ni*)

234-R. (Ukrainian.) Kinetics and Mechanism of High-Temperature Oxidation of Rhenium in the Recrystallized and Cold Worked States. V. A. Lavrenko. *Dopovidi Akademii Nauk Ukrainskoi RSR,* no. 11, 1958, p. 1216-1220.

Temperature relation equation of linear oxidation calculated for temperature range 400-725° C. 10 ref. (R1h, 2-62; Re)

235-R.* Design From the Viewpoint of Corrosion. W. D. Clark. *Metallurgical Reviews*, v. 3, no. 11, 1958, p. 270-325.

Economic and environmental factors affecting design and choice of corrosion resistant materials. Interpretation of corrosion tests. Environmental, geometrical and metallurgical factors to be considered in design. Protective measures. 75 ref. (R-general; 17-51, SGA-g)

236-R.* Internal Cathodic Protection. Pt. 1. C. Plumpton and C. Wilson. *Corrosion Prevention & Control*, v. 6, Jan. 1959, p. 31-36.

Techniques and mathematical principles involved in analysis of cathodic protection problems. General theorems concerning electric current density of re-entrant edges of structures. Examples illustrate determination of potential due to distribution of electrodes in presence of plane boundaries. (R10d)

237-R.* Effect of Dextrin Inhibitor on the Corrosion Potentials of Aluminum in Alkaline Solutions. J. Sundararajan and T. L. Rama Char. *Corrosion Prevention & Control*, v.6, Jan. 1959. p. 41-42.

Potentials of commercial Al alloys containing 4% Mn and 3% Fe in 0.1 and 0.3 normal NaOH solutions with up to 30 g. per l. dextrin. (R10b; Al-b, *Mn, Fe*)

238-R.* Corrosion Prevention in the Bottling Industry. L. A. Johnson. *Corrosion Prevention & Control*, v. 6, Jan. 1959, p. 45-49.

Corrosion problems; removal of mill scale and protection of steel work with primers, paint and coatings. (R10, L26, ST)

239-R* Anodic Dissolution of Magnesium Alloys in Aqueous Salt Solutions. R. Glicksman. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 83-88.

Dissolution of magnesium alloy AZ10A studied by measuring corrosion rates and electrode potentials as functions of current density, pH and electrolyte concentration; explained in terms of rate-controlling proton transfer step through surface film of magnesium oxide or hydroxide. Effects of different alloy compositions and soluble metal additives to electrolyte on anodic corrosion rate and electrode potential. 26 ref. (R1a; Mg-b, 2-60)

240-R.* Potential Studies on Passivity to Corrosion Induced by Pretreatment Processes for Metals. Pt. 1. Aluminum. K. S. Rajagopalan. *Electrochemical Society, Journal*, v. 106, Feb. 1959, p. 113-117.

Potential and polarization characteristics of Al which was subjected to various chemical oxidation processes. Treated metal shows more negative initial electrode potential. Cathodic polarization curve is also much steeper than untreated metal. 32 ref. (R10c; Al, 8-69)

241-R.* Deterioration of Anodized Aluminum Exposed to Corrosive Environments. J. M. Kape. *Electroplating and Metal Finishing*, v. 12, Feb. 1959, p. 41-46, 59.

Review of literature on testing atmospheric, aqueous and chemical corrosion. 23 ref. (R-general; Al-b, 8-73)

242-R.* Oxidation of Three Iron-Nickel Alloys and Iron at 800° C. S. W. Kennedy, L. D. Calvert and M. Cohen. *Metallurgical Society of AIME, Transactions*, v. 215, Feb. 1959, p. 64-72.

How orientation of an Fe_2O_3 layer on Fe, on a 25% Fe-Ni alloy and on a 75% Ni alloy affects oxidation phenomena. Process by which FeO layer is identified. (R1h, 3-72, 2-62; Fe-a, Fe-b, *Ni*, Ni-b, *Fe*)

243-R.* The Use of Stainless Steels in Corrosion Control. J. P. Ogilvie. *Canadian Mining and Metallurgical Bulletin*, v. 52, Feb. 1959, p. 85-89.

Intergranular corrosion, pitting corrosion, crevice corrosion, chemical corrosion. 5 ref. (R-general; SS)

244-R.* Mechanical Properties and Corrosion Resistance of Oil Well Tubing. F. A. Prange. *Corrosion*, v. 15, Feb. 1959, p. 49t-54t.

Applications of the various grades of tubing in sweet and sour wells related to corrosion damage. Sulphide stress cracking is closely related to mechanical properties. 9 ref. (R1d, R8, Q-general, T28p; 3-66)

245-R.* Influence of Service Temperature on the Resistance of Wrought Aluminum-Magnesium Alloys to Corrosion. E. H. Dix, Jr., W. A. Anderson and M. Byron Shumaker. *Corrosion*, v. 15, Feb. 1959, p. 55t-62t.

Prolonged heating of wrought Al-Mg alloys with high Mg content in the range of 150 to 350°F. causes selective precipitation of an anodic phase resulting in susceptibility to intergranular corrosion,

which can cause stress-corrosion cracking. A new alloy, 5454, is free from the temperature limitation placed on the higher Mg alloys. 7 ref. (R1d, R2d, 2-60; Al-b, *Mg*, SGA-g)

246-R.* Choride Stress-Corrosion Cracking of the Austenitic Stainless Steels. J. P. Engle, G. L. Floyd and R. B. Rosene. *Corrosion*, v. 15, Feb. 1959, p. 68t-72t.

Conditions under which hydrochloric acid can be safely used to clean austenitic steels. The active-passive characteristics of the alloys play an important role. A number of factors, acting together, must be present to produce cracking. 5 ref. (R1d, R6, L12; SS-e)

247-R.* Variable Interaction: a Statistical Solution. H. C. Bowen, C. Groot and J. L. Jaech. *Corrosion*, v. 15, Feb. 1959, p. 83t-84t.

Effects of independent variables in corrosion data seem to be multiplicative, which calls for a logarithmic transformation to convert this to an additive system. Experiment to determine whether the occasional use of low-purity water would cause excessive corrosion in the Al alloy cooling system of a nuclear power reactor. (R4a, W10f, W11f; Al-b)

248-R.* Effect of Molten Boron Oxide on Selected High-Temperature Alloys. David Roller and C. R. Andrews. *Corrosion*, v. 15, Feb. 1959, p. 85t-96t.

Exposure of high-temperature alloys to molten boron oxide at 1600 to 2000°F. in air and inert atmosphere for 150 hr. Molten B_2O_3 is very corrosive, particularly to Fe and Co-base alloys over 1800° F. Plastic properties are more rapidly affected than the elastic properties. 21 ref. (R6p, R11g, 2-62, 2-60; Co-b, Ni-b, SGA-h, *B, O*, NM-a34)

249-R.* Intergranular Corrosion of Duralumin: Correlation of Laboratory and Service Behavior. G. J. Schafer, T. Marshall and H. J. Todd. *Journal of Applied Chemistry*, v. 9, Jan. 1959, p. 38-43.

Those Al-Cu alloys which corrode intergranularly in the acid chloride test give approximately parabolic gas evolution curves. 6 ref. (R6g, R2h, 2-60; Al-b, *Cu*)

250-R.* Use of Radioactive Tracers in the Study of Passive Films on Metals. Dora M. Brasher, A. H. Kingsbury and A. D. Mercer. Paper from "Radioisotopes in Scientific Research". v. 1, Pergamon Press, New York, 1958, p. 326-342.

Radioactive tracer technique is an extremely sensitive and reliable means of measuring small amounts of Cr on the surface of Fe after immersion in chromate solution. Metal specimen acquires an adsorbed film immediately on immersion, and thereafter the oxide film grows in a "logarithmic" manner, similar to its growth in air at room temperature. 43 ref. (R10c, L14c, 1-59; Fe, Cr)

251-R.* Exfoliation of Metals at High Temperatures. Koji Inagaki. *Tohoku University, Research Reports, Series A*, v. 10, no. 5, 1958, p. 388-399.

Disintegration mechanism is represented by three actions—fatigue exfoliation, deforming exfoliation and sintering. At high temperatures, especially above the recrystallizing temperature, deforming exfoliation pays a major role in the pulverizing mechanism; exfoliation by fatigue increases with the lowering of the temperature and is scarcely observable above the recrystallizing temperature. (R2n, 2-62, 3-68)

252-R.* (English.) Effect of Stress on the Corrosion Potential of Steel. Pt. 1. Tensional Stress. Eino Uusitalo. *Suomen Kemistilehti*, v. 31, no. 12, 1958, p. 395-399.

In the elastic range stretching produces a temporary shift of the potential in the anodic direction. At the plastic limit the potential first undergoes a large shift in the anodic direction but then changes rapidly in the reverse direction. 11 ref. (R1d; ST)

253-R.* (French.) Behavior of Aluminum and of Aluminum Alloys in Various Atmospheres. Pt. 2. Andrew Guilhaudis. *Revue de l'Aluminium*, v. 35, Dec. 1958, p. 1271-1278.

Effect of anodizing in corrosion prevention; salt spray tests; corrosion in marine atmospheres. (R3, R11j; 8-73, Al-b)

254-R.* (Russian.) Anode Behavior in Cu-Zn System in 0.1 N Solution of Sodium Chloride. V. V. Scorchelletti, I. A. Stepanov and E. P. Kuksenko. *Zhurnal Prikladnoi Khimii*, v. 31, no. 12, 1958, p. 1823-1831.

Alloys with a Zn content above 25% are dezinced; mechanism of dezincification. 9 ref. (R2k, M24b; Cu-b, *Zn*)

255-R.* (Russian.) Effect of Chromium Diluted With Nitrogen on Corrosion of Metals

at High Temperature. K. L. Tseitlin and V. A. Strunkin. *Zhurnal Prikladnoi Khimii*, v. 31, no. 12, 1958, p. 1843-1848.

Regulation of the corrosion rate by changing Cr concentration in a medium of inert gas. Cr diluted with nitrogen sharply lowers the corrosion rate of Al; Fe and its alloys, Ta and to a lesser degree Cu (above 200° C.), Ni (above 600° C.), Pb (above 250°). 11 ref. (R-general, 2-62; Al, Fe-b, Cu, Pb, Ni, Ta, Cr, N, EG-m43)

256-R. Corrosion Resistance of Wrought Iron and Openhearth Steel. Irvine I. Tingley and R. R. Rogers. *Canadian Dept. of Mines, Technical Surveys, Mines Branch*, IC111, Dec. 12, 1958, 21 p.

Wrought iron and openhearth steel have essentially similar corrosion behavior in most common media. 36 ref. (R-general; Fe-m, ST)

257-R. An Electrochemical Study of Aluminum and Aluminum Alloys. E. M. Khairy and M. Kamal Hussein. *Corrosion*, v. 15, Feb. 1959, p. 63t-67t.

Static electrode potentials of the R, duralumin, M 22, DK and S 2 Al-base alloys show that these alloys have the same behavior as pure metal in buffer solutions initially free from metal ions within the pH range 1 to 8. Corrosive action of chloride ions. 5 ref. (R11m, P15; Al-a, Al-b)

258-R. Behavior of AZ 63 Alloy and Magnesium, 1 Percent Manganese Alloy Anodes in Sodium Chloride Electrolyte. J. H. Greenblatt and E. Zinck. *Corrosion*, v. 15, Feb. 1959, p. 76t.

The solution mechanism for the dissolution of Mg alloys is substantially the same as for pure Mg. 4 ref. (R10d, P15; Mg-b)

259-R. Corrosivity of Soil. N. D. Tomashov and Y. N. Mikhailovsky. *Corrosion*, v. 15, Feb. 1959, p. 77t-82t.

Methods used to determine the corrosive activity of soils. 14 ref. (R8, 1-54, 1-68)

260-R. Developments in Cooling Tower System Treatments. J. I. Bregman and T. R. Newman. *Corrosion*, v. 15, Feb. 1959, p. 97t-100t.

The addition of certain metallic cations in very small quantities to synergized polyphosphate treatments in cooling tower systems will increase corrosion protection. 4 ref. (R10b, W10f; CN, *P*, *O*)

261-R. Underground Corrosion Investigation. Pt. 2. *Corrosion Prevention & Control*, v. 6, Jan. 1959, p. 52-54.

U. S. National Bureau of Standards investigation on influence of soil and soil conditions on corrosion of iron, steel, Cu, Pb and Zn. Protection. (R8; CI, ST, Cu-b, Pb, Zn)

262-R. Application of T-Δ G Diagram to High-Temperature Oxidation of a Binary Alloy. Kazuo Fueki. *Electrochemical Society of Japan, Journal*, v. 26, no. 7-9, 1958, p. E120-E122.

Diagram for determining the layer structure of oxides formed in Ni-Cr alloys. (R1h, 2-62; Ni-b, *Cr*)

263-R. Observations on the Corrosion of Aluminum and Its Relation to Chemical Examination of the Corrosion Products. R. A. Hinze. *Journal of Applied Chemistry*, v. 9, Jan. 1959, p. 43-49.

Performance and limitations of different alloys in various environments. 16 ref. (R-general, 2-66; Al-b)

264-R. Effect of Radiation on Corrosion of Structural Materials by Molten Fluorides. G. W. Keilholtz, J. G. Morgan and W. E. Browning. *Nuclear Science and Engineering*, v. 5, Jan. 1959, p. 15-20.

Metallurgical examinations of the Inconel capsules and tubing have likewise shown no changes in corrosion that can be the result of radiation damage. 6 ref. (R6, 2-67; Ni-b)

265-R. (French.) Treatment of Boiler Water by Means of Aluminum Anode. Gilbert L. Aslan. *Revue de l'Aluminium*, v. 35, Dec. 1958, p. 1265-1267.

Anodes are placed inside the boiler and supplied with low-tension positive current; the cathode is formed by the metallic mass of the boiler. (R10d, T26q, W3h; Al)

266-R.* (French.) Protection Afforded by Metallized Zinc and Aluminum Coatings in Liquid Fuels. Zbigniew Kowalski. *Corrosion et Anticorrosion*, v. 6, Dec. 1958, p. 457-462.

Samples of steel coated with Zn or Al were immersed in five types of motor fuels for periods of 1128, 1248 and 2376 hr. Presence of water and of tetraethyl lead affect corrosion resistance of these coatings, especially in case of Zn, but protection provided is adequate for walls of tanks and other vessels containing liquid fuels. 11 ref. (R7d, ST, 8-67, *Al*, *Zn*)

267-R.* (German.) Corrosion Caused by Perspiring Hands. G. Oelsner. *Galvanotechnik*, v. 50, Feb. 15, 1958, p. 77-84.

Corrosion considered in terms of anodic dissolution. 9 ref. (R7p)

268-R. (German.) Last Developments in Rust-Proof Painting. K. Krenkler. *Werkstoffe und Korrosion*, v. 10, Jan. 1959, p. 1-14.

Effects of environment (atmospheric conditions) on structural steel corrosion. Mechanical rust removal and coating the steel with various media. 8 ref. (R3, L26; ST, SGB-s)

269-R.* (German.) Influence of Protective Colloids on the Corrosion of Brass. M. N. Desai, Y. D. Talati and A. M. Trivedi. *Werkstoffe und Korrosion*, v. 10, Jan. 1959, p. 26-29.

Effect of protective colloids (pulvis acacia, egg albumin, agar and dextrine) on the corrosion of cold rolled electrolytic brass plates (Cu and Zn) in citric acid, sulphuric acid and in hydrochloric acid. Essential decrease in corrosion took place in citric acid solutions. 16 ref. (R6g, R10b; Cu-n, 4-53)

270-R.* Correlate Corrosion Testing Methods. Robert V. Jelinek. *Chemical Engineering*, v. 66, Jan. 26, 1959, p. 104-110.

Test objectives are to study corrosion mechanism and factors that influence it; select the best material or protective coating to withstand a particular corrosive environment; determine the environment which a given material withstands; develop materials for particular uses; study effectiveness of various protective measures; control product uniformity in the manufacture of corrosion resistant materials. 42 ref. (R11)

271-R.* Nitric Acid Corrosion of Austenitic Stainless Steels. J. M. West. *Journal of Applied Chemistry*, v. 9, Jan. 1959, p. 1-10.

Variables in the testing of corrosion of Ti stabilized austenitic stainless. 6 ref. (R6q, 2-60, 2-61, SS-e, *Ti*)

272-R.* Mechanism of Stress-Corrosion Cracking in the AZ31B Magnesium Alloy. Hugh L. Logan. *Journal of Research of the National Bureau of Standards*, v. 61, Dec. 1958, p. 503-508.

Cracking is predominantly an electrochemical process and is dependent on the rate of strain in the specimen following loading in tension. Cracks develop if the protective film on the metal surface is ruptured (over narrow segments of the specimen) at a greater rate than it is repaired in the corroding medium. This would expose film-free metal that is anodic to the filmed metal. 14 ref. (R1d, R4a, R6, 3-66; Mg-b)

273-R.* Thermal Oxidation Properties of Metallic Coatings. R. L. Samuel. *Product Finishing*, v. 12, Feb. 1959, p. 73-86.

Reference to Zn, Si, Al and Cr diffusion and use of facing alloys or cladding. 12 ref. (R1h, L15, 2-61; Al, Cr, Si, Zn, 8-74)

274-R.* (French.) Cathodic Protection and Coatings for Buried and Submerged Steel and Reinforced Concrete. Bernard Heuze. *Nature*, Dec. 1958, p. 472-479.

Coordination of cathodic protection and coatings; dangers of improper use of coating materials, incompatibility with metals in certain cases; use of coatings to limit interactions between a cathodic protective device and a nonprotected installation in vicinity. Examples of protection of pipelines, floating docks, heating plants. (R10d; ST, 4-60)

275-R.* (French.) Behavior of Magnesium and Two Magnesium Alloys Heated in CO_2. M. L. Boussion, R. Darras and D. Leclercq. *Revue de Metallurgie*, v. 56, Jan. 1959, p. 61-67.

Mg specimens, pure or lightly alloyed with Zr and Zn, were exposed to CO_2 under pressure of 15 kg. per sq.cm. for 3000 hr. at 400 to 500° C. Weight increases were slight. CO_2 appears to have inhibiting effect, as was noticed also in tests of shorter duration in mixed atmospheres of CO_2, N_2O_2 and air. A carbon deposit appears at 450° C.; presence of Zn causes marked sublimation above 550°. (R1h, 2-60; Mg-b, *Zr*, *Zn*)

276-R.* Pipe-Wrapping Materials for Corrosion Protection. J. G. Parry and J. R. James. *Corrosion Technology*, v. 6, Feb. 1959, p. 35-37.

Functions of pipeline coatings. Characteristics of asphalt, coal tar and plastic tape coatings and inner and outer wraps of glass fiber, asbestos or kraft paper. (R10e, T26r; ST, 4-60)

277-R.* Polyvinyl Chloride Tapes for Pipe Protection. K. S. Chitty. *Corrosion Technology*, v. 6, Feb. 1959, p. 39-41.

Physical and insulating properties of polyvinyl chloride tapes; protection of

pipe from corrosive and abrasive conditions. (R10e; ST, 4-60)

278-R.* Pipeline Protection in the Middle East. Pt. 2. Preparing the Ground and Checking the Results. L. R. Sparrow. *Corrosion Technology*, v. 6, Feb. 1959, p. 42-48.

Problems in construction of ground beds in the desert. Effects of magnetic iron oxide scale, salt concentration of ground water and variation in soil resistivity on effectiveness of cathodic protection of pipeline. Cathodic protection of oil field equipment in marine environment. (R10d, R8, T26r; ST, 4-60)

279-R.* General and Intergranular Corrosion of Austenitic Stainless Steels in Acids. Michael A. Streicher. *Electrochemical Society, Journal*, v. 106, Mar. 1959, p. 161-180.

Effect of cations in the acids, influence of heat treatment and grain boundaries. 57 ref. (R6g, R2h, 2-64, 3-71; SS-e)

280-R.* Reaction of Aluminum and Carbon Tetrachloride. Pt. 1. J. D. Minford, M. H. Brown and R. H. Brown. *Electrochemical Society, Journal*, v. 106, Mar. 1959, p. 185-191.

Corrosion of alloys by boiling CCl_4. Reaction decreases as Mg content increases. 15 ref. (R6k, 2-60; Al-b, *Mg*)

281-R.* Reaction of Aluminum and Carbon Tetrachloride. Pt. 2. R. H. Brown, E. H. Cook, M. H. Brown and J. D. Minford. *Electrochemical Society, Journal*, v. 106, Mar. 1959, p. 192-199.

Conductivity measurements indicate that the reaction starts as soon as the Al is exposed to the boiling solution. Increase in the conductivity with time is caused by the presence of $AlCl_3$. Substances that retard the reaction form inactive complexes with the $AlCl_3$. 7 ref. (R6k, Al-b)

282-R.* (French.) Role of Corrosion Inhibitors in Water Treatment. E. L. Streatfield. *Metaux Corrosion-Industries*, v. 33, Oct. 1958, p. 420-430.

Various types of anodic, cathodic and organic inhibitors. Aliphatic amines and their salts have properties particularly useful in boiler applications. 12 ref. (R10b, R4c)

283-R. (French.) Zinc and Its Resistance to Corrosion. A. Herz. *Corrosion et Anticorrosion*, Dec. 1958, p. 444-445.

(R-general; Zn)

284-R.* Dissolution of Metals and Alloys. Pt. 1. Dissolution of Copper in Solutions Containing Persulphate Ion. G. C. Bond, B. M. Hill and R. Tennison. *Chemical Society, Journal*, Jan. 1959, p. 33-38.

Copper readily dissolves at room temperatures, but the reaction is transport controlled at all concentrations up to 0.1 M above 35°. 11 ref. (R2a, P15, 2-60, 2-61; Cu)

285-R.* (English.) Influence of Aggressive Carbonic Acid on the Corrosion of Steel in Water. E. Uusitalo and J. Heinasen. *Teknillisen Kemian Aikakauslehti*, v. 15, Dec. 31, 1958, p. 625-627.

Carbonic acid corrodes uncoated steel pipe both in soft and hard water, although less in hard water. 7 ref. (R6g, 2-60, 2-66; ST, 4-60)

286-R. (Translation.) German Standardization Practice With Accelerated Corrosion Tests. Pt. 1. B. M. Pearson. *Corrosion Prevention & Control*, v. 6, Jan. 1959, p. 50-51, 54. (From *Metalloberflache*, v. 12, no. 10, p. B145-B147.)

See item 56-R, 1959. (R11j, R11q)

287-R. (Translation—BISI no. 1036.) Rate of Scaling of Pure Iron in Oxygen at Reduced Pressures and in Carbon Dioxide. Norbert G. Schmahl. *Archiv fur das Eisenhuttenwesen*, v. 29, Mar. 1958 p. 147-152.

See item 281-R, 1958. (R2q, 3-74; Fe-a)

288-R. (Translation—Brutcher no. 4482.) Susceptibility of Stainless Steels to Intercrystalline Corrosion After Heat Treatment. A. P. Akshentseva. *Metallovedenie i Termicheskaya Obrabotka Metallov*, Jan. 1959, p. 47-52.

Hot rolled sheets of steels EI533, EI628 and EI629 were heated and held at high temperatures for various periods and treated subsequently in hot acid. EI533 and EI628 steels from 600 to 850° C. revealed precipitation of carbides at the grain boundaries which makes them susceptible to intercrystalline corrosion. 10 ref. (R2h, 2-64; SS, 4-53)

289-R. (Translation—ConBur.) Oxidation of Alloys Containing the Intermetallic Compound NiAl. E. I. Mozhukhin, L. Kh. Pivouarov and Ya. S. Umansky. *Journal of Applied Chemistry of the USSR*, v. 30, Nov. 1957, p. 1658-1663.

Dense oxide film formed in presence of excess Al atoms; with excess Ni atoms

the continuity of film is disrupted by separation of Ni_3Al phase, with acceleration of oxidation processes. CoAl is oxidized more than NiAl. 6 ref. (R1h, 2-60; Ni-b, *Al*, Co-b, *Fe*, 14-68)

290-R. (Translation—ConBur.) Mechanism of Corrosion of Metals in Molten Chlorides. N. D. Tomashov and N. I. Tugarinov. *Journal of Applied Chemistry of the USSR*. v. 30, Nov. 1957, p. 1681-1687.

Activity and prevention of high-temperature corrosion; 70% of surface corrosion concentrated around grain boundaries. 11 ref. (R6j, 2-62; Fe-a)

291-R. (Translation—ConBur.) Corrosion of Zinc, Iron Aluminum and Magnesium in Aqueous Dioxane Solutions of Certain Electrolytes. Yu. B. Kletenik. *Journal of Applied Chemistry of the USSR*, v. 30, Nov. 1957, p. 1688-1693.

In H_2SO_4 passivation takes place. Influence of CI ions and dioxane on corrosion rate of passivated metals. 10 ref. (R7b, R10c; Mg, Zn, Fe, Al)

292-R. (Translation—ConBur.) Corrosion of Steel in the Atmosphere of a Steel Mill. A. V. Shreider and A. I. Sokolikov. *Journal of Applied Chemistry of the USSR*, v. 30, Nov. 1957, p. 1770-1772.

Effect of relative humidity of SO_2 and HCl and of the type of steel on weight loss due to corrosion for 160 hr. (R3n, 2-60, 2-66; ST)

293-R. (Translation—ConBur.) Corrosion of Steel by Hydrochloric Acid in the Spheroidal State. Kh. L. Tseitlin and S. M. Babitskaia. *Journal of Applied Chemistry of the USSR*, v. 31, Jan. 1958, p. 76-80.

Maximum operating temperature is 400° for carbon steel and 500° for 1KH18N9T and EI-496 stainless steels. To reduce the breakdown of spheroidal state of HCl, metal surface temperature must be greater than 300° C. 6 ref. (R6g, 2-62; SS, CN)

294-R. (Translation—ConBur.) Effect of Alpha-Activity on the Corrosion of Platinum and Zirconium in Hydrobromic Acid. D. M. Ziv and I. A. Efros. *Soviet Journal of Atomic Energy*, v. 4, Mar. 1958, p. 388-389.

Radiation does not effect the corrosion of Pt except at ranges above room temperature. Zirconium is effected to a greater extent. Atomic bromine and hydrogen peroxide are thought to be the corrosion agents. 4 ref. (R6g, 2-67; Pt, Zr)

295-R.* Growth and Scaling in S.G. Iron. The Influence of Silicon. R. J. Maitland and I. C. H. Hughes. *Iron and Steel*, v. 32, Feb. 1959, p. 57-59.

Provided the exposure occurs below the critical temperature range, growth and scaling are inhibited by increasing Si content. Above a maximum temperature, corresponding roughly with the critical temperature range, scaling and growth become catastrophic. Increasing Si content raises the critical range and the safe maximum working temperature but also promotes both growth and scaling above this temperature. (To be continued) (R2q, 2-60; CI-r, *Si*)

296-R.* (Dutch.) Attack of Nitrogen on Various Heat Resistant Alloys. C. Vollers. *Metalen*, v. 14, Feb. 14, 1959, p. 41-42.

Exposure of Ni-Cr-Fe alloys, a Ni-Fe alloy and pure Ni at 500° C. in an atmosphere of anhydrous ammonia for a period of 1540 hr. With high Ni content, a protective film of nitrides forms. Corrosion resistance against nitrogen is also increased by Cr. (R7j, 2-62; Ni-b, Cr, Fe, SGA-h)

297-R.* (German.) Decomposition of Wustite in Layer of Scale on Iron Specimens. Wilhelm Anton Fischer and Alfred Hoffman. *Archiv fur das Eisenhuttenwesen*, v. 30, Jan. 1959, p. 15-22.

X-ray and microscopic investigation of wustite decomposition below 570° C. in the scale layers produced by oxidizing pure Fe, Armco iron and low-carbon steel. Lattice constants for wustite after oxidation at 750 to 1050° C. 38 ref. (R1h, M26; Fe, CN-g)

298-R.* (Rumanian.) Effect of Plastic Deformation on the Corrosion of Rolled Nodular Cast Iron. Irina Cornea and Stefan Zamirca. *Studii si Cercetari de Metalurgie*, v. 3, no. 4, 1958, p. 451-461.

Corrosion behavior of cast iron, rolled at approximately 900° C. and then heat treated. When the heat treatment temperature is too low for producing a structural transformation, the weight loss in HCl and NaCl increases with the degree of deformation. With higher temperature , stress relief and an extensive ferritization occur, while corrosion decreases in proportion to the amount of plastic deformation. 5 ref. (R1d, Q24; CI-r)

299-R.* High-Temperature Oxidation of Magnesium in Dry and in Moist Oxygen.

S. J. Gregg and W. B. Jepson. *Institute of Metals, Journal,* v. 87, Feb. 1959, p. 187-203.

Oxidation of Mg sheet between 350 and 600° C. in dry oxygen and in moist oxygen at four different humidities. Effect of surface preparation, moisture and temperature on rate of oxidation. Reaction mechanisms. 46 ref. (R1h, 2-62; Mg-a, 4-53)

300-R. A Review of the Corrosion Behavior of Uranium. James T. Waber. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission, La-2035,* Dec. 29, 1958, 45 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Data for dry air and oxygen and for attack by water, water vapor and steam, as well as by moist air and helium. Role of lattice defects in the corrosion mechanism; effects of impurities and test conditions on corrosion rates. 32 ref. (R-general, 3-69, M26s; U)

301-R.* Equipment and Procedure for the Evaluation of Stress Corrosion Susceptibility of a Wrought Copper Base Alloy. G. B. Smith. *Corrosion,* v. 15, Mar. 1959, p. 101t-102t.

Wrought aluminum bronze alloys in stress condition exposed to corrosive vapors at 350° F. (R11s; Cu-b, Cu-s, *Al*)

302-R.* The Corrosion of Zirconium in Hydrochloric Acid at Atmospheric Pressure. W. E. Kuhn. *Corrosion,* v. 15, Mar. 1959, p. 103t-112t.

Corrosion resistance of commercial grade consumable electrode arc-melted Zr in aerated and in boiling aqueous solutions of hydrochloric acids for up to 2000 hr. Influence of mechanical polishing, electrolytic polishing or vacuum annealing on corrosion behavior and formation of oxide and hydride protective films. Film characteristics; corrosion mechanisms. 18 ref. (R6g, 2-64, 3-70; Zr)

303-R.* Corrosion in the Corn Wet Milling Industry. Richard Benes, Fred J. Holsinger and Russell E. Pierson. *Corrosion,* v. 15, Mar. 1959, p. 113t-116t.

Corrosion problems resulting from use of sulphurous acid, sodium hypochlorite, sulphuric acid and hydrochloric acid in corn processing. Application of Type-316 stainless steel, Cu alloys and organic finishing. (R6g, T29p, SS, Cu-b)

304-R.* Cathodic Protection of Process Equipment. *Corrosion,* v. 15, Mar. 1959, p. 123t-124t.

Ten case histories of application of cathodic protection to chemical processing equipment including 316 stainless steel in sodium hypochlorite, lead pipe in barium chloride, mild steel in sodium hydroxide; stainless steel in sulphuric acid, organic acid mixtures; Cu in zinc chloride, in ammonium chloride and in hydrochloric acid. (R10d, T29m)

305-R.* Iso-Corrosion Rate Curves for High-Temperature Hydrogen-Hydrogen Sulfide. E. B. Backensto and J. W. Sjoberg. *Corrosion,* v. 15, Mar. 1959, p. 125t-127t.

Corrosion rates of 0-5% Cr steels and for Cr-Ni austenitic stainless steels in hydrogen-hydrogen sulphide containing up to 10% hydrogen sulphide by volume at temperatures from 500-1400° F. 10 ref. (R6p, R7k, 2-62; SS-e, *Cr, Ni*)

306-R.* Evaluation of Certain Organic Nitrogen Compounds as Corrosion Inhibitors. R. J. Schwoegler and L. U. Berman. *Corrosion,* v. 15, Mar. 1959, p. 128t-130t.

Static water drop tests to evaluate ability of a number of heterocyclic nitrogen compounds in lubricating oil to inhibit corrosion of SAE 1020 steel. Relation of various functional groups and their positions in the molecule to corrosion inhibiting properties. 9 ref. (R10b, R11a; ST)

307-R.* Corrosion Inhibitor Testing Inside Products Pipe Line. Robert H. Meyer. *Corrosion,* v. 15, Mar. 1959, p. 131t-134t.

Tests with four different oil-soluble corrosion inhibitors in a 150-mile section of refined petroleum products pipe line. Data from test coupons, special segments of pipe, product filtration, scraper trap deposits, turbine-type rust tests and roughness factors. (R10b, R7d, T26r)

308-R.* Factors Influencing the Rate-of-Pickling Test on Tin-Plate Steel. R. M. Hudson and G. L. Stragand. *Corrosion,* v. 15, Mar. 1959, p. 135t-140t.

Measurements of time required to produce a uniform rate of attack as indicated by weight loss, hydrogen evolution or corrosion potential of steel specimens in *6N* hydrochloric acid at 90° C. Influence of annealing atmospheres, cleanliness of steel and time-temperature cycles. Variation in lag time with concentrations of certain elements on steel surface. 7 ref. (R6g, R11a; ST, 8-62, *Sn*)

309-R.* High Temperature Oxidation of Chromium-Nickel Steels. D. Caplan and M.

Cohen. *Corrosion*, v. 15, Mar. 1959, p. 141t-146t.

Scaling of austenitic stainless steels Type 302, 309 and 330 at 1600-2000° F. X-ray diffraction, spectrographic and metallographic examination of scales. (R1h, R2q, 2-62; SS-e)

310-R.* Comparative Corrosion Resistance of 200 and 300 Series Stainless Steels in Chemical Manufacturing Processes. A. C. Hamstead and L. S. Van Delinder. *Corrosion*, v. 15, Mar. 1959, p. 147t-157t.

Results of laboratory and field tests covering a variety of chemical manufacturing processes. Effect of sensitizing heat treatment on susceptibility to intergranular attack. 12 ref. (R6, R7, R2h, 2-60; SS)

311-R.* Control of Internal Corrosion of Petroleum Products Pipelines With Oil Soluble Inhibitors. Maurice R. Barusch, L. C. Haskell and Robert L. Piehl. *Corrosion*, v. 15, Mar. 1959, 158t-166t.

Effectiveness of water-soluble and oil-soluble inhibitors in controlling corrosion. Behavior mechanism of oil-soluble corrosion inhibitors. 8 ref. (R7d, R10b, T26r; ST)

312-R.* Growth and Scaling in S. G. Iron. R. J. Maitland and I. C. H. Hughes. *Iron & Steel*, v. 32, Mar. 1959, p. 100-103.

Critical temperatures determined by heating at various temperatures near the critical temperature range, followed by quenching in water. Relation of critical temperature to linear growth and scaling. (Concluded.) (R2q, P10d, 2-61; Fe-b *Si*)

313-R.* Why and How to Use High Alloy Castings. Ernest A. Schoefer. *Modern Castings*, v. 35, Mar. 1959, p. 34-35.

Corrosion and mechanical characteristics, applications. (R-general, Q-general; SS, 5, 17-57)

314-R.* (French.) Problems of Contact Corrosion of Aluminum in Buildings. S. Acimovic, F. Podbreznik and S. Vuckovic. *Alluminio*, v. 27, Dec. 1958, p. 533-540.

Unanodized, anodized, anodized and colored Al sheet of 99.5% purity in contact with steel, galvanized iron, concrete, mortar, plaster, beech and fir woods, polyvinyl chloride and tar paper in 100% humidity chamber and in steam. With exception of polyvinyl chloride and tar paper, all materials studied caused corrosion. (R1a, T26n; Al, 17-57)

315-R.* (Italian.) Mixed Joints of Aluminum and Other Metallic Materials. *Alluminio*, v. 27, Dec. 1958, p. 567-574.

Galvanic couples; metals that can be used in direct contact with Al and Al alloys in saline atmosphere without danger of corrosion; methods of preventing or diminishing contact corrosion; insulating materials; design of insulated joints. 7 ref. (R1a; Al-b)

316-R.* Copper-Nickel-Chromium and Corrosion Protection. A. H. Du Rose and W. J. Pierce. *Metal Finishing*, v. 57, Mar. 1959, p. 44-50, 54.

Quality of electroplating, value of undercoating, validity of tests. 11 ref. (R3, R11j; ST, *Cr, Cu, Ni*, 8-62)

317-R.* (Rumanian.) Effect of Heat Treatment on the Intercrystalline Corrosion of Stainless Steel 20-9 With Titanium. Irina Cornea and Stefan Zamirca. *Studii si Cercetari de Metalurgie*, v. 3, no. 3, 1958, p. 287-294.

Thin sheets quenched after being held at 1050, 1100 and 1150° C. for 10 to 40 min., subjected to annealing at 650° C. with holding times from 30 min. to 8 hr., and then boiled for 72 hr. in $H_2O + CuSO_4 + H_2SO_4$. Susceptibility to intercrystalline corrosion decreases in proportion to the ferrite present. 12 ref. (R2h, 2-64; SS-e)

318-R.* (French.) Effect of Photosynthesis Upon the Corrosion of Steel in Sea Water. A. Hache, L. Barriety and J. Debyser. *Corrosion et Anticorrosion*, v. 7, Feb. 1959, p. 56-61.

Oxygen content in sea water is the decisive factor with regard to steel corrosion. Tests with sea water and with sodium chloride solution indicate that the corrosion of specimens tested is proportional to the concentration of oxygen in sea water or in the solution. 6 ref. (R4b, R1h; ST)

319-R.* (French.) Stress Corrosion Cracking of Austenitic Stainless Steel in Aqueous Magnesium Chloride Solution. T. P. Hoar and J. G. Hines. *Metaux Corrosion Industries*, v. 34, Jan. 1959, p. 36-47.

Experiments on alloy steel wires under tension showed that corrosion cracking may be avoided by cathodic protection. 23 ref. (R1d, R10d; SS-e)

320-R.* (German.) Scale Formation on Hot Rolled Sheets. August Lueth. *Archiv fur das Eisenhuttenwesen*, v. 30, Feb. 1959, p. 71-78.

Scale on sheets in rolled conditions. Sheet scale behavior as affected by annealing in controlled atmosphere. (R2q, F23, 2-64; ST, 4-53)

321-R.* Corrosion Testing and Corrosion Problems in Process of Tall Oil. Harold C. Templeton. *American Oil Chemists' Society, Journal,* v. 36, Mar. 1959, p. 127-129.

Hastelloy C, Inconel and 316 alloy with Mo have good resistance. (R7, R11; SS, *Mo,* Ni-b)

322-R.* Corrosion of Metals Connected to Graphite Components. T. K. Ross. *British Chemical Engineering,* v. 3, July 1958, p. 368-370.

Corrosion resistance of stainless steel, Ni and Ti is excellent while that of mild steel, Pb and Cu is not. (R1a; CN, SS, Cu, Ni, Pb, Ti, C, NM-k36)

323-R.* Wrought Iron Learns New Tricks. R. B. Norden, Editor. *Chemical Engineering,* v. 66, Mar. 9, 1959, p. 172-176.

A. M. Beyer 4-D material shows improved resistance to atmospheric and chemical corrosion. (R-general; Fe-m)

324-R.* High-Nickel Alloys in the Petroleum Industry. Pt. 1. G. L. Swales. *Corrosion Technology,* v. 6, Mar. 1959, p. 81-84.

Corrosion properties of Ni alloys; applications of Ni and Ni alloys. 4 ref. (R-general, T29n; Ni-b, 17-57)

325-R.* Cyclohexylamine for Corrosion Prevention in Steam-Raising Equipment. W. K. Ashcroft and P. N. Heron. *Corrosion Technology,* v. 6, Mar. 1959, p. 85-88.

Neutralization of carbonic acid in boiler water. 9 ref. (R4c, R10b)

326-R.* Resistance of Cobalt to Certain Solutions. R. S. Young. *Corrosion Technology,* v. 6, Mar. 1959, p. 89.

Results of immersion tests with sodium hydroxide, hydrofluoric acid, phosphoric acid and hydrazine. (R-general; Co)

327-R.* Some Fundamental Features of Mechano-Chemical Attack on Metals. T. P. Hoar. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development, Structures and Materials Panel, 6th Meeting,* Report no. 158, Nov. 1957, 11 p.

Behavior of oxide films under conditions leading to their chemical failure, and under fretting, fatigue and static stress conditions. 5 ref. (R1d)

328-R.* Corrosion Exists in Many Forms. John C. Kuli and John L. McPherson. *Petroleum Engineer,* v. 31, Mar. 1959, p. C6-C11.

Atmosphere, fluid and soil corrosion; hydrogen blistering. (R2n, R3, R8)

329-R.* Calcareous Coatings: Corrosion Engineer's Offshore Ally. Donald M. Taylor. *Pipe Line Industry,* v. 10, Mar. 1959, p. 36-39.

In salt water the protective current builds up a calcareous coating where current density is high. In some ways this "electrocoating" is superior to conventional coatings. 5 ref. (R4b, T26r; ST)

330-R.* (German.) High-Temperature Corrosion of Oil Refining Equipment by Sulfur Compounds. W. G. Richards. *Werkstoffe und Korrosion,* v. 10, Feb. 1959, p. 74-77.

Corrosion of alloy steel (8% Cr content) in hydrogen sulphide at 780° F. amounts to 0.13 in. per year. Increase in Cr to 30% decreases speed of corrosion to 0.01 in. per year. (R7k, T29n, 2-60, 2-62; AY, *Cr*)

331-R.* (German.) Pitting Corrosion of Austenitic High-Alloy Cr-Ni Steels and Ferritic Chromium Steels in Aqueous Halide Solutions. Guenther Pier and Wilhelm Schwenk. *Werkstoffe und Korrosion,* v. 10, Feb. 1959, p. 78-81.

Alloy steels (18 Cr, 10 Ni; 18 Cr, 10 Ni, 2 Mo; 18 Cr, 10 Ni, Ti stabilized; 18 Cr, 10 Ni, 2 Mo, Ti stabilized) investigated in $FeCl_3$, NaCl, H_2SO_4 and KNO_3 by the K_3 $[Fe(CN)_6]$ test. Pitting appears as active-passive reaction. (R2j; SS, *Cr, Ni, Mo, Ti*)

332-R.* (German.) Effect of Organic and Inorganic Bases Upon Corrosion of Aluminum and Aluminum Alloys. A. Bukowiecki. *Werkstoffe und Korrosion,* v. 10, Feb. 1959, p. 91-105.

Comparison of organic and inorganic bases upon Anticorodal AC B, Avional AV-23, Perunal PU V, and Peraluman, indicates a decrease in attack in the range of sodium hydroxide, methylamine, ethylamine, n-butylamine, ammonia, thietanolamine, sodium carbonate, calcium hydroxide and hydrazine. 33 ref. (R6j; Al-b)

333-R. Corrosion in Amine-Type Gas Processing Units. R. A. Graff. *Petroleum Engineer,* v. 31, Mar. 1959, p. C12-C14.

Recommendations for protection of gas refinery equipment. (R7, T29)

334-R. What Trans-Canada Is Doing to Protect Its System Against Corrosion. Lance

F. Heverly. *Petroleum Engineer*, v. 31, Mar. 1959, p. D22-D27.

Pipeline covering 2290 miles is subjected to every type of galvanic corrosion process. Protection is by coating and zinc anodes. (R10d, T26r)

335-R.* Initial Oxidation Rate of Nickel and Effect of the Curie Temperature. H. Uhlig, J. Pickett and J. Macnairn. *Acta Metallurgica*, v. 7, Feb. 1959, p. 111-117.

Nickel foil oxidized for 24-hr. periods at 307 to 442° C. producing NiO films up to 3400 Å maximum. Discontinuity of oxide thickness at Curie temperature explained by an observed work function of Ni. 26 ref. (R1h, 2-62; Ni)

336-R. Mechanism of Stress-Corrosion Cracking. Hugh L. Longan. *U. S. National Bureau of Standards*, STR 2300, n.d., 5 p.

Experiments indicated that stress-corrosion cracking of AZ31B Mg alloy is primarily an electrochemical process and is dependent on strain rate. (R1d; Mg-b)

337-R. Rocket Exhaust Corrosion Simulator. F. B. Cramer. Rocketdyne, North American Aviation, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151273, Aug. 1957, 138 p. $2.75.

Application of the equipment showed that exposure was uniform from specimen to specimen and that differences could be demonstrated between different surfaces. (R11, X1)

338-R. Oxidation of Experimental Alloys. Pt. 1. J. C. Richmond and H. R. Thornton. National Bureau of Standards. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151264, June 1958, 54 p. $1.50.

Oxidation resistance of Nichrome V and Cb-modified and Al-modified Nichrome V, Inconel, Inconel X and Inconel 702, Hastelloy W and Hastelloy R235, Type 136 stainless steel, and an Fe-Cr-Al alloy. (R1h; SGA-h, Ni-b, SS, Fe-b, *Cr*, *Al*)

339-R.* (Italian.) Electrochemical Study of Inhibitors. Pt. 1. Neutral Solutions of NaCl. Dina Gherard. *Metallurgia Italiana*, v. 51, Jan. 1959, p. 13-20.

Theory of electrochemical action of inhibitors; interpretation of polarization curves. Corrosion potentials, polarization data and weight losses obtained from tests on steel (0.09%C, 0.02% S, 0.102% P, 0.28% Mn) with series of organic and inorganic inhibitors. $K_2Cr_2O_7$ and KNO_2 were most effective of inorganic inhibitors; of others, only Teramin showed any clear inhibitor action, chiefly due to anodic polarization. (R10b, R11m, ST)

340-R.* (Russian.) Corrosion by Condensed Water. I. L. Rosenfeld and K. A. Zhigalova. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 172-174.

Corrosion of low-carbon steel caused by condensed water is influenced by the shape of condensed water (droplets or continuous film) and is promoted by periodical drying and the presence of SO_2 or salts such as NaCl. (R4, R6; CN-g)

341-R.* (Russian.) Long-Time Tests on the Corrosion by Liquid Media Under Elevated Temperatures and Pressures. A. V. Ryabchenkov and V. P. Sidorov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 204-205.

Testing of three austenitic and one ferritic-martensitic steel. 4 ref. (R11s, 2-62, 3-74; SS)

342-R. Hydrogen Permeation of Zircaloy-2 Corrosion Films. R. F. Boyle and T. J. Kisiel. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 31-48. U. S. Office of Technical Services, Washington 25, D. C.

Determination of the effect of H_2 pressure during normal 750° F. steam corrosion to simulate in-pile failures. Zircaloy-2 with a corrosion film will hydride completely in a pure hydrogen atmosphere and in a hydrogen-steam mixture if the hydrogen-to-steam pressure ratio is greater than 10^4-to-1 when the temperature is 343° C. 12 ref. (R4d; Zr-b)

343-R. Relationship of Cooling Rate to the Corrosion Resistance of Zircaloy-2. L. S. Rubenstein, J. G. Goodwin and F. L. Shubert. Paper from "Bettis Technical Review, no. 10, Reactor Metallurgy". WAPD-BT-10, Oct. 1958, p. 23-30. U. S. Office of Technical Services, Washington 25, D. C.

To maintain high corrosion resistance in Zircaloy-2 and to obtain a weight gain of 28-10 mg. per sq. dm. after a 14-day, 750° F., 1500-psi. steam test, any heat treatment in the beta or the alpha-plus-beta regions should be consummated with a rapid cooling rate through the alpha-plus-beta phase region greater than 90° F. per min. 6 ref. (R4d, 2-64; Zr-b)

344-R.* (French.) Protection Against Stress Corrosion. A. Royez and J. Pomey. *Revue de Metallurgie*, v. 56, Feb. 1959, p. 122-128.

Protection afforded alloy steel tubes by electrodeposition of Zn, Cr, Co, Pb and Cd. (R1e, L17; AY, 4-60, *Zn, Cr, Co, Pb, Cd*)

345-R.* (German.) Corrosion and Protection of Iron and Steel. Heinrich Steinrath and Helmut Ternes. *Stahl und Eisen*, v. 79, Mar. 5, 1959, p. 307-313.

Behavior of recently developed stainless steel with 14% Ni, 12% Cr, 6.5% Cu and 6.5% Mo; atmospheric corrosion at ambient and at elevated temperature; corrosive effects of gases, of sea and fresh water. Passivation of cast iron and steel with HNO_3 in different concentrations. 391 ref. (R-general, R10c; SS, *Ni, Cr, Cu, Mo*)

346-R.* (Italian.) Corrosion Resistance of Stainless Steels. Pt. 2. Stress Corrosion. Giampiero Colombo. *Acciaio Inossidabile*, v. 25, Nov-Dec. 1958, p. 173-185.

Nature of stresses and resulting fractures; examples of stress-corrosion, methods of prevention. 8 ref. (R1d, R10; SS)

347-R. Investigations on "Active Iron". Pt. 1. Isolation. G. V. L. N. Murty. *Metallurgia*, v. 59, Mar. 1959, p. 141-142.

Iron deposited electrolytically under certain conditions appears to have an unusually high chemical reactivity. 10 ref. (R4; Fe)

348-R. How to Design Impressed Current Systems. Pt. 1. James C. Bell. *Pipe Line Industry*, v. 10, Mar. 1959, p. 40-47.

To be continued. (R10d, T26r, 17-51)

349-R.* Influence of Hydrogen Peroxide on the Corrosion of Brass by Acids. M. N. Desai and A. M. Trivedi. *Indian Journal of Applied Chemistry*, v. 21, no. 4, 1958, p. 138-141.

Hydrogen peroxide was found not to favor dezincification of brass, but it leads to dissolution of both Cu and Zn. 10 ref. (R7b; Cu-n)

350-R.* (Japanese.) Resistivity of Beryllium Carbide for Hydrolysis and Oxidation. Yasumichi Oishi, Yoshiteru Hamano and Yachiho Seki. *Osaka Industrial Research Institute, Bulletin*, v. 8, July 1957, p. 159-165.

Oxidation rate in air is less than that of graphite, but poor above 140° C. Hydrolysis in humid air is rapid. 5 ref. (R3; Be, C, NM-a35)

351-R.* Cathodic Protection Applications Using Platinum Anodes. H. S. Preiser. *Platinum Metals Review*, v. 3, Apr. 1959, p. 38-43.

Corrosion properties of Pt, Ta and Ti; application of Pt-clad Ti and Ta as anodes. 15 ref. (R10d; Ti, Ta, *Pt*, 8-66, 17-57)

352-R.* Lead-Platinum Bi-Electrodes. L. L. Shreir. *Platinum Metals Review*, v. 3, Apr. 1959, p. 44-46.

Pb electrodes with small inserts of Pt used for cathodic protection. (R10d; Pb, Pt, 17-57)

353-R.* (German.) Importance of Inhibitors and Passivators in Corrosion Protection. Willibald Machu. *Archiv fur das Eisenhuttenwesen*, v. 30, Mar. 1959, p. 145-152.

Mechanism of the protection of metallic surfaces by inhibitors and passivators. For inhibitors, a pin-cushion shaped structure formed by built up molecules on the surface is assumed. 44 ref. (R10b, R10c)

354-R.* (German.) Problems in Rust Prevention. Hans Hebberling. *Bauingenieur*, v. 34, Jan. 1959, p. 23-24.

Mechanical and chemical derusting, passivating and base painting with red lead. The protective coating hinders the rust-producing local currents. (R10, L26; ST)

355-R.* A High-Temperature X-Ray Investigation on Niobium Pentoxide and Some Problems Concerning the Oxidation of Niobium. H. J. Goldschmidt. *Institute of Metals, Journal*, v. 87, Mar. 1959, p. 235-239.

Phase transformations of columbium (niobium) pentoxide. The total oxidation of initially pure Cb metal is followed in sequence, the isothermal stages extending from solid solution of oxygen in Cb to Cb_2O_5. Preferred orientation can be produced in thin films of alpha Cb_2O_5, as distinct from the random loose oxide. The alpha or beta form of Cb_2O_5 can be stabilized by additions of certain oxides of other metals. 14 ref. (R1h, N7c, M21f; Cb)

356-R. Corrosion Tests on Metallized Coatings. *Welding Journal*, v. 38, Mar. 1959, p. 215-221.

Atmospheric and sea water immersion tests of An and Al coatings on steel. Thickness, 0.003-0.018 in., of both gives protection. (R3, R4b, R11; ST, *Al, Zn*, 8-67)

357-R. Corrosion of Stainless Steel Welds Formed With Carbon Dioxide Shielding. B. E. Hopkinson and D. W. McDowell. *Welding Journal*, v. 38, Apr. 1959, p. 188s-193s.

Compares the effect on weld chemistry and corrosion resistance of weldments made under CO_2 shielding with similar welds made under argon plus 1% oxygen. 10 ref. (R3, K1d, SS)

358-R.* (German.) Wire Rope Corrosion and Prevention. Anton Zastera. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 369-370.

Water containing oxygen causes cathodic effect in the outer layer and anodic in the lower having less contact with the oxygen. The electric current produced in these cells accelerates corrosion in addition to chemical factors. Effectiveness of corrosion preventive lubricants. (R1a; 4-61, ST)

359-R. Corrosion Inhibition and Chelating Agents. Norman Hackerman. *Electrochemical Society, India Section, Bulletin*, v. 8, Jan. 1959, p. 9-15.

Mechanism of inhibition by chelating agents. 13 ref. (R10b)

360-R. Using High-Sulphur Fuel Oils. T. J. Wilkinson and D. G. Clarke. *Foundry Trade Journal*, v. 106, Apr. 2, 1959, p. 387-388.

Corrosion and corrosion prevention in generating stations. (R7d, R10, W11)

361-R. Corrosion Problems With Pressure Vessels. Henry Allen. *Petroleum*, v. 22, Apr. 1959, p. 140-143.

Corrosive agents, preventive maintenance, neutralizers and inhibitors. 6 ref. (R-general, T26q)

362-R.* Growth and Scaling Characteristics of Cast Irons in Air and Steam. G. N. J. Gilbert. *British Cast Iron Research Assoc., Journal*, v. 7, Feb. 1959, p. 478-566.

Growth and scaling tests on 35 cast irons in air at 483 to 932° F. for periods up to 64 weeks and in steam at 440 to 800° F. up to 49 weeks. Includes flake-graphite, nodular-graphite and black-heart malleable irons. Tensile and hardness of growth test specimens. Results of short-time high-temperature tensile and impact tests. 6 ref. (R2q, R1h, Q-general, 2-62; CI)

363-R.* Corrosion Problems Associated With Uranium Refining. F. H. Meyer, Jr., F. J. Podlipec and T. R. Kato. *Corrosion*, v, 15, Apr. 1959, p. 168t-170t.

Processing conditions and materials of construction. Corrosion rate of various irons, stainless steel, Ni alloys and Ta exposed to nitric acid, hydrochloric acid and hydrogen sulphide atmospheres. (R6, T29m, C19, SS, CI, Ni-b, Ta, U)

364-R.* Corrosion Rate Measurement by Hydrogen Effusion in Dynamic Aqueous Systems at Elevated Temperature and Pressure. M. Krulfeld, M. C. Bloom and R. E. Seebold. *Corrosion*, v. 15, Apr. 1959, p. 179t-182t.

Apparatus and procedures; corrosion rate in thermal convection loop of SAE 1010 steel by distilled water at 316° C., 2000 psi. and with flow velocity of 1 ft. per sec. Reproducibility of hydrogen effusion rates and comparison with static systems. Corrosion in loop with high flow velocity. 7 ref. (R11a, R4e, 2-62; CN)

365-R.* Minimum Corrosion for Butane Isomerization Units. J. F. Mason, Jr., and C. M. Schillmoller. *Corrosion*, v. 15, Apr. 1959, p. 185t-188t.

Operating conditions of vapor phase and liquid phase process units. Corrosion rate of Ni, Monel, Hastelloy A and Hastelloy B alloys and Ni-Resist cast iron in air-saturated and air-free hydrochloric acid solutions. Influence of acid concentration and temperature. (R6g, R7d, T29n, 2-61; Ni-b, CI)

366-R.* Corrosion of Refinery Equipment by Aqueous Hydrogen Sulfide. Roy V. Comeaux. *Corrosion*, v. 15, Apr. 1959, p. 189t-193t.

Experience with corrosion inhibitors in units employing mild steel condenser tubes. Electrochemistry of corrosion reaction. 6 ref. (R10b, R6p, R7k, T29n; CN)

367-R.* Some Experiments on Internal Oxidation of Nickel Chromium Alloys. H. R. Copson and F. S. Lang. *Corrosion*, v. 15, Apr. 1959, p. 194t-198t.

Oxidation of alloys containing up to 20% Cr and varying amounts of Fe and other elements by exposure to air and dry or wet carbon monoxide at 1750 to 1900°F. Effect of alloy content on penetration of oxides and weight gain. 12 ref. (R2s, 2-60; Ni, *Cr, Fe, Cb, Ti, Mo, Cu, Si*)

368-R.* Identification of Corrosion Products on Copper and Copper Alloys. *Corrosion*, v. 15, Apr. 1959, p. 199t-201t.

Microchemical methods for oxides, chlorides, sulphates, sulphides, carbonates, silica, Ca, Mg, Na, ammonia and

metal constituents. Spectrographic procedure. 5 ref. (R11, S11k; Cu-b)

369-R.* Evaluation of Steam Resistant Coatings for Carbon Steel Hospital Ware. E. G. Bobalek, W. R. R. Park, E. G. Bell and W. R. Dawson. *Corrosion*, v. 15, Apr. 1959, p. 202t-206t.

Performance of 120 commercial coatings exposed for 500 hr. to 20-psi. steam. Protection afforded by steam resistant resinous coatings, Ni plate, porcelain or Al on mild steel sterilizers intermittently exposed to live steam. 7 ref. (R4d, L26n, L26p, 2-62; CN)

370-R.* The Effect of Sigma Phase Vs. Chromium Carbides on the Intergranular Corrosion of Type 316 and 316L Stainless Steel. Pt. 1. Donald Warren. *Corrosion*, v. 15, Apr. 1959, p. 213t-220t.

Service environment and laboratory test solutions causing intergranular corrosion of austenitic stainless steel and relation to presence of chromium carbides and sigma phase. 80 ref. (R2h, R6g, R7, N8r; SS-e)

371-R. Effect of Alloying Additions and Temperature on the Corrosion of Aluminum-Nickel-Iron Alloys in High Temperature Water. G. J. Biefer. *Atomic Energy of Canada Ltd.*, CR-MET-796, July 1958, 26 p.

Small additions of Ti, Zr and Be improve corrosion resistance. The effect of increased Ni and minor additions is additive. The alloy possessing the best corrosion resistance has 2% Ni, 0.5% Fe, 0.2% Si, 0.2% Ti, 0.05% Zr, 0.05% Be. Significance of these data in terms of reactor technology and the mechanism of corrosion. 12 ref. (R4, 2-62, 2-60; Al-b, *Ni, Fe, Ti, Zr, Be, Si*)

372-R.* (French.) Corrosion of Buried Metal Pipe. *l'Industrie Francaise*, v. 8, Mar. 1959, p. 257-261.

Chemical, biochemical and electrochemical corrosion of metal pipes conveying water, vapor, gas, oil and other fluids. Cathodic protection and other preventive measures. (R-general, R10d, T26r)

373-R.* (German.) Corrosion Resistance With Special Reference to Corrosion Fatigue of Nitrided Titanium Steel. M. Tomory. *Periodica Polytechnica-Engineering Series*, v. 2, no. 4, 1958, p. 275-289.

Corrosion coupled with alternating stress causes sharp cracks. Corrosion fatigue strength is increased by internal compressive stresses as in nitrided Ti steel. Corrosion resisting phase of nitrided Ti steel or Cr-Al-Mo steel. 13 ref. (R1e, R10, 2-64, 3-66; AY, *Ti, Cr, Al, Mo*, CN)

374-R. Metallurgy—Important Factor in Corrosion Science. Anton I. Petrovich. *Industrial & Engineering Chemistry*, v. 51, Feb. 1959, p. 73A-74A.

Hydrogen embrittlement and types of stress-corrosion cracking as manifestations of interaction between hydrogen diffusing in the metal, and dislocations. 5 ref. (R1d, Q26s, M26b; H)

375-R.* This Test for Oxidation Resistance. Rod Simenz. *Product Engineering (Design Issue)*, v. 30, Apr. 27, 1959, p. 48-50.

Metallographic examination for subsurface defects, intergranular oxidation and alloy depletion. 6 ref. (R1h, 1-54, R2h, M21c; SGA-h)

376-R.* (German.) Possibilities and Limitations in the Corrosion Protection of Brass. G. Marwedel. *Farbe und Lach*, v. 65, Feb. 1959, p. 64-71.

The porosity of organic protective coatings requires a certain layer thickness. Full protection is afforded by baked-on lacquer. (R10, L26n; Cu-n)

377-R.* (Italian.) Corrosion Behavior of Aluminum by Rain Water Containing Copper and Zinc Salts. G. Luft. *Aluminio*, v. 28, Mar. 1959, p. 115-120.

Over a period of 5 years Cu or Zn sheet was exposed over Al sheet to catch the rain water before it dropped onto the Al. The resultant Cu salts caused strong corrosion while no remarkable corrosion by Zn salts was observed. (R6; Al)

378-R.* (Czech.) Prevention of Intercrystalline Corrosion in Stainless Steel Weldments. Josef Nemec. *Zvaranie*, v. 8, Mar. 1959, p. 74-78.

Heat treatment after welding. Service conditions to which the weldments will be exposed. Methods of testing corrosion resistance. Stabilized filler metals obtained in various automatic welding processes. 15 ref. (R2h; SS-e, 7-51)

379-R.* (German.) Adsorption of Hydrogen in the Dissolution of Iron. L. Cavallaro, G. P. Bolognesi and L. Felloni. *Werkstoffe und Korrosion*, v. 10, Feb. 1959, p. 81-86.

Results from Armco iron sheet samples dissolved in hydrochloric acid indicate a

correlation between the quantity of hydrogen adsorbed from the iron and the dissolution speed. 10 ref. (R6g; Fe)

380-R.* (German.) Effect of Photosynthesis on the Corrosion of Steel in Sea Water. A. Hache, L. Barriety and J. Debyser. *Werkstoffe und Korrosion,* v. 10, Mar. 1959, p. 145-148.

Openhearth steel exposed to sea water and to a 3% NaCl solution with varying oxygen content. Oxygen enrichment (for example, by photosynthesis) increases the pH-value and promotes corrosion. 6 ref. (R4b; ST-e)

381-R. Visual Observation on the Water Stream in an Elevated Temperature High Velocity Loop. R. E. Seebold. *Corrosion,* v. 15, Apr. 1959, p. 183t-184t.

Visual examination of effects of oxygen and oxide coatings on corrosion of low-carbon steel loop by high-velocity water at 316° C. (R4e, X1c, 2-62; CN)

382-R. (German.) Corrosion Testing of Paints With Aerosoles. H. Anders. *Werkstoffe und Korrosion,* v. 10, Mar. 1959, p. 151-152.

Apparatus for short-time testing the corrosion behavior of metals and the corrosion protection by surface treatments and paint. (R11a, 1-53, 8-70)

383-R. Oxidation of Nickel-Cobalt Alloys in the Range of Curie Temperatures. W. W. Smeltzer. *Acta Metallurgica,* v. 7, Mar. 1959, p. 191-198.

Alloy of largest Co content oxidized most rapidly. Proposed that variations are caused by electronic properties of the metal substratum, which influence the rate-determining reaction step of metal ion diffusion through the surface oxide layer. 16 ref. (R1h, 2-62, 2-60; Ni-b, *Co*)

384-R. Are Cathodic Protection Techniques for You? *Chemical Engineering,* v. 66, Jan. 12, 1959, p. 154-158.

Underground sea water pipe protection with Mg anodes. (R4b, R8, R10d, T26r)

385-R.* (German.) Corrosive Behavior of Non-Drying Oils and Greases, With Special Reference to Modern Lubricants and Metal Preserving Agents. Pt. 3. Corrosive Behavior of Non-Drying Oils and Greases Containing Water and Salt. A. Bukowiecki. *Schweizer Archiv,* v. 25, Feb. 1959, p. 62-74.

Corrosive mechanism, literature review, experiments using various oils and greases with additions on Fe, Cu, Pb and Zn. (To be continued.) (R7e; Fe, Cu, Pb, Zn)

386-R.* (Italian.) Corrosion Resistance of Stainless Steels. Pt. 7. Pitting Corrosion. Giampiero Colombo. *Acciaio Inossidabile,* v. 26, Jan-Feb. 1959, p. 5-12.

Mechanism, electrochemical reactions, formation of galvanic couples, passivation, development of attack. (To be continued.) (R2j; SS)

387-R.* Impressions of Russian Corrosion Research. J. B. Cotton and E. C. Potter. *Corrosion Technology,* v. 6, Apr. 1959, p. 117-118.

Report on corrosion conference in Moscow, May 1958. Application of electrochemical kinetic theory to practical corrosion prevention. (R-general, A9)

388-R.* High-Nickel Alloys in the Petroleum Industry. Pt. 2. G. L. Swales. *Corrosion Technology,* v. 6, Apr. 1959, p. 119-124.

Selection of materials for high-temperature applications in refinery and associated petrochemical processes. 11 ref. (R-general, T29n, 2-62; Ni-b)

389-R. The Reactions of Zirconium and Zirconium Based Alloys With Nitric and Nitric-Hydrofluoric Acids. F. S. Martin and B. O. Field. *United Kingdom Atomic Energy Authority,* AERE C/R 2692, Dec. 1958, 14 p.

Explosive reactions observed are not of the detonation type but involve a rapid oxidative reaction between adsorbed or precipitated nitrates and finely divided metal, or metal in a low oxidation state, on the alloy surfaces. Dissolution rates are reported for 5% U, Zircaloy-2 and for Zircaloy-2 in nitric acid-fluoride mixtures and in sulphuric acid catalyzed by ferric ion (R6g; Zr)

390-R. Oxidation of Uranium in Air at High Temperatures. R. K. Hillard. Hanford Atomic Products Corp. *U. S. Atomic Energy Commission,* HW-58022, Dec. 10 1958, 31 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Oxidation rates at furnace temperatures up to 1440° C. The over-all oxidation rate, based on the time required to completely oxidize the specimen, was correlated as a function of furnace temperature and area/weight ratio. From these correlations the over-all rate for any specimen size can be estimated at any temperature near the melting point of U. (R1h, 2-62; U)

391-R.* (French.) Steels and Alloys Resistant to Sulphuric and Hydrochloric Environment. L. Colombier. *Metallurgie et la Construction Mecanique,* v. 91, Mar. 1959, p. 155-162.

Steels and alloys composed of Ni, Mo, Fe, Cr, Si and Cu tested in sulphuric and hydrochloric acid for 1000 hr. at 10-1000° C. (R6g; AY, *Ni, Mo, Fe, Si, Cu*)

392-R.* (German.) Corrosion Protection Inside Hollow Structures. A. Seils and W. Kranitzky. *Stahlbau,* v. 28, Feb. 1959, p. 46-53.

Atmospheric conditions inside hollow structures were registered. Air-tight structures need no inside protective coating while ventilated structures need only a light coating. Zinc dust paint does not impair the welding. 13 ref. (R3; ST)

393-R.* (German.) Potentail-Time Measurements on Oxide-Covered Aluminum Surfaces. St. Bloeck. *Metall,* v. 13, Mar. 1959, p. 196-198.

Test results indicate the possibility of quick detection of oxide layers on the surface of Al and of their resistance to corrosion. Potential measurements are not adequate for the differentiation of particular oxide layers. 6 ref. (R1h, 1-54; Al)

394-R.* Indentation of Metals by Cavitation. W. H. Wheeler. *American Society of Mechanical Engineers,* Paper no. 59-Hyd-15, 1959, 9 p.

Indentations, rupture and corrosion damage of high-purity Fe and Al caused by cavitation in water or toluene. Metallographic techniques; rupture and corrosive oxidation mechanisms. 11 ref. (R2m; Al-a, Fe-a)

395-R.* Evaluation of Corrosion in Diesel Cylinders. J. M. A. Van der Horst and W. Schultze. *American Society of Mechanical Engineers,* Paper no. 59-OGP-2, 1959, 8 p.

Corrosion of Cr plated cylinders in 40-hr. test runs. Corrosion patterns with straight-run emulsified and special-duty lubricants. 22 ref. (R7d, R11a, R10b; Cr, 8-62)

396-R.* (French.) Application of Zinc Anodes in Cathodic Protection. R. Soucke. *Corrosion et Anticorrosion,* v. 7, Mar. 1959, p. 79-82.

Protection of exposed or buried steel structures, tanks and vessels. Zn must be at least 99.996% pure and usually contains trace amounts of Al or Mg. (R10d; Zn-a, *Mg, Al*)

397-R.* (French.) Corrosion and Passivation. U. F. Franck. *Corrosion et Anticorrosion,* v. 7, Mar. 1959, p. 83-97.

The passive state results from very thin films which are formed on the metal surface. The reaction of passivated metals toward corrosion is primarily determined by chemical and electric properties of the film and not by the properties of metal itself. 62 ref. (R10c)

398-R.* (French.) Faraday's Law and Anodic Dissolution of Metals. Michel Froment. *Corrosion et Anticorrosion,* v. 7, Mar. 1959, p. 98-109.

Anodic dissolution of metals by baths containing magnesium perchlorate, ethyl alcohol, perchloric acid, acetic andryhide and sodium chloride aqueous solutions. 14 ref. (R7)

399-R.* (Italian.) High-Temperature Corrosion of Metals by Vanadium Oxide. Pt. 5. Mechanical Properties and Behavior of Fe-Al-Ti Alloys. A. Burdese and S. Gallo. *Metallurgia Italiana,* v. 51, Feb. 1959, p. 65-71.

Effect of increasing Al content on oxidation resistance of Fe in presence of V_2O_5 vapors. Properties compared with those of commercial superalloys, particularly the refractory "Thermenol". Addition of small quantities of Ti and C to Fe-Al alloys simplifies their manufacture and decreases costs, improves forgeability and mechanical properties and produces a finer grain than Mo additions. Ti is partially segregated as a carbide. 24 ref. (R6p, Q27a, Q3, 2-62; Fe-b, *Ti, Mo*)

400-R.* Oxidation Studies on the Iron-Chromium-Aluminum Heater Alloys. Earl A. Gulbransen and Kenneth F. Andrew. *Electrochemical Society, Journal,* v. 106, Apr. 1959, p. 294-302.

Studies on weight gain of alloys and crystal structure and composition of oxide films. Tested adhesion of oxide film to metal by introducing strains into the metal oxide system during oxidation. Showed constant oxidation rate between 900-1050° C., rate increase above 1050° C. 23 ref. (R1h; Fe-b, *Cr, Al*)

401-R.* (French.) Protection of Metals by Corrosion-Resistant Paints. George Nedey. *Nature,* no. 3287, Mar. 1959, p. 112-116.

Protection of metals exposed either to atmospheric conditions (oxygen, water vapor and corrosive industrial gases) or to acid solutions, alkaline or saline. Efficiency of the protection depends on the adhesion of paint to the metal surface and

its impermeability to liquids and gases. (R3; NM-g30)

402-R.* (Polish.) Oxidation at High Temperatures. Stanislaw Mrowiec, Dominik Wajszel and Teodor Werber. *Wiadomosci Chemiczne,* v. 12, Nov. 1958, p. 709-736.
Oxidation in relation to jet engine, gas turbines, chemical apparatus, electric furnaces and nuclear reactor applications. 55 ref. (R1h, 2-62)

403-R. X-Ray Examination of Corrosion Products. R. Scheidegger. *Brown Boveri Review,* v. 45, Nov-Dec. 1958, p. 561-566.
18 ref. (R11a, M21f)

404-R. (French.) Corrosion Research at Cebedeau. Edm. Leclerc. *Metaux Corrosion-Industries,* v. 34, Feb. 1959, p. 81-83.
Research methods at the Centre Belgique d'Eau. 9 ref. (R4)

405-R. Iron-Aluminum Alloy Systems. Comparative Study of Oxidation Resistance in the Fe-Al System. Richard E. Heimerdinger. Ford Motor Co., Scientific Laboratory. *Wright Air Development Center,* Technical Report no. 57-298, Pt. 2, Nov. 1958, 18 p.
Effect of Al (o-16%) on oxidation resistance of Fe-Al alloys at temperatures to 2200° F. and for periods up to 500 hr. The addition of Cr was beneficial only at the 7.50% Cr level. An alloy containing 7.50% Al and 7.50% Cr is recommended for its good oxidation resistance, corrosion resistance and ductility. (R1h, 2-62, 2-60; Fe-b, *Al, Cr*)

406-R.* (Japanese.) Corrosion of Insoluble Lead Anodes in Zinc Sulphate Solution. Yuuichi Imai. *Metal Finishing Society of Japan Journal,* v. 10, Jan. 1959, p. 21-26.
Anodic potential and weight loss of 99.99% Pb, Pb-Ag, Pb-Tl, Pb-Ca, Pb-As and Pb-Sb anodes. Weight loss increases with increasing anodic potential. (R6p, W3r; Pb-b, *Ag, Tl, Ca, As, Sb*)

407-R. Oxidation in Metals. Walter W. Smeltzer and Lyndon H. Everett. *Industrial & Engineering Chemistry,* v. 51, Mar. 1959, p. 406-411.
Review. 196 ref. (R1h)

408-R. Inhibition of the Corrosive Attack of Paint Remover Solvents on Steel. A. Stanley Dalton Materials Laboratory. *Wright Air Development Center,* Technical Note 58-129, Mar. 1959, 14 p.
Corrosivity of typical methylene chloride-base paint remover solvent. Effect of inhibitors. 10 ref. (R10b, R7h; ST)

409-R.* (English.) Corrosion of Iron and Steel in Moving Acid Aqueous Solutions. Saburo Shimodaira and Yoshinobu Sawada. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-177-E-179.
Rate of corrosion is controlled by diffusion of hydrogen ions above pH 3 and is determined by dissolved oxygen below pH 3. (R6a; Fe, ST)

410-R.* (English.) Rate of Oxygen Consumption by Aluminum in Aqueous Salt Solution. Hiroshi Chiba and Takaski Tanaka. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-180-E-182.
Rate of consumption in neutral salt solutions measured by polarographic method. Presence of chloride strongly influenced oxygen consumption. (R1h, 1-66; Al)

411-R.* (English.) Cathodic Polarization and Cathodic Corrosion of Titanium in Dilute Sulphuric Acid. Rikuro Otsuka. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-191-E-194.
Electrochemical and corrosion behavior of Ti; effect of Ti hydride on the surface. 4 ref. (R6g, P15; Ti)

412-R.* Electrochemical Aspects of Stress Corrosion. D. K. Priest. *Electrochemical Society, Journal,* v. 106, Apr. 1959, p. 358-360.
Data and theory which support electrochemical theory of stress-corrosion. 11 ref. (R1d)

413-R.* Ignition of Titanium. *Light Metal Age,* v. 17, Apr. 1959, p. 6-7.
Rapid oxidation occurs when oxygen content and pressure are high and fresh metal surface is exposed. (R1h, 3-74; Ti, Zr)

414-R.* (English.) o-Hydroxyazo Compounds in Basic Baths as Inhibitor for Metallic Aluminum. Yasumasa Hayakawa and Ikuo Ida. *Electrochemical Society of Japan Journal,* v. 26, no. 10-12, 1958, p. E-197-E-199.
Inhibition takes place only in alkaline baths and is caused by the formation of aluminum chelate. 7 ref. (R10b; Al)

415-R. Automotive Corrosion Resistance: Past and Present. Leonard C. Rowe. *Corrosion,* v. 15, Apr. 1959, p. 167t.

Factors responsible for improved corrosion resistance of modern automobiles. (R10, T21a)

416-R. (English.) Flade Potential of Passive Nickel. Go Okamoto, Tetsuo Takaishi and Norio Sato. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-188-E-190.
11 ref. (R10c; Ni)

417-R. New Alloy N Joins Hastelloy Family. F. S. Badger. *Chemical Engineering,* v. 66, May 4, 1959, p. 162, 164, 166.
Nickel alloy designed as a container for fused chlorides containing uranium. (R6, T11; Ni-b, 17-57)

418-R.* New Alloy Licks Top Corrosion Troubles. *Chemical Week,* Apr. 18, 1959, p. 76, 78, 81.
Addition of 1% Pd to commercially pure Ti produces alloy resistant to reducing environments. (R-general; Ti-b, *Pd*)

419-R.* Oxygen and Carbon Dioxide Corrosion. Paul Brindisi. *Combustion,* Apr. 1959, p. 47-52.
Corrosion by water in steam power plants. (R4c, W11g; O)

420-R.* Internal Cathodic Protection. Pt. 2. Application of Cathodic Protection to the Inner Walls of a Rectangular Box. C. Plumpton and C. Wilson. *Corrosion Prevention & Control,* v. 6, Mar. 1959, p. 49-54.
Theoretical mathematical analysis of current flow of the anodes. (R10d)

421-R.* Studies on the Dry Corrosion of Nimonic 80A by Peat Ash. J. A. Waddams and J. C. Wright. *Metallurgia,* v. 59, Apr. 1959, p. 161-164.
Corrosion of Nimonic 80A in peat ash and synthetic mixtures of sulphates, chlorides, phosphates and silicates at 800° C. in air. X-ray diffraction and metallographic examination of corroded area. (R1h, R2q, R6k; Ni-b, *Cr, Ti, Al, Fe, Co*)

422-R.* Rating Heat Transfer Surfaces for Corrosion. N. D. Groves and C. M. Eisenbrown. *Metal Progress,* v. 75, May 1959, p. 78-81.
A new test can accurately determine weight loss of a metal immersed in a corrosive solution. Specimen and corrodent can be maintained at different temperatures simulating heat transfer conditions. A typical problem in heat exchanger design is solved with curves developed from this test. (R11a, R6g; SS)

423-R.* (English.) Cathodic Protection of Mild Steel and Some Copper Alloys in Agitated Artificially Prepared Sea Water. Hayata Shigeno and Toyoji Kobayashi. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-175-E-176.
Corrosion and protection of mild steel brass, gun metal and manganese bronze. (R4b, R10d; CN, Cu-n, Cu-s, *Mn, Sn*)

424-R.* (English.) Corrosion of Aluminum Irradiated in Atomic Reactor. Masayuki Kawasaki, Sueo Nomura and Noboru Ito. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-195-E-196.
Radiation has little effect on aqueous corrosion. (R4, 2-67; Al)

425-R.* (English.) High-Temperature Corrosion of Cast Iron in Sulfur Vapor. Keizo Nishida. *Electrochemical Society of Japan, Journal,* v. 26, no. 10-12, 1958, p. E-205-E-208.
Thickness and structure of the sulphide scale; effect of Al in the cast iron. 9 ref. (R6q, 2-62, 2-60; CI, *Al*)

426-R.* Corrosion of Metals in Synthetic Atmospheres Containing Sulphur Dioxide. B. Sanyal and D. V. Bhadwar. *Journal of Scientific & Industrial Research,* v. 18A, Feb. 1959, p. 69-74.
Each metal requires a minimum humidity for the initiation of corrosion. 9 ref. (R3, R7k; Al, Cu, Ni, ST, Zn)

427-R. Titanium-Palladium Alloys Has Broad Corrosion Resistance. *Chemical Processing,* v. 22, May 1959, p. 158-159.
Addition of 0.1% or less of noble metal to Ti makes it resistant to reducing solutions such as HCl without lessening ability to withstand oxidizing agents. (R6g, R7b, 2-60; Ti-b, *Pd, EG-c*)

428-R. (Translation—ConBur) Kinetics of the Process of Formation of Oxide Films on Tungsten and Molybdenum. V. A. Arslambekov and K. M. Gorbunova. *Academy of Sciences of the USSR, Physical Chemistry Section, Proceedings,* v. 119, Mar-Apr. 1958, p. 151-153.
(R1h; Mo, W)

429-R.* (Translation—ConBur) Atmospheric Corrosion of Irradiated Metals. A. V. Bialobzheskii. *Academy of Sciences of the USSR, Proceedings, Physical Chemistry Section,* v. 119, Mar-Apr. 1958, p. 183-186.

Intensification of the process of atmospheric corrosion results from the fact that the radiation products formed intensify the corrosion current of the microcells by acting as energetic cathodic depolarizers. (R3, 2-67)

430-R.* (French.) Dry Oxidation of Steels and Refractory Alloys at Elevated Temperatures (to 1200° C.) S. Ferre. *Revue de Metallurgie*, v. 56, Apr. 1959, p. 386-394.

Isothermal oxidation tests on 18-8 type steels, Nimonic-type alloys, cobalt-base alloys and other materials such as a TiC-base cermet. Influence of duration of test and composition of alloy on weight increase; intergranular corrosion; classification of materials in order of susceptibility to oxidation. 9 ref. (R1h, 2-62, 6-70; Ni-b, Co-b, SS)

431-R.* (German.) Prevention of Damage in Aluminum Semifinished Products Caused by Condensed Moisture in Transportation and Storage. H. M. Cohen. *Aluminium*, v. 35, Apr. 1959, p. 197-202.

Smooth and polished metal sheet surfaces are more susceptible to corrosion than rough surfaces. Prevention is possible by coating the surfaces with oil and protective grease. 5 ref. (R10e, R10f; Al, 4-53)

432-R.* (Russian.) Effect of Some Inhibitors on Season Cracking in Stainless Steel and Brass. S. A. Balezin, V. V. Romanov and N. I. Podovaev. *Doklady Akademii Nauk*, v. 123, no. 5, 1958, p. 902-905.

Organic inhibitors may completely prevent inner-crystalline structure of an austenite stainless steel in a chlorine atmosphere at elevated temperature. Protection is provided against corrosion and from cracking under stress. This indicates that mechanical factors have a smaller effect during cracking of metals than corrosive factors. (R1d, R10b; SS-e, Cu-n)

433-R. Oxidation and Contamination Reactions of Niobium and Niobium Alloys. William D. Kloop, Daniel J. Maykuth, Chester T. Sims and Robert I. Jaffee. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1317, Feb. 3, 1959, 62 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.25.

Cb reacts linearly with air at 600 to 1200° C. and with oxygen at 400 to 1400° C. At 1400° C. a very rapid reaction with oxygen is observed. Contamination hardening during oxidation is attributed to diffusion of oxygen into the metal from the predominantly Cb_2O_5 scale. The most effective binary additions for improving oxidation resistance are Cr, Mo, Ti and V. 24 ref. (R1h, 2-60; Cb, *O, Cr, Mo, Ti, V*)

434-R.* (Russian.) Origin and Development of Pitting Corrosion in Iron. T. N. Shavanova, N. I. Fedulova and A. I. Krasil'shchekov. *Zhurnal Fizicheskoi Khimii*, v. 33, Jan. 1959, p. 206-212.

Pitting corrosion is derived from fluctuations of potential due to the thermal motion of the molecules and from the presence of certain conditions facilitating the appearance in the electrode of protracted local potential differences. 16 ref. (R2j)

435-R.* (Russian.) Mechanism of Metallic Corrosion in Cracks and Crevices. Pt. 5. Corrosion of Copper and Copper Alloys. I. K. Marshakov and I. L. Rosenfel'd. *Zhurnal Fizicheskoi Khimii*, v. 33, Jan. 1959, p. 219-223.

In copper and bronze intensified disintegration of the metal lies not in the crevice itself but on the external surface. Severe corrosion in a crack or crevice in Cu and bronze is due to the presence of concentration cells. 9 ref. (R1b, R2k; Cu, Cu-n, Cu-s)

436-R.* (Russian.) Protective Effect of Volatile Corrosion Inhibitors and Anitcorrosive Greases in Tropical Humidity and Temperature. E. I. P. Skorskii and E. M. Il'ina. *Zhurnal Prikladnoi Khimii*, v. 32, Jan. 1959, p. 138-141.

Presence of carbamides or a mixture of carbamide with Na_3N considerably increases the protective ability of grease. A 624-hr. test at a relative humidity of 98% and 63°, a grease containing 2% of barium soap of montanin and 10% of lanolin, produced a corrosion resistant grease. (R10b; NM-b)

437-R.* (Russian.) Protective Action of Corrosion Inhibitor Mixtures in Neutral Atmospheres. A. S. Afans'ev and F. V. Zhuk. *Zhurnal Prikladnoi Khimii*, v. 32, Jan. 1959, p. 141-149.

Effects on atmospheric and underwater corrosion of steel of sodium nitrite, silicon-nitride; triethylamine, sodium triphosphate, emulsions used as corrosion inhibitors. 4 ref. (R10b; ST, NM-b)

438-R. (French.) Corrosion Protection in the Refrigeration Industry. (Continued.) P. Orlowski. *Revue Pratique de Froid*, v. 12,

Feb. 1959, p. 41-43.
(R10, T29p)

439-R. (Italian.) Genoa's Center for Research on Marine Corrosion of Metals. Giorgi Balbi. *Pitture e Vernici*, v. 14, Dec. 1958, p. 987-990.
(R-general, A9)

440-R.* Stainless Steels to Combat Corrosion. G. E. Rowan. *Canadian Mining and Metallurgical Bulletin*, v. 52, Apr. 1959, p. 255-260.
Corrosion resistance and applications of principal stainless steels. (R-general; SS)

441-R.* (Russian.) Phenols as Corrosion Inhibitors of Lead in Water. A. P. Myagkova and I. N. Putilova. *Zhurnal Fizicheskoi Khimii*, v. 33, Jan. 1959, p. 228-229.
A 960 hr. test at 20° C. and 10 hr. and tests at 60° C. with phenols, resorcin and hydro-quinone showed that all three substances retard corrosion. 18 ref. (R10b; NM-b, Pb)

442-R.* (French.) Corrosion of Tin Plate Containers in the Canned Food Industry. H. Cheftel. *Corrosion et Anticorrosion*, v. 7, Apr. 1959, p. 125-133.
Influence of type of steel, presence of cathodic depolarizing agents, storage temperature. Evolution of potentials of Sn and steel in couples in which Sn plays role of anode. 34 ref. (R-general, T29p; Sn, 8-62)

443-R.* (French.) Influence of Inhibitors on the Corrosion Behavior of Iron. H. Grubitsch and T. Sneck. *Corrosion et Anticorrosion*, v. 7, Apr. 1959, p. 153-161.
Influence of two inhibitors in cells depolarized by oxygen studied by tracing pH-potential curves over a period of 10 hr. Urotropine added to a neutral electrolyte acts as anodic inhibitor; in acid solution it acts principally as cathodic inhibitor. Ethylquinoline iodide has almost no effect in neutral media while in acid media it is a powerful anodic inhibitor, and to a much lesser degree a cathodic inhibitor. 16 ref. (R1a, R10b; Fe)

444-R.* (Hungarian.) Survey of the Oxidation Processes in Cast Iron. Gyula Nandori. *Kohaszati Lapok-Ontode*, v. 92, Feb-Mar. 1959, p. 70-77.
The inter-dendrite porosity in cast iron affecting the strength of casting is attributed to the presence of oxygen introduced from the ambient atmosphere by air passing through the melt and by the oxygen content of the charge. 12 ref. (R1h; CI)

445-R. Titanium Solves a Major Corrosion Problem. *Corrosion Technology*, v. 6, May 1959, p. 149.
Platinized Ti anodes. (R10d; 17-57, Ti)

446-R. Atmospheric Corrosion of Metals. Pt. 2. Corrosion of Metals in Bombay. B. Sanyal, A. N. Nandi, A. Natarajan and D. Bhadwar. *Journal of Scientific & Industrial Research*, v. 18A, Mar. 1959, p. 127-131.
Corrosion rates for Zn and mild steel. (R3)

447-R. (German.) Artificially Produced Patina. W. Hacker. *Metalloberflache*, v. 13, May 1959, p. 136-138.
(R2r)

448-R.* Palladium Makes Titanium More Resistant to Corrosion. *Modern Metals*. v. 15, May 1959, p. 82.
Improvement in the performance of Ti as a corrosion resistant metal is achieved by small additions of most of the other noble metals—Pt, Re, Ru, Ir, Os, Rh. Mechanical properties are identical with those of unalloyed Ti. (R6g, Q-general, 2-60; Ti-b, *Pd*, SGA-g, *Pt, Re, Ru, Ir, Os, Rh*)

449-R. Evaluation and Control of Sweat Damage. Raymond K. Cohen and Michael Nelson. *Stanford Research Institute*, Technical Report no. 1, May 1, 1958, 123 p.
Evaluation of sweat (condensation) damage to canned goods. Statistical analysis shows that damage claims are increasing and that the increase is related to reduction of weight of the Sn coatings. 91 ref. (R7p, R3p, W12c; ST, *Sn*, 8)

450-R. Reprocessing of Power Reactor Fuels. Third Quarterly Progress Report. Apr. 1 to July 1, 1958. E. I. du Pont de Nemours & Co., Savannah River Laboratory. *U. S. Atomic Energy Commission*, DP-319, Dec. 1958, 15 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.
Zr-clad fuel elements of U-Mo alloy can be dissolved in boiling hydrofluoric-nitric acid mixtures practicably and without excessive corrosion in a dissolver made of wrought 309 Cb stainless steel. (R6g, T11g, A11d; U-b, *Mo*, Zr, 8-66)

451-R. Reprocessing of Power Reactor Fuels. Fourth Quarterly Progress Report. July 1 to Oct. 1, 1958. E. S. Occhipinti. E. I. du Pont de Nemours & Co. Savannah River Laboratory. *U. S. Atomic Energy Commission,* DP-338, Feb. 1959, 12 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Studies of reprocessing fuel elements clad with Zr revealed that increased concentrations of nitric acid increases the dissolution rate of Zr in hydrofluoric nitric acid mixtures with concentrations of hydrofluoric acid less than approximately 1.0 molar. (R6g, T11g, Alld; Zr, 8-66)

452-R. Corrosion Resistance and Mechanical Properties of Aluminum Powder Products. J. E. Draley and W. E. Ruther. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5927, Mar. 1959, 10 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Experimental extrusions were prepared from mixtures of atomized Al alloy and several powdered additives, including SiO_2, $AlPO_4$ and Al_2O_3. Some extrusions failed during corrosion testing in water at 290 and 350° C., others corroded in approximately the same manner as wrought X8001 alloy. The ultimate tensile strengths of these extrusions at 316° C. were approximately $2\frac{1}{2}$ times greater than that of wrought X8001 alloy. (R-general, Q-general; Al-b, *Si, O,* 6-72, 4-51)

453-R.* (French.) Conditions of Fixation of Radioactive Sulphur on the Surface of Polycrystalline Iron and Its Relationship to Crystal Orientation. Bernard Le Boucher, Cesar Libanati and Paul Lacombe. *Comptes Rendus,* v. 248, May 4, 1959, p. 2578-2580.

Aqueous or gaseous fixation of S^{35} on surface of Fe at room temperature is influenced by presence of oxygen at the metal surface or in corrosive medium. When the presence of oxygen is minimal, the amount of S^{35} deposited is function of crystal orientation. (R7k, 1-59, 3-72; Fe, S)

454-R.* (German.) Pipe Systems for Conveying Sulphuric Acid. Gert Westhoff. *Industrie-Anzeiger,* v. 81, May 15, 1959, p. 593-595.

Corrosion and passivation behavior of carbon steel, V2A-E, V4A-E and V16A-E steels, Si alloyed cast iron and Pb in the presence of H_2SO_4 of various concentrations. Effects of temperature and flow velocity of acid. (R6g, R10c, 2-61; Cn, AY, CI, *Si,* Pb, 4-60)

455-R.* (German.) Corrosion and Corrosion Inhibition Tested by Paper-Chromatographic Electrophoresis. J. Frasch. *Werkstoffe und Korrosion,* v. 10, Apr. 1959, p. 218-226.

Method by which the corrosion of Fe, Al, Zn, Cu in various aggressive media can be tested and the effect of inhibitors studied. Effect of phosphatizing on the corrosion behavior. (R6, 2-62, R10b, L14b; Fe, Al, Zn, Cu)

456-R. (German.) Cathodic Protection by Applied Current and Sacrificial Anodes. H. Kaesche. *Werkstoffe und Korrosion,* v. 10, Apr. 1959, p. 227-239.

Regulation of the current density resulting from sacrificial anodes by adequate screening and surrounding the anode with substances of satisfactory conductivity. Determination of the correct density of applied current. Cathodic protection by electroplating. 33 ref. (R10d)

457-R.* (German.) Corrosion Theory for Titanium. W. R. Fischer. *Werkstoffe und Korrosion,* v. 10, Apr. 1959, p. 243-249.

Effect of potential changes on the corrosion behavior of Ti in various aggressive media. 35 ref. (R1a; Ti)

458-R.* (Japanese.) Materials for Turbo-Jet Engines. Sachio Nishiyama. *Metals,* v. 29, Feb. 1959, p. 120-123.

Resistance to stress corrosion of turbine blades was improved by the development of a 12% Cr steel. Low alloy heat resistive steel H-40 "17-22A" S or "17-22A" V has superior characteristics at high temperature and is protected from oxidation and erosion if it is adequately Ni plated. (R1d, R1h, T24b; SS)

459-R.* (Russian.) Electrochemical Corrosion of Titanium. Pt. 2. Effect of Halide Ions and Electrochemical Behavior of Titanium in Sulphuric Acid. N. D. Tomashov and P. M. Al'tovskii. *Zhurnal Fizicheskoi Khimii,* v. 33, no. 3, 1959, p. 610-616.

Corrosion behavior of Ti is determined by the presence of a protective oxide film on its surface. The halide ions Cl' and Br' in H_2SO_4 acid in air or hydrogen atmosphere have a double effect on the corrosion of Ti in that they activate corrosion in dilute acid solution and retard it in a concentrated acid solution. 13 ref. (R6g; Ti)

460-R. Investigation of Cracks in an 18/13/1 Stainless Steel Autoclave. F. Turner

and H. K. Richardson. *United Kingdom Atomic Energy Authority,* IGR-TN/C-1015, Sept. 5, 1958, 10 p.

A stainless steel autoclave used in the corrosion testing of metals in high-temperature water failed by stress corrosion in the vicinity of a weld. Welding had been done by metallic arc using flux coated electrodes and a slag deposit was found at the weld root in the failed area. The corroding medium was the chloride content of the entrapped slag at the weld root. (R1d, X1a; 7-51, SS)

461-R.* (German.) Corrosion Protection for Tankers Carrying Light Oil. R. H. Maas and R. D. Merrick. *Werkstoffe und Korrosion,* v. 10, May 1959, p. 305-311.

Laboratory and field experiments with water soluble inhibitors, oil soluble inhibitors, on samples of various types of alloy steels and on the cathodic protection of tanks. (R10b, R10d, T26q; AY)

462-R.* (German.) Critical Considerations on the Huey-Test. Herbert Zitter. *Werkstoffe und Korrosion,* v. 10, May 1959, p. 311-321.

Corrosion behavior of steel in boiling 65% nitric acid is not always an adequate criterion for its behavior in other substances. (R6n; SS)

463-R.* (German.) Corrosion Protection by Zinc, Cadmium and Tin Platings on Steel. H. W. Dettner. *Werkstoffe und Korrosion,* v. 10, May 1959, p. 321-326.

Behavior of samples with different plating in the salt-spray test and in industrial and tropical atmospheres. 10 ref. (R3; ST, *Zn, Sn, Cd,* 8-62)

464-R.* (Russian.) Corrosion Resistance of Titanium and Titanium Alloys. D. Mendeleeva. *Khimicheskaya Nauka i Promyshlenost,* v. 3, no. 6, 1959, p. 803-807.

Resistance of Ti to corrosion in media of chlorine, chlorides and weak HCl is greater than that of 18-8 stainless steel. The formation on the surface ot Ti of a thin oxide film, due to its density and uniformity, protects the metal from further interaction with outer media. It is attacked by a number of mineral and organic acids. 23 ref. (R6g, R7b; Ti)

465-R.* (Russian.) Effect of Anhydrous Sulphur Dioxide on Wear of Cast Iron. K. S. Ramaiya and V. S. Zavel'skii. *Khimiya i Tekhnologiya Topliva i Masel,* no. 1, 1959, p. 31-34.

Anhydrous SO_2 gas, at temperatures developed by friction of moving pistons in cylinders of internal combustion engines, cause corrosion of ferrous parts and decrease their resistance to wear. (R7k, Q9n; CI)

466-R.* (Russian.) Intensity of Atmospheric Corrosion of Low Carbon Steel at Below Zero Temperatures. I. P. Kharlmanov and G. N. Mekhovshchikova. *Zhurnal Prikladnoi Khimii,* v. 32, no. 2, 1959, p. 443-444.

Study of low carbon steel, stored in the open air for about one year, with a winter temperature of -35° C. showed that corrosion proceeds slowly at this temperature. Corrosion rate during winter is about three times slower than during spring and summer months. 7 ref. (R3; CN-g)

467-R. Study of Corrosion on Various Metals in the Calcining of Aqueous Radioactive Wastes Containing Zirconium Fluoride and Aluminum Nitrate as Bulk Salts. E. J. Tuthill and R. F. Domish. Brookhaven National Laboratory. *U. S. Atomic Energy Commission,* BNL 510 (T-123) May 1959, 45 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Corrosion rates for Illium G, Inconel X, Haynes 25 and Nionel. (R6g; Ni-b, Co-b, *Cr, W*)

468-R.* (French.) Oxidation of Austenitic Steel at High Temperatures. Jacques Benard, Jean Hertz, Yves Jeannin and Jean Moreau. *Comptes Rendus,* v. 248, Apr. 6, 1959, p. 2095-2097.

Oxidation occurs in three stages. In the initial period oxidation is slow and parabolic and the scale is mostly composed of chromium-rich oxides, $FeCr_2O_3$ and Cr_2O_3; in the second period (rapid oxidation) a strong proportion of the iron oxide, especially of Fe_2O_3 alpha appears close to chromite. In the third period the velocity of oxidation suddenly drops and the reaction comes to an end. (R1h, 2-62; SS-e)

469-R.* (French.) Steels and Alloys With High Resistance to Sulphuric and Hydrochoric Acids. Pt. 2. L. Colombier. *Metallurgie et la Construction Mecanique,* v. 91, Apr. 1959, p. 249-259.

Corrosion resistance, technological characteristics and structure of Hastelloys; applications, particularly in chemical industry. (R6g, T29; Ni-b, SGA-g)

470-R.* (Japanese.) Oxide Films of Copper Alloys at High Temperature. Pt. 2. Takemi-

chi Otsu and Shiro Satoh. *Sumitomo Metals*, v. 10, Oct. 1958, p. 241-245.

Electron diffraction study. Films formed at 500 or 600° C. consist of amorphous aluminum oxide and CuO while films formed at 700° C. are composed of gamma aluminum oxide. (R1h, 2-62; Cu-b)

471-R.* (German.) Pitting Corrosion on Passive Electrodes of Unalloyed Steel in Sulphuric Acid Containing Chlorine-Ions. Hans-Jurgen Engell and Nikolas D. Stolica. *Archiv fur das Eisenhuttenwesen*, v. 30, Apr. 1959, p. 239-248.

Steel electrodes are passivated in 1n H_2SO_4 of 25° C. by a potential of +1750 mV. A lower potential is applied to the electrodes in 1n H_2SO_4 and in the presence of Cl-ions. The increase of dissolution current at a constant electrode potential is due to local attacks on the electrode surface by Cl-ions. (R2j, R10c; ST)

472-R.* (German.) Formation of Internal Oxidation Zones in Silver-Indium Alloys. Isolde Dietrich and Lisl Koch. *Zeitschrift fur Metallkunde*, v. 50, Jan. 1959, p. 31-35.

Internal oxidation of Ag-In alloys. The subscales were produced by annealing in air. Etched or polished samples were studied metallographically. The effect of In concentration, annealing time and annealing concentration on the subscale growth. 9 ref. (R2s; Ag-b, In)

473-R. Mechanism of the Iron-Hydrogen Sulfide Reaction at Elevated Temperatures. Fritz Hugli, Charles M. Hudgins, Jr., and Paul Delahay. *American Petroleum Institute, Proceedings*, v. 38, no. 3, 1958, p. 23-30.

Reaction investigated in the 427 to 760° C. range. The law of attack is linear; the rate depends on the partial pressure of hydrogen which acts as a diluent; hydrogen can be replaced by helium at the same partial pressure, the rate remaining unchanged (not near equilibrium). 34 ref. (R7k, 2-62; Fe, *S*)

474-R. Study on Oxidation Resistance of Zirconium. Jin-ichi Takamura and Yasuo Sasaki. *Kyoto University, Engineering Research Institute, Technical Reports*, v. 9, Mar. 1959, 16 p.

23 ref. (R1l; Zr)

475-R. Stress-Corrosion Fracture. Notes from Papers Presented at a Technical Conference on Physical Metallurgy of Stress-Corrosion Fracture, Sponsored by A.I.M.E., Pittsburgh, Apr. 1959. *Metal Progress*, v. 75, June 1959, p. 143-144, 149A, 150, 152, 154, 156.

Concise digests of 14 papers. (R1d)

476-R. Atmospheric Corrosion Resistance and Metal Coatings. John H. Nicholls. *Product Finishing*, v. 12, May 1959, p. 65-67.

Process of depositing Sn on a layer of Cd already present on the steel base. (R3, R10, L17; Sn, Cd, ST)

477-R.* (German.) New Physical and Chemical Properties of High-Purity Metals. G. Chaudron. *Galvanotechnik*, v. 50, Apr. 15, 1959, p. 203-205.

Al and Fe investigated after refining by electrolysis and heating in pure hydrogen, or produced by zone melting. Different behavior of refined and of high-purity metals (after zone melting or heating in hydrogen) in the presence of corrosive agents. (R7b, C23p, C28k; Fe-a, Al-a)

478-R.* (German.) Effect of Degree of Purity on Properties of Aluminum. P. Brenner. *Galvanotechnik*, v. 50, Apr. 15, 1959, p. 205-209.

Al shows an increase in corrosion resistance in proportion to an increase in its purity. The influence of Si additions is very small compared with that of Cu. Zn up to 0.4% does not affect the corrosion resistance of Al. Stress-cossosion of Al-Zn-Mg alloys may be diminished by heat treatment, retarded cooling, and additions of Cr and V. (R2h, R1d, 2-60; Al-a, Al-b, *Zn, Cu, Cr, V, Si*)

479-R.* (German.) Corrosion Under Alpha-Particle Irradiation. K. Lintner. *Galvanotechnik*, v. 50, Apr. 15, 1959, p. 211.

Effect of radiation on corrosion resistance to steam at 50° C. in Al and Al alloys. (R4d, 2-67; Al, SS)

480-R.* (German.) Effect of Cations on Stress-Corrosion of Aluminum Alloys. H. Spindler. *Galvanotechnik*, v. 50, Apr. 15, 1959, p. 211-213.

Stress-corrosion resistance of $AlMg_7$ and Al-Cu-Mg alloys tested in various aqueous solutions of metal chlorides. The composition of distilled water used proved very important in that even slight changes in the content of metal ions showed strong effects. Chlorides of alkali metals, alkaline earth metals and earth metals do not cause stress-corrosion unlike chlorides of Cu, Hg, Fe, Co, Ni, Sn, Pb and Cd. (R1d, Al-b, *Mg, Cu*)

481-R. (Ukrainian.) Corrosion Resistance of Borides of Columbium, Tantalum and Tungsten. K. D. Modylevskaya and G. V. Samsonova. *Ukrainskii Khimicheskii Zhurnal, Akademii Nauk Ukrainskoi SSR,* v. 25, Jan. 1959, p. 55-61.

Borides of Cb, Ta and W have a high resistance to acid and caustic soda corrosion at room temperature. 6 ref. (R-general; Cb, Ta, W, 14-68)

482-R. (Ukrainian.) Effect of Urotropin on Corrosion of Steel. A. S. Afanas'ev, A. P. Brynza and L. I. Gerashutina. *Ukrainskii Khimicheskii Zhurnal, Akademii Nauk Ukrainskoi SSR,* v. 25, Jan. 1959, p. 73-80.

Urotropin (hexa-methylene-tetramine) in weak concentrations is an anodic inhibitor of acid corrosion, while in strong concentrations it stimulates corrosion. Corrosion losses in 0.2N H_2SO_4 of an oxidized and scale-covered steel were considerably decreased by the use of urotropin as an acid inhibitor. 8 ref. (R10b; ST)

483-R.* (French.) Chemical Attack and Oxidation of Oriented Surfaces of Germanium Single Crystals. L. Gouskov and N. Nifontoff. *Comptes Rendus,* v. 248, Mar. 9, 1959, p. 1499-1502.

Microstructure of the faces corresponding to the (001), (110) and (111) planes of Ge single crystals following corrosion by a solution of H_2O_2. (R1h, M27; Ge, 14-61)

484-R.* (Japanese.) Study of Corrosion Fatigue. S. Okamoto and H. Kitagawa. *Japan Society of Mechanical Engineers, Journal,* v. 62, Feb. 1959, p. 204-213.

SS41 steel corroded by water or salt spray and then examined by bending, tension and load tests. (R1e; AY)

485-R.* (Russian.) Mechanism of Metal Corrosion in Narrow Cracks and Crevices. Pt. 4. Magnesium and Magnesium Alloys. I. L. Rosenfeld and I. K. Marshakov. *Zhurnal Fizicheskoi Khimii,* v. 33, no. 2, 1959, p. 411-415.

Metals are subjected to more severe corrosion in cracks than in a conventional electrolyte, the corrosion assuming a more clearly expressed local character. 4 ref. (R1b; Mg-b)

486-R.* (Pamphlet.) Three-Year Interim Report of Corrosion Tests on Metallized Coatings. 7 p. Dec. 1958. American Welding Society, 33 W. 39th St., New York 18, N. Y.

Corrosion protection afforded by metallized Zn and Al coatings applied to low-carbon steel. Data on atmospheric and salt spray testing. (R11j, R3; Zn, Al, 8-67)

487-R.* (Translation—AIP.) Electron-Diffraction Study of the Oxidation of Aluminum Alloys. Iu. D. Chistiakov and M. V. Mal'tsev. *Soviet Physics, Crystallography,* v. 2, no. 5, 1958, p. 620-625.

Effect of additions of Be, Li, Ca, Sr, Ba and Mg on oxidation of Al alloys. 10 ref. (R1h, 2-60; Al-b, *Be, Li, Ca, Sr, Ba, Mg*)

488-R. (Translation—BISI no. 1148.) Stress Corrosion Tests on Mild Steel. A. Hache. *Revue de Metallurgie,* v. 55, July 1958, p. 656-675.

See item 54-R, 1959. (R1d, R3, R4; CN)

489-R.* The Corrosion-Resistance of Welded Nickel-Molybdenum Alloys. G. N. Flint. *Institute of Metals, Journal,* v. 87, May 1959, p. 303-310.

Welded Ni-Mo-Fe alloys of normal commercial purity suffer intergranular corrosion in the zones adjacent to the weld metal when in contact with many industrial media. This susceptibility arises from the presence of carbides precipitated at grain boundaries during cooling after welding. Additions of V and Cb prove beneficial. 9 ref. (R2h; Ni-b, *Mo, Fe,* 7-51)

490-R.* Corrosion Characteristics of Types 304 and 304L Weldments. M. W. Marshall. *Welding Journal,* v. 38, June 1959, p. 247s-250s.

Small amounts of carbides which precipitate in heat affected zones alongside welded joints can adversely affect their performance. This is true with carbon as low as 0.04%, and especially where service conditions are of unknown severity. 7 ref. (R-general, 2-60; SS, 7-51, *C*)

491-R.* Weld Corrosion in Type 316 and 316L Stainless Steels and Related Problems. M. E. Carruthers. *Welding Journal,* v. 38, June 1959, p. 259s-267s.

Weld corrosion deficiencies are overcome by post annealing or stabilizing heat treatment. Preferential attack at delta-ferrite boundaries was associated with all the weld failures studied. Heat affected zones in Type 316 sheets and plates failed by intergranular corrosion in several cases. (R6g, R2h, 2-64; SS, 7-51)

492-R.* Duplex-Type Nickel Plate Protects Zinc Die Castings. *Iron Age,* v. 183, June 11, 1959, p. 132-133.

Plating process adjusted to specific operating conditions to maintain required brightness and adhesion. With semi-bright Ni, corrosive materials do not penetrate or corrode. (R3, L17; Zn-b, *Ni*, 5-61)

493-R.* (French.) Study of Stress-Corrosion of 18-8 Type Austenitic Steels. Joseph Hochmann. *Comptes Rendus*, v. 248, May 25, 1959, p. 2999-3000.

Study of influence of surface condition on corrosion resistance. Pickled and polished specimens broke after periods of time ranging from 2 to 24 hr. No cracking was noted in sand-blasted specimen after 150 hr. (R1d; SS)

494-R. (Russian.) Emission of Electrons and Hydrogen Peroxide Formation in the Corrosion of Metals. I. L. Roich. *Zhurnal Fizicheskoĭ Khimii*, v. 33, no, 2, 1959, p. 288-293.

The relationship of electron emission and H_2O_2 formation in the oxidation of Al. 22 ref. (R1h, 2-67; Al)

495-R.* The Corrosion Resistance of Aluminium and Aluminium Alloys. F. C. Porter. *Corrosion Prevention and Control*, v. 6, May 1959, p. 36-44.

Atmospheric resistance, chemical resistance, effective physical factors, contact with other materials, mechanical and design factors, methods of protection, and Al as a coating metal. 17 ref. (R-general; Al)

496-R.* The Passivation of Iron and Steel in Chromate Solutions. A. H. Kingsbury. *Australian Institute of Metals, Journal*, v. 4, May 1959, p. 12-18.

It is suggested that both chromate ion adsorption and oxide film formation take part in the passivation process. A layer of chromate ions is first adsorbed onto the surface. This adsorbed layer obstructs the electrode processes involved in corrosion and acts as a reservoir of oxidants in intimate contact with the surface and as a shield against ions which could interfere with the orderly growth of an oxide film beneath it. Oxidation by chromate ions (and oxygen in aerated solution) then proceeds under the adsorbed layer. 27 ref. (R10c; ST, Fe)

497-R.* Latest Developments in Materials to Resist Chemical Corrosion. Spencer W. Shepard. *American Society of Mechanical Engineers*, Paper no. 59-MD-7, 1959, 13 p.

Availability, fabricability, mechanical properties and corrosion resistance of stainless steels, cast irons, Al, Ni, Cb, V, Mo, Ti, Mg, Zr, U and Cu alloys. Plastics, cermets and organic, ceramic and metallic coatings. 100 ref. (R6, R7, L-general, Q-general; SGA-g)

498-R.* (German.) Scaling of Pure Iron-Silicon Alloys in Oxygen. Norbert G. Schmahl, Hans Baumann and Hermann Schenck. *Archiv fur das Eisenhuttenwesen*, v. 30, May 1959, p. 267-273.

Scaling of Fe-Si alloys was tested on specimens with Si content varying from 0.03-3.63% by melting in crucibles of pure silica under an argon atmosphere. A considerable decrease in the logarithms of scaling constants appeared above 1% Si. 30 ref. (R2q; Fe-b, *Si*)

499-R.* (German.) Adherence of Scale on Steel. Friedrich-Karl Peters and Hans Juergen Engell. *Archiv fur das Eisenhuttenwesen*, v. 30, May 1959, p. 275-282.

Effect of scale thickness, chemical composition of steel and oxidizing temperature on the adhesive strength. Increase in the thickness of scale layer is accompanied by a decrease in the adhesive strength. 21 ref. (R2q, 2-60; ST)

500-R.* (German.) Effect of Corrosion Produced by Aqueous Solutions of Hydrogen Sulphide on the Stress-Corrosion Cracking of Steel. Friedrich Karl Naumann and Wolfhard Carius. *Archiv fur das Eisenhuttenwesen*, v. 30, May 1959, p. 283-292.

Atomic hydrogen separates during cathodic reaction. This separation is not caused by ions discharge but results directly from the reduction of dissolved hydrogen sulphide molecules. 19 ref. (R1d, Q26, R11m; ST)

501-R.* (German.) Intergranular Corrosion of Austenitic Chromium-Nickel Steel After Long-Time Stress Between 450 and 800° C. Hans Joachim Wiester and Guenther Pier. *Archiv fur das Eisenhuttenwesen*, v. 30, May 1959, p. 293-297.

Resistance to intergranular corrosion of 11 high-alloy austenitic Cr-Ni steels with 18% Cr and 9% Ni, with or without Ti or Cb; 18% Cr, 10% Ni and 2% Mo, with or without Ti or Cb; 16% Cr, 13% Ni with Mo, V and Cb; 16% Cr, 16% Ni and 2% Mo with Cb, was tested after quenching from various temperatures between 950 and 1300° C. and after heat treatment. (R2h, 2-64, 2-60; SS-e, *Cr, Ni, Mo, V, Ti, Cb*)

502-R.* (German.) Precipitation in Austenitic Chromium-Nickel Steels and Its Effect on Intergranular Corrosion. Hans Joachim Wiester, Hans-Jurgen Schueller and Paul Schwaab. *Archiv fur das Eisenhuttenwesen,* v. 30, May 1959, p. 299-309.

Electron microscopic and electron diffraction investigation of precipitation and the tendency to intergranular corrosion of two austenitic Cr-Ni steels. Intergranular corrosion susceptibility is always connected with the appearance of chromium carbides $M_{23}C_6$ on grain boundaries. 29 ref. (R2h, N8r; SS-e)

503-R.* (German.) The Tantalum-Oxygen System. Erich Gebhardt and Hans-Dieter Seghezzi. *Zeitschrift fur Metallkunde,* v. 50, May 1959, p. 248-257.

Ta was oxidized by pure oxygen at 700-1420° C. under pressure. Three simultaneous reactions occur—formation of an outer oxide layer of Ta_2O_5, growth of an oxide subscale of laminated structure in cubic Ta and dissolution of oxygen in Ta. 33 ref. (R1h; Ta)

504-R. Internal Cathodic Protection. Pt. 3. The Application of Cathodic Protection to the Inner Walls of a Long Pipeline of Circular Cross-Section. C. Plumpton and C. Wilson. *Corrosion Prevention & Control,* v. 6, May 1959, p. 53-58.

(R10d, T26r; ST)

505-R.* (Italian.) Solubilization of Arsenic, Lead and Antimony Contents of Tin. Giulio Milazzo. *Chimica e l'Industria,* v. 41, Feb. 1959, p. 128-131.

Possibility of contamination of toxic elements present in Sn of process food containers investigated in Sn-As, Sn-Sb and Sn-Pb alloys, using H_2SO_4, NaOH, tartaric, citric and oxalic acids in solution. As and Sb did not pass into solution while Pb did in small quantities. 8 ref. (R7n; Sn, Pb, Sb, As)

506-R.* Oxidation Kinetics in the Case of Ageing Oxide Films. J. L. Meijerling and M. L. Verheijke. *Acta Metallurgica,* v. 7, May 1959, p. 331-338.

The cubic relationship for the oxidation of CuO in the 800-1000° C. range is confirmed together with the abnormally low temperature coefficient of the rate constant. Experiments show that aging effects in the CuO layer must be responsible for this behavior. Calculations of the oxidation kinetics are given for the case when the permeability (or its reciprocal) of the oxide formed changes exponentially with age. 20 ref. (R1h, N7a; Cu)

507-R.* (German.) Pitting Corrosion of Austenitic Chromium-Nickel Steels. H. Graefen. *Metalloberflache,* v. 13, June 1959, p. 161-166.

Boiling experiments, measurement of potential-time and amperage-voltage curves. Development of pitting corrosion and its relationship to stress and intergranular corrosion. 10 ref. (R2j, R2h, R1d; SS-e)

508-R.* (German.) Corrosion of Boilers. K. Kovacs. *Metalloberflache,* v. 13, June 1959, p. 167-168.

Steam corrosion lowers the resistance of steel surfaces to further development of corrosion. Protective layer of magnetite is formed only up to 570° C. and is then replaced by wustite which has a reduced protective capacity. 5 ref. (R4d, T26q; ST)

509-R. Thorex Plant Corrosion Studies: Pt. 1. Corrosion of Types 304L and 309SCb Stainless Steel During Production and Development Periods. J. L. English. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2673, May 12, 1959, 73 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.25.

Both types of steel exhibited comparable corrosion resistance in all environments. The area of most severe corrosion attack was the vapor phase of the feed adjustment tank operated at 155° C. maximum. (R6g; SS)

510-R.* The Effect of Sigma Phase vs. Chromium Carbides on the Intergranular Corrosion of Type 316 and 316L Stainless Steel. Pt. II. Donald Warren. *Corrosion,* v. 15, May 1959, p. 17-28.

Tests of steels in 14 different acids including nitric, nitric-hydrofloric and weaker acids. 10 ref. (R2h, R6g; SS)

511-R.* Summary of Questionnaire—Replies on Corrosion in HF Alkylation Units. *Corrosion,* v. 15, May 1959, p. 33-36.

Study of corrosion of various component parts in terms of uniform corrosion, pitting, grooving, weld decaying, hydrogen attack and stress-corrosion cracking. 14 ref. (R1d, R2j, T29n)

512-R.* Corrosion Prevention in Tankers and Storage Tanks by Fogging or Flotation With an Inhibitor Solution. J. C. D. Oosterhout, M. E. Stanley and W. S. Quimby. *Corrosion,* v. 15, May 1959, p. 37-40.

Proper amount of inhibitor for flotation, proper fogging procedure, time and dispersant. 8 ref. (R10b)

513-R.* Study of Chemical Factors Affecting Corrosion of Carbon Steel AISI 1020 by Liquid-Phase Fuming Nitric Acid. John B. Rittenhouse and David M. Mason. *Corrosion,* v. 15, May 1959, p. 41-46.

Corrosion rates obtained by measuring change in electrical resistance of the tube with time. Rates decreased with increasing nitrogen dioxide concentration and with increased water content. Passivity was produced by the formation of an oxide layer. 25 ref. (R6g; CN)

514-R.* Laboratory Methods for Determining Corrosion Rates Under Heat Flux Conditions. A. O. Fisher and F. L. Whitney, Jr. *Corrosion,* v. 15, May 1959, p. 53-57.

Comparison of three techniques prove advantage of a modified disk-heat flux technique. Skin temperature of metals is major controlling factor in corrosion, not the amount of heat flowing through the metal. (R6, R11)

515-R.* Influence of Temperature on Corrosion Fatigue. I. Cornet and Simcha Golan. *Corrosion,* v. 15, May 1959, p. 58-64.

Test equipment, results from two types of steel between 80 and 180° F. in 2.5% NaCl solution. Better corrosion fatigue properties exist at 180° F. than at room temperature. 32 ref. (R1e, 2-61; ST)

516-R.* Erosion of Materials by Cavitation Attack. D. Peckner. *Corrosion,* v. 15, May 1959, p. 65-70.

Relationship between cavitation attack and erosion, with causes and possible mechanism of cavitation attack. Various test methods and relative erosion resistance of several alloys. 36 ref. (R1c, R2m)

517-R.* Acetylenic Alcohol-Inhibited Pickling Bath as a Pretreatment Prior to Linding Steel Pipe. K. N. Edwards, L. J. Nowacki and E. R. Meuller. *Corrosion,* v. 15, May 1959, p. 71-74.

Bath provides substrate which increases corrosion inhibitation of epoxy-phenolic system. Effects of various metal surface pretreatments and effect of Zn. 14 ref. (R10b, L12g; ST, 4-60)

518-R.* (German.) Choice of Materials for Corrosion Resistant Welded Constructions: Stainless Steels of Low Carbon Content or Stabilized Steels. Gunnar Lilljekvist. *Chemische Rundschau,* Beilage 3, v. 12, June 1, 1959, p. 313-316.

Corrosion behavior of various Ti and Cb- stabilized and unstabilized 18-8 Cr-Ni-steels, with low carbon content, in 6% HNO_3. Corrosive attack, together with the formation of carbides during welding, are influenced by carbon content. Stabilized steels have slightly higher mechanical properties. (R-general, K-general, 2-60; SS, *C, Cb, Ti,* 7-51)

519-R.* (German.) Chromic Acid Passivation of Zinc With the Chromic Acid Ester of Tertiary Butyl Alcohol. L. Cerveny. *Czechoslovak Academy of Science, Collection of Czechoslovak Chemical Communications,* v. 24, May 1959, p. 1400-1407.

Samples of galvanized steel sheet exposed to vapors of the passivation agent under reduced air pressure. Corrosion resistance depends on the time the samples are exposed to the agent. 24 ref. (R10c; ST, 8-62, *Zn*)

520-R.* (German.) Corrosion by Washing Compounds, With Special Reference to "Syndets". H. Stupel and F. Koch. *Seifen, Ole, Fette, Wachse,* v. 85, May 27, 1959, p. 311-315.

Corrosive effects of soaps and washing compounds on stainless steel, copper, brass, bronze, Sn, Zn, Al and other alloys. (R7p; SS, Cu, Cu-s, Cu-n, Sn, Zn, Al-b)

521-R.* (German.) Effect of Inhibitors on the Corrosion of Iron. H. Grubitsch and T. Sneck. *Teknilisen Kemian Aikakauslihti (Helsinki),* v. 16, Apr. 15, 1959, p. 203-216.

In a cell with a diaphragm between anode and cathode, a steady current of nitrogen is supplied to the anolyte while an air current bubbles through the catholyte. Urotropine acts in neutral electrolytes as an anodic inhibitor and, in acids, as a cathodic inhibitor. 16 ref. (R10b; Fe)

522-R.* (German.) Nuclei Formation in Supersaturated Salt Solutions During the Anodic Passivation of Cadmium, Zinc and Lead. W. Lorenz. *Zeitschrift fur Physikalische Chemie,* v. 20, Apr. 1959, p. 95-102.

Experiments with electrodes in dilute H_2SO_4 and HCl. Relationships between the concentration of metal salt in solution and anodic passivation. (R10c; Cd, Zn, Pb)

523-R.* (Hungarian.) Scale Resistant Alloys. R. Radtke. *Kohaszati Lapok,* v. 14, May 1959, p. 127-131.

Ferritic-base cast alloys in relation to scale formation. The influence of various alloying elements is defined. Si is claimed to have a good effect on scale prevention. Protective layers of spinell-structure are recommended. (R2q; CN, 2-60)

524-R.* (French.) Biological Factors Influencing Sea Water Corrosion. Bernard Callame. *Corrosion et Anticorrosion,* v. 7, May 1959, p. 173-177.

Oxygen enrichment and elevation of the pH-number by the photosynthesis of green plants. Reduction of oxygen content and of the pH-number by animal metabolism. Formation of H_2S and CO_2 and hydrogen consumption by anaerobes. (R4b)

525-R.* (French.) Sea Water Resistant Steels. M. Thivin. *Corrosion et Anticorrosion,* v. 7, May 1959, p. 195-202.

Corrosion resistance of a low-alloy steel and martensitic, austenitic-ferritic and austenitic stainless steels increases with the Cr and Mo content. Austenic-ferritic steels showed best results. Behavior of steel in the presence of bronze. (R4b, 2-60; AY, SS, *Mo, Cr,* Cu-s, SGA-g)

526-R.* (French.) Corrosion Protection by Paint and by Galvanizing. P. Morisset. *Corrosion et Anticorrosion,* v. 7, May 1959, p. 203-220.

Tests with galvanized and painted steel sheet in artificially produced atmospheres. 9 ref. (R3, ST, 4-53, 8-70, 8-65, 8-62, *Zn*)

527-R.* (French.) Effect of Impurities, Minor Additions and an Excess of Certain Elements on the Properties of Aluminum and Aluminum Alloys. Marcel Tournaire and Martial Renouard. *Revue de Metallurgie,* v. 56, May 1959, p. 435-442.

Effect of O, H, Ca, Pb, Na, Ti, B, C, V, Zr, Mg, Be and Mn on corrosion, brittleness, texture, recrystallization, cracking and hardness. 22 ref. (R-general, Q26s, Q29n, N5, 2-60; Al-b, *O, H, Ca, Pb, Na, Ti, B, C, V, Zr, Mg, Be, Mn*)

528-R.* (German.) Kinetics of the Dissolution of Metals in Acids and Bases. Ivan Sekerka. *Werkstoffe und Korrosion,* v. 10, June 1959, p. 303-385.

Determination of the dissolution velocities of Zn, Fe, Mg, Cu and Al in H_2SO_4, HCl, NaOH and NH_4OH of various concentrations. 3 ref. (R6; Zn, Fe, Mg, Cu, Al)

529-R.* (German.) Corrosion in SO_2-Contaminated Humid Air. K. Barton and E. Beranek. *Werkstoffe und Korrosion,* v. 10, June 1959, p. 377-383.

Fe, Cu, Zn and Al were exposed to an atmosphere with 100% relative humidity, 0.05 vol. % SO_2 and traces of HCl, The corrosion velocity is determined by the H_2SO_3 and H_2SO_4 concentration influencing the pH value, and also by the properties of corrosion products. 14 ref. (R3n; Fe, Cu, Zn, Al)

530-R.* (Swedish.) Corrosion Protection by Electroplating. K. S. Soderberg. *Industriell Teknik,* v. 87, no. 8, Apr. 15, 1959, p. 225-230.

Protective effect of Zn, Pb, Ni. Ni-Sn alloy, Cr and Cr-Ni plate. 20 ref. (R3; 8-62, Zn, Pb, Ni, Sn, Cr)

531-R.* Five Case Histories on Corrosion Problems in Nitric Acid and Ammonium Nitrate Production and Storage. D. M. Carr. *Corrosion,* v. 15, June 1959, p. 99-100.

Corrosion of Al and stainless steel tubes and tanks. (R6g, T26q; SS, Al-b, 4-60)

532-R.* Rates of Dissolution and Passivation of Hafnium-free Zirconium in Hydrofluoric Acid. M. E. Straumanis, W. J. James and A. S. Neiman. *Corrosion,* v. 15, June 1959, p. 286t-290t.

Dissolution rates and potentials of Zr in hydrofluoric acid. Effect of nitric acid and fluoride additions. Nature of passivating films. 23 ref. (R6g, R10c; Zr)

533-R.* Performance of Organic Coatings in Tropical Environments. A. L. Alexander, B. W. Forgeson, and C. R. Southwell. *Corrosion,* v. 15, June 1959, p. 291t-294t.

Ability of more than 350 coating systems to protect metal during tropical exposures of up to 7 years, including continuous and mean tide immersion in sea water, continuous immersion in fresh water and continuous immersion in marine and inland atmospheres. 5 ref. (R3s, R4, L26)

534-R.* Stress-Corrosion Crack Paths in Alpha Aluminum Bronze in Ammonia and Steam Atmospheres. J. F. Klement, R. E. Maersch and P. A. Tully. *Corrosion,* v. 15, June 1959, p. 295t-298t.

Cracking in bronze of 5-8% Al exposed to ammonia and steam atmospheres while stressed to 80% yield strength. 5 ref. (R1d; Cu-s, *Al*)

535-R.* Factors Affecting the Corrosion of Steel by Oil-Brine-Hydrogen Sulfide Mixtures. Donald W. Shannon and James E. Boggs. *Corrosion*, v. 15, June 1959, p. 299t-302t.

Effect of exposure time and of hydrogen sulfide and sodium chloride concentrations. (R4h, R6, R7d; ST)

536-R.* An Analytical Procedure for Testing the Effectiveness of Hydrogen Sulfide Corrosion Inhibitors. Donald W. Shannon and James E. Boggs. *Corrosion*, v. 15, June 1959, p. 303t-306t.

Conditions and materials for dynamic weight loss tests. Corrosion of steel coupons in presence of inhibitors of various types. 3 ref. (R11a, R10e, R6; CN-g)

537-R.* A Laboratory Method for Evaluating Corrosion Inhibitors for Secondary Recovery. T. R. Newman. *Corrosion*, v. 15, June 1959, p. 307t-310t.

Corrosion of mild steel coupons by flowing brine solution. Effect of dissolved oxygen, hydrogen sulfide, dissolved solids and pH on corrosivity. Performance of commercial water flood inhibitors. (R10b, R6, R4h; CN-g)

538-R.* Evaluation of Protective Coatings for Ship Bottoms. J. R. Brown. *Corrosion*, v. 15, June 1959, p. 315t-320t.

Comparison of coating systems on mild steel test panels in static sea water immersion using d-c. resistance techniques. Effect of specimen preparation on performance. 9 ref. (R4b, 1-60, R11h, L26n, T22g; CN, 8-70)

539-R.* Evaluation of Organic Corrosion Inhibitors for Special Applications in Petroleum Refining. R. B. Thompson, R. F. Stedman, Charles Wankat and R. C. Henry. *Corrosion*, v. 15, June 1959, p. 321t-326t.

Test procedures used for evaluation of oil-soluble and water-soluble corrosion inhibitors for steel in acid media and admiralty metals in alkaline environments. 5 ref. (R10b, R11a, R7d; ST, Cu-b, *Zn, Sn*)

540-R.* Effect of Velocity on Life Expectancy of Steel Pipelines in Commercial Strengths of Sulfuric Acid. T. F. Degnan. *Corrosion*, v. 15, June 1959, p. 326t.

Service life of carbon steel pipe used for handling acid in the range of 93-99% at ambient temperatures. (R6g, T26r; CN, 4-60)

541-R.* Corrosion of Die Casting Alloys in Detergent Solutions Measured by Electrical Resistance Method. H. J. Smith and R. L. Hadley. *Corrosion*, v. 15, June 1959, p. 327t-330t.

Resistance of Al and Zn die cast materials to corrosion in tap water, detergent solution and detergent solution plus bleach. 6 ref. (R11h, R6, R7m; Zn-b, Al-b, 5-61)

542-R.* Progress Report on Inhibiting the Corrosion of Steel in a Reinforced Concrete Bridge. R. F. Stratfull. *Corrosion*, v. 15, June 1959, p. 331t-334t.

Control methods including application of cathodic protection, addition of capillary water to concrete to produce oxygen starvation and use of paints to produce moisture equalization within the concrete. 7 ref. (R10, R10d, T26p; ST)

543-R.* (Czech.) Influence of Anthocyanins on the Corrosion of Tin Plate. Vilem Šimak. *Obaly*, no. 4, July-Aug. 1959, p. 124-126.

To reconstruct the processes occurring in food preservation, a steel electrode and a Sn electrode were short-circuited and exposed to anthocyanins. Corrosion of the Sn electrode increases with the anthocyanin concentration. 8 ref. (R7n; ST, 4-53, 8-62, *Sn*)

544-R.* (German.) Corrosion by Non-Drying Oils With Special Reference to Modern Lubricants and Preservatives. A. Bukowiecki. *Schweizer Archiv*, v. 25, Apr. 1959, p. 126-143.

Effects of the presence of water and salts. Protection of metals by thin oil films. 245 ref. (R7e, R10f; ST, NM-h)

545-R.* (French.) Acid Resistant Casting Alloys With Approximately 16% Silicon. A. Charmeau. *Metallurgie et la Construction Mecanique*, v. 91, June 1959, p. 441-457.

Behavior of Fe-Si alloys and Si alloys in the presence of various inorganic and organic corrosive agents. (R6, R7, 2-60; Fe-b, *Si*, SGA-g)

546-R.* (German.) Stainless Steel in Architecture. G. Hebbel, P. A. Huppertz. *Industrie-Anzeiger*, v. 81, June 19, 1959, p. 747-750.

Composition and properties of several German stainless steels. Potential of Fe-Cr alloys in air and rate of corrosion as a function of Cr content. (R3, T26r, 17-57, 2-60; SS, *Mn, Mo*)

547-R.* (German.) Corrosion Resistance of Metals in the Presence of Nonaqueous Liquids. A. Bukowiecky. *Metall,* v. 13, June 1959, p. 536-540.

Metallic corrosion initiated by purified, dehydrogenized liquids, by nonaqueous solvents of corroding agents and by water present in nonaqueous liquids. 36 ref. (R7)

548-R.* (German.) Oxide Layers on Molybdenum. H. J. Booss. *Metall,* v. 13, June 1959, p. 555-559.

Oxidation of Mo strip between 450 and 500° C. is influened by preparation (annealing and chemical attack). Structural changes and surface roughening increase the rate of oxidation. Pitting at 460-470° C. is caused by a structural transformation of the outer oxide layer. 16 ref. (R1h, R2j, 3-70; Mo, 4-53)

549-R. Solving Corrosion Problems at Electrical Generating Plants. L. Baskette. *Corrosion,* v. 15, June 1959, p. 95-96.

Corrosion of heat exchanger tubes, condensers, ground water wells, tower footings, fences and structural steel. (R3p, R4a, W11; ST, Cu-b, Al-b)

550-R. (Russian.) Mechanism of Corrosion Retardation by the Application of External Current and the Concurrent Discharge by Means of Zinc and Hydrogen Ions. A. I. Levin and V. I. Falicheva. *Zhurnal Fizicheskoi Khimii,* v. 23, Apr. 1959, p. 933-935.

15 ref. (R10d)

551-R.* Corrosion Resistance of Type 347 Stainless After "Sensitizing" Heat Treatments. Hilmer F. Ebling and Merrill A. Scheil. *Metal Progress,* v. 76, July 1959, p. 94-97, 96-B.

Corrosion rates in boiling HNO_3 after a systematic series of long heatings between 700 and 1500° F. can be plotted in TTS (time-temperature-sensitization) diagrams to avoid fabrication practices which would produce unexpected damage from corrosive liquids. (R11, R2h; SS)

552-R. (Norwegian.) Corrosion Testing With Aerosols. W. Hess. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 18, no. 10, 1959, p. 161-164.

Instruments and testing methods. (R11, 1-53)

553-R.* A Lead-Tin-Barium Alloy for the Positive Grids of Lead/Acid Batteries. N. L. Parr, A. Muscott and A. J. Crocker. *Institute of Metals, Journal,* v. 87, June 1959, p. 321-329.

Suitability of such castings for battery grids is invalidated by a susceptibility to rapid anodic stress-corrosion at grain boundaries unless Sn is also present in sufficient quantity to impart good corrosion resistance. Experiments indicate that 3-3.5% Sn can be recommended as a suitable addition to a 0.1% barium alloy. (R1d, 2-60; Pb-b, *Sn, Ba,* 5)

554-R.* (German.) Scale Formation on Iron-Aluminum Alloys in Oxygen. Norbert G. Schmahl, Hans Baumann and Hermann Schenck. *Archiv fur das Eisenhuttenwesen,* v. 30, June 1959, p. 345-349.

Melts of varying composition exposed to oxygen. Scaling mechanism is influenced by the Al content. 17 ref. (R2q, R1h, 2-60; Fe-b, *Al*)

555-R.* (German.) Oxidation of Iron-Molybdenum Alloys by Air at Elevated Temperatures. Alfred Rahmel, Willi Jager and Klaus Becker. *Archiv fur das Eisenhuttenwesen,* v. 30, June 1959, p. 351-360.

Retarding effect of Mo content on oxidation. Composition of surface layers after oxidation at different temperatures. 41 ref. (R1h, 2-60, 2-62; Fe-b, *Mo*)

556-R.* (Report.) Corrosion and Deposits in Coal and Oil-Fired Boilers and Gas Turbines. Battelle Memorial Institute. Report of ASME Research Committee on Corrosion and Deposits from Combustion Gases. American Society of Mechanical Engineers, 29 W. 39 St., New York 18, N. Y. 1959, 198 p.

Mineral constitutents in coal and heavy-fuel oil, and their behavior during combustion; the action of SO_2 and SO_3; physical aspects of deposition; origin and composition of deposits and their prevention; corrosion of metals exposed to combustion gases below 400° F. and removal of solids from combustion gases turbines or air heaters. 349 ref. (R7d, R7k, W11m, T26q)

557-R. (Translation--Brutcher no. 4570.) Change in Corrosion Resistance of Nitrided Stainless Steels. A. G. Andreeva and L. Ya. Gurvich. *Metallovedenie i Termicheskaya*

Obrabotka Metallov, v. 5, Apr. 1959, p. 34-40.

Changes in resistance of nitrided Cr-Ni-W-Mo and Cr-Ni-W steels, depend on the depth of the innermost layer and correspond to the magnitude of electrode potential. There are four zones with definite corrosive properties, each having a corresponding electrode potential. (R-general, J28k; SS, *W, Mo*)

558-R. (Translation--Brutcher no. 4571.) Corrosion of Stainless Steel Welds in Acid Solutions. M. M. Kuptepov and A. S. Gryasanova. *Metallovedenie i Termicheskaya Obrabotka Metallov*, v. 5, Apr. 1959, p. 41-44.

Study of argon-arc welded stainless steel samples hardened at 1050° C., water quenched, stabilized for 3 hr. at 850° C. and air cooled showed that the greatest corrosion resistance was in welds that were not heat treated or hardened. Short-time tempering of heat treated samples considerably increases the corrosion rate. 8 ref. (R6g, 2-60, 2-64; 7-51, SS)

559-R.* Mechanism of Stress-Corrosion Cracking. *Corrosion*, v. 15, July 1959, p. 106-108, 110.

Stress-corrosion cracking in AZ31B Mg alloy in an aqueous solution of 3.5% sodium chloride plus 2.0% potassium chromate. Specimens immersed in the corrodent and extending at an average rate of 500 ± 100 micro-in. per in. per min., one min. after the stress was applied generally failed within 5 min. For slower rates, specimens did not fail in 1000 min. Cracking was stopped by application of a cathodic current of 0.5 milliamp. per sq. cm. of exposed area. (R1d, Q26q; Mg-b)

560-R.* Comparisons of Wagner's Analysis of Cathodic Protection With Operating Data for Ships. J. H. Greenblatt. *Corrosion*, v. 15, July 1959, p. 339t-340t.

The predicted values of the key parameters in Wagner's analytical expression for the conditions for cathodic protection are compared with values found empirically from operating experience in the protection of ships. Agreement is good over certain ranges of the key parameters. Possible reasons are suggested for the occurrence of discrepancies in values. 8 ref. (R10d, T22g)

561-R.* Corrosion Resistance of Titanium and Zirconium in Chemical Plant Exposures. P. J. Gegner and W. L. Wilson. *Corrosion*, v. 15, July 1959, p. 341t-350t.

Ti possesses low or, in many cases, nil corrosion rates in such varied exposures as wet chlorine gas, hypochlorous acid, sodium and calcium hypochlorites, sodium and potassium chlorides, sea water and a number of solutions containing wet chlorine. It is, however, very resistant to many concentrations of calcium chloride, sodium and potassium hydroxides, nitric acid and chlorine-saturated sulfuric acid. Zr shows low corrosion rates in nitric acid, sodium and potassium hydroxides, hydrochloric acid and dry chlorine. 21 ref. (R6, T29; Ti, Zr)

562-R.* Corrosion of Types 316 and 317 Stainless Steel by 75% and 85% Phosphoric Acid. Albert R. Morgan, Jr. *Corrosion*, v. 15, July 1959, p. 351t-354t.

Corrosion rates were found to be considerably affected by acid temperatures and by testing conditions. Plant data showed 316 and 316L to be acceptable only at 100° C. or less. Type 317 proved more resistant than 316L in both pilot and plant tests. Aerated and agitated samples showed lower corrosion rates than stagnant samples. (R6; SS)

563-R.* Mechanism of Stress-Corrosion of Austenitic Stainless Steels in Chloride Waters. R. W. Staehle, F. H. Beck and M. G. Fontana. *Corrosion*, v. 15, July 1959, p. 373t-381t.

Stress-corrosion cracking of austenitic stainless steels studied under various conditions of stress, chloride concentration, complete immersion of specimens, intermittent wetting and drying and presence of oxygen. Stress-corrosion cracking will occur at stresses as low as 2,000 psi. at 50 ppm. NaCl. A three-dimensional analysis of stress-corrosion cracks is presented. 13 ref. (R1d, Q26q; SS-e)

564-R.* Corrosion of Reinforcing Steel in Concrete in Marine Atmospheres. D. A. Lewis and W. J. Copenhagen. *Corrosion*, v. 15, July 1959, p. 382t-388t.

Corrosion reaction proceeds by electrochemical mechanisms whose emf.'s derive from differences in pH, aeration or other factors but whose severity is influenced mainly by presence of sodium chloride in the concrete. Significant factors are cover to the steel, protective coatings to the mortar, and the curing, cement content and water cement ratio of the mortar. 17 ref. (R3p; ST)

565-R.* Cathodic Protection of Lead Cable Sheath. W. H. Bruckner and Ole G. Jansson. *Corrosion,* v. 15, July 1959, p. 389t-394t.

Corrosion of Pb can occur while under cathodic protection when the potential is not sufficiently negative to prevent corrosion in the environment. Corrosion of Pb has also been demonstrated upon cessation of cathodic protection when the environment had a high pH resulting from previous cathodic protection. 4 ref. (R10d, T1b; Pb)

566-R.* (Russian.) Radioactive Tracer Studies of the Corrosion Resistance of Solid Solutions. Pt. 2. Magnesium-Cadmium System. N. N. Gratsianskii and P. F. Kaluzhnaya. *Zhurnal Fizicheskoi Khimii,* v. 33, May 1959, p. 997-1001.

Determination of the formation of a surface layer on Mg-Cd alloys in 0.1N H_2SO_4 by means of radioisotope Rb^{86} Cd^{115} isotope was employed to study corrosion rate. (R6g, R11, 1-59; Mg-b, *Cd,* 14-67)

567-R.* (Russian.) Sodium Salicylate as a Corrosion Inhibitor in Neutral Media. E. V. Bogatyreva and S. A. Balezin. *Zhurnal Prikladnoi Khimii,* v. 22, May 1959, p. 1071-1076.

$Na_7H_5O_3$ retards corrosion in distilled and tap water for many steels. Minimum protective concentrations are given together with optimum temperatures. 7 ref. (R10b, 2-66; CN)

568-R.* (Russian.) Corrosion Resistance of Several Galvanic Alloys Under Conditions of Tropical Heat and Humidity. N. P. Fedot'ev, P. M. Byacheslavov, E. G. Kruglova and S. Ya. Grilikhes. *Zhurnal Prikladnoi Khimii,* v. 22, May 1959, p. 1165-1167.

Double and triple-coated galvanic alloys as well as Zn and Cd coatings proved to be corrosion resistant. Data for Zn-Cd, Sn-Zn, Sn-Cd, Cu-Sn, Cu-Sn-Zn and Cu-Sn-Cd alloys. (R3s; Zn-b, Sn-b, Cu-b, *Cd,* SGA-g)

569-R.* (Russian.) Corrosion of Metals in Thionyl Chloride. V. A. Tomov, Yu. A. Babkin and I. M. Balandin. *Zhurnal Prikladnoi Khimii,* v. 22, May 1959, p. 1167-1169.

E.T. 461 (steel) possesses a high corrosion resistance, the rate being 0.01 mm. per year. An effective and cheaper substitute is provided by 18-8 Cr-Ni-Ti steel possessing high corrosion resistance (0.02 mm. per year) high plasticity, good weldability and high impact strength. (R7p, K9s, Q-general; SS, *Ti*)

570-R. Corrosion Protection Features of the Hyperion Ocean Outfall. Harry J. Keeling. *Corrosion,* v. 15, July 1959, p. 363t-368t.

Planning, design and installation of corrosion protection facilities to provide 100-year design life for a 7-mile, 22-in. steel pipe sewer outfall, the outer end of which is in ocean water 340 ft. deep. 6 ref. (R-general, T26r; ST)

571-R. Pitting Corrosion of Aluminium in Sodium Chloride Solutions. T. Hagyard and J. R. Santhiapillai. *Journal of Applied Chemistry,* v. 9, June 1959, p. 323-330.

Anodic corrosion process in an artificial pit in Al undergoing active corrosion in dilute sodium chloride examined by pH, potential measurements and Schlieren observations. (R2j; Al)

572-R.* Oxidation Resistance of Binary Chromium-Base Alloys. E. P. Abrahamson and N. J. Grant. Paper from "High Temperature Materials". John Wiley & sons, Inc., New York 16, 1959, p. 501-509.

Study of Cr alloyed with elements in groups IV_A, V_A, VI_A, VII_A and VIII. All elements investigated, with the exception of Ir, cause an initial increase in oxidation resistance of Cr. (R1h, 2-60; Cr-b, SGA-h)

573-R.* The Oxidation of Tungsten and Molybdenum From 1800 to 2500° F. J. W. Semmel. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York, 16, 1959, p. 510-519.

Specimens were tested in dry air flowing at 75 cu.ft. per hr. Mo oxidizes linearly low between 1800 and 2500° F. Oxidation of tungsten undergoes transition from predominantly linear to parabolic oxidation as temperature is increased. 4 ref. (R1h, 2-62; Mo, W, SGA-h)

574-R.* (German.) Corrosion of Stainless Steel. Stig Berg. *Chemische Rundschau,* no. 2, Apr. 1959, p. 185-190.

Behavior of stainless steel in various media and under various conditions. Factors influencing, and measures preventing, corrosion. (R1, R10g, L27; SS)

575-R.* (German.) Chemistry and Electrochemistry of Corrosion Occurring in a

Nuclear Reactor. G. H. Cartledge. *Dechema-Monographien*, v. 30, no. 411-425, 1959, p. 42-66.

Theory based on measurements of the electrode potential of Pt and stainless steel in dilute H_2SO_4 and at 85° C. Effects of gamma-irradiation and of hydrogen, oxygen or air passed through the electrolyte. 44 ref. (R6, 2-67, T11; Pt, SS)

576-R.* (German.) Behavior of Metal Surfaces in the Presence of Radioactive Hydrogen Sulphide. L. V. Erichsen. *Dechema-Monographien*, v. 30, no. 411-425, 1959, p. 82-89.

Al, Fe, Ni, Cu, Zn, Pd, Ag, Pt, Au, Pb, Ms60 brass, phosphor bronze, German silver, V2A and V4A alloys were exposed to the action of radioactive H_2S. Sulphur absorption and surface activity vary from metal to metal and increase at the cutting edges of sheets at locations where the crystal structure is distrubed. 7 ref. (R6, 2-67; Al, Fe, Cu, Zn, Pd, Ag, Pt, Au, Pb, Cu-s, Cu-n)

577-R.* (German.) Corrosion Pits in Small-Size Oxygen Bottles. Heinrich Cordes. *Freiberger Forschungshefte*, no. A89, Nov. 1958, p. 5-14.

Corrosion protection with synthetic resins. Essential requirements demanded of coatings are good adherence, thermal expansion similar to that of the base material, elasticity, absence of pores, insulating properties and heat resistance. (R2j, T26q, L26p; CN, AY)

578-R.* Titanium-Noble Metal Alloys Greatly Heighten Resistance to Corrosion. *Light Metal Age*, v. 17, June 1959, p. 14-15, 30.

Effect of Pt, Pd, Rb, Ru, Ir, Os, Re or Au additions to Ti on corrosion rate in boiling sulphuric and hydrochloric acid solutions. (R6g, 2-60; Ti-b, *Pt, Pd, Rb, Re, Ru, Os, Ir, Au*)

579-R.* The Oxidation of Zirconium Carbide in High-Temperature Combustion Gases. W. Watt. *Powder Metallurgy*, no. 1-2, 1958, p. 227-234.

Reactions of sintered Zr carbide and Ti carbide to combustion gases at 2300° C. 9 ref. (R1h, 2-62; Ti, Zr, 14-68)

580-R. Oxidation and Corrosion of Zirconium and Its Alloys. Pt. 1. Destructive Internal Oxidation of Zircaloy-2 in Steam Under Irradiation at 300° C. K. Alcock and B. Cox. *United Kingdom Atomic Energy Authority*, AERE C/R 2826, Feb. 1959, 24 p. 7s.

Metallographic examination has failed to throw any light on the causes of the localized oxidation or to indicate any reason for the selection of the point or origin in any specific instance. Possible influencing factors include different surface preparations, variation in method of support, variation in shape of specimen, different billets of Zircaloy-2 and effect of U-bends on location of point of origin. 18 ref. (R1h, R4d, 2-67; Zr-b)

581-R.* High-Temperature Oxidation of Gas-Turbine Alloys. John F. Radavich. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York, 1959, p. 520-537.

Effects of Mo, Co and W additions on formation of oxide film and scale on an Fe alloy and on three high-temperature Ni alloys. Composition, structure, adherence of film and scale. 5 ref. (R1h, R2q, 2-60, 2-62; Fe-b, *W, Co, Mo*, Ni-b, SGA-h)

582-R.* (German.) Internal Oxidation of Silver and Silver Alloys. H. Spengler. *Metall*, v. 13, July 1959, p. 464-652.

Velocity of internal oxidation of 99.9-99.999% pure Au and Ag-Cd alloys as a function of temperature and time. Effects of internal oxidation on hardness and electrical conductivity. 10 ref. (R2s, Q29, P15g, 2-61, 3-67; Ag, Ag-b, *Cd*)

583-R. INCO's Concern With Corrosion. F. L. LaQue. *Inco*, v. 27, Apr. 1959, p. 2-6. (R-general; SS, Ni-b)

584-R. Corrosion Control System Employing Tiny Platinum Anode Developed for Steel-Hulled Small Boats. *Inco*, v. 27, Apr. 1959, p. 14-15. (R10b, T22g; ST)

585-R. A Pinch of Palladium in Titanium Broadens Range of Corrosion Resistance. *Inco*, v. 27, Apr. 1959, p. 26-27. (R6g, 2-60; Ti-b, *Pd, Pt*)

586-R.* Oxidation of Hot-Pressed Titanium Carbide and Titanium Boride in the Temperature Range 300-1000° C. N. F. MacDonald and C. E. Ransley. *Powder Metallurgy*, no. 3, 1959, p. 172-176.

Oxidation in slow stream of undried air for periods up to 200 hr. (R1h; Ti, 14-68)

587-R.* Economic Questions Arising in Protection Against Corrosion. Frantisek Trojanek. *Czechoslovak Heavy Industry*, no. 7, 1959, p. 2-6.

Selection of corrosion resistant materials; treatment of corrosive environment; cathodic protection and coatings. Basic costs compared. (R-general)

588-R.* Electron Metallographic Evidence of Diffusion of Hydrogen Through Tin Plate Containers. Elma Lanterman. *Journal of Applied Physics*, v. 30, July 1959, p. 1084-1086.

Rupture and blistering of the exterior Sn surface of containers which had failed prematurely due to excessive hydrogen formation by corrosion processes within the container when packed with grapefruit juice. (R2n, R7n, N1, W12c; ST, *Sn*, 8-62, *H*)

589-R.* Chemical Treatment Against Corrosion of Galvanized Steel Produced in Continuous Lines. G. Odone and G. Milanese. *Metal Finishing Journal*, v. 5, June 1959, p. 237-240.

Various passivating solutions tested for protection against "white rust". 10 ref. (R10c; ST, *Zn*, 8-65)

590-R.* Zircaloy—a New Corrosion Problem. *Nuclear Power*, v. 4, July 1959, p. 86.

Zircaloy-2 was exposed simultaneously to steam and irradiation. Corrosion is accompanied by local swelling and fissures. (R4d, 2-67; Zr-b)

591-R. Studies of Solid State Reactions in High-Temperature Alloy Systems. J. F. Radavich. General Electric Co., Atomic Products Div., *U. S. Atomic Energy Commission*, APEX 483, Oct. 29, 1958, 17 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Procedures for the study of matrix and oxidized surface of Ni-Cr alloys. Vacuum melted Ni-base alloys of the type under study have less precipitated phase and entrapped oxides than similar air melted alloys. The oxide scale formed on vacuum melted Ni-Cr alloys during 100 hr. at 1800° F. in air is inversely proportional to the Si content up to at least 1.90% Si. (R1h, 2-60; Ni-b, *Cr*, *Si*, SGA-h)

592-R.* (French.) Types of Gray Cast Iron Used for Marine Equipment. Roger Poirot. *Fonderie*, no. 161, June 1959, p. 251-261.

Composition and properties of spheroidal, sorbitic, bainitic, martensitic and austenitic cast irons. Corrosion resistance in sea water. 10 ref. (R4b, 2-60, T22; CI-n)

593-R. (French.) Corrosion of 99.99% Purity Aluminum Single Crystals by Water at High Temperatures. P. Lelong and J. Herenguel. *Journal of Nuclear Materials*, v. 1, Apr. 1959, p. 58-72.

Exposure of polycrystalline samples and of single crystals to the action of water at temperatures above 100° C. Corrosion patterns, growth phenomena and the effects of cold working and heat treatment. 26 ref. (R4a, 2-62, 3-68, 2-64; Al, 14-61)

594-R.* The Inhibition of the Corrosion of Iron in Neutral and Alkaline Solutions. Pt. 1. P. Hancock and J. E. O. Mayne. *Journal of Applied Chemistry*, v. 9, July 1959, p. 345-352.

In neutral and alkaline solutions the potential at the surface of the sample of Fe is great enough to oxidize the existing oxide coating to cubic oxide which protects the metal from further corrosion. In acid solutions no protective coating is formed and corrosion continues. (R10b, R6j; Fe)

595-R. Boiler Water Control. C. Hinchcliffe. *Australasian Manufacturer*, v. 44, June 13, 1959, p. 76-81.

General problems of scaling and corrosion in boilers and auxiliary systems; various means of control. (R4c, R2q, T26q)

596-R.* (English.) Electron Diffraction Studies on the High-Temperature Oxidation of Iron-Aluminum Alloys. Tadayuki Nakayama. *Waseda University, Castings Research Laboratory, Report*, Nov. 1958, p. 71-80.

Relationship between high-temperature oxidation and heat resistance properties conferred by Al. Formation of gamma and alpha Al_2O_3 crystals on the oxidized surfaces of Fe-Al alloys. 8 ref. (R1h, 2-62, M22h; Fe-b, *Al*)

597-R.* (German.) Corrosion Resistance of Aluminum in Contact With Stainless Steel. H. Zeiger. *Aluminium*, v. 35, July 1959, p. 394-395.

Electrochemical measurements and salt spray and weathering tests show a great susceptibility of Al to contact corrosion. The danger of corrosion is

considerably less under normal atmospheric conditions. 20 ref. (R1a, R11; Al, SS)

598-R. Corrosion of Stainless Steel, Titanium, and Titanium Alloys by Ammonia-Base Sulphite Liquor. Lyle C. Jenness. *Tappi*, v. 42, May 1959, p. 404-406. (R6k; SS, Ti)

599-R. Evaluation of Protective Coatings for Molybdenum Nozzle Guide Vanes. John R. Giancola. *Wright Air Development Center*, WADC Technical Note 58-241, June 1959, 39 p.
Penetrant, visual and microscopic examination of tested vanes showed that electrodeposited multilayer metallic coating provided best protection against oxidation and erosion at temperatures of 1860-1890° F. Thinner coatings were less susceptible to thermal shock cracking. (R1h, 2-62, T24b; Mo, 8-62)

600-R.* (German.) Scaling of Pure Iron-Silicon Alloys in the Alpha Range Exposed to Oxygen. Norbert G. Schmahl, Hans Bauman and Hermann Schenck. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 415-416.
Corrosion behavior of alloys with 0.03-0.63% Si at 890° C. and in an oxygen atmosphere of 760 Torr pressure. (R2q; Fe-b, *Si*)

601-R.* (German.) Corrosion of Steel in Concrete. Anton Baumel and Hans-Jurgen Engell. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 417-428.
To reproduce processes occurring in reinforced concrete, steel wire was exposed to the action of 0.1 N caustic soda solution or a saturated calcium hydroxide solution with the corrosion resistance by passivation being observed. In the presence of a given amount of Cl-ions destruction of the passivation layer and local corrosion take place. 20 ref. (R6j; CN-r, 4-61)

602-R.* Role of Oxide Plasticity in the Oxidation Mechanism of Pure Copper. J. A. Sartell, R. J. Stokes, S. H. Bendel, T. L. Johnston and C. H. Li. *Metallurgical Society of AIME, Transactions*, v. 215, June 1959, p. 420-424.
Mechanism of oxidation studied at temperatures from 500 to 981° C. employing gravimetric, high-temperature microscopic and inert marker techniques. The oxidation of Cu is found to be parabolic at all temperatures. The controlling mechanism is the outward diffusion of Cu^+ ions through the Cu_2O layer, but the mechanism of diffusion is modified by the state of compressive stress in the oxide layer at the oxidation temperature. 10 ref. (R1h, N1; Cu-a)

603-R. (German.) Copper Casting Alloys for Parts Exposed to Chemicals. K. Geissler. *Industrie-Anzeiger*, v. 81, May 12, 1959, p. 586-588.
Behavior of Cu, various types of brass, Al-bronzes and other Cu-alloys in the presence of chemicals. (R6, R7; Cu-b, Cu-n, *Al*, Cu-s)

604-R. (Russian.) Methods of Investigating the Corrosion and Electrochemical Properties of Metals in Tension. N. D. Tomashov and N. I. Isaev. *Zavodskaya Laboratoriya*, v. 25, June 1959, p. 700-702.
Method of measuring electrical resistance and electrode potential may be usefully employed to study behavior of protective oxide films in metals subjected to tension. (R2q, M23s)

605-R. (Translation—BWRA.) Effect of Prolonged Aging of Austenitic Deposited Metal on Its Tendency to Intercrystalline Corrosion. M. A. Gal'perin and V. V. Ardentov. *Avtomaticheskaya Svarka*, v. 66, Jan. 1959, p. 44-51.
Resistance of 1Kh18N9T stainless steel plate and of Type 18-8 austenitic-ferritic deposited stainless steels alloyed with Mo, V or Cb to intercrystalline corrosion following treatment for 500-1500 hr. at 340-550° C. Change in carbide-phase composition with aging. (R2h, N8r, 2-65; SS-e, *Mo, V, Cb*)

606-R. (Translation—ConBur.) Effect of Nickel on the Electrochemical and Corrosion Behavior of Steel. G. M. Florianovich, Ia. Kolotyrkin and N. K. Smirnova. *Proceedings of the Academy of Sciences of the USSR*, v. 120, May-June 1958, p. 415-418.
Introduction of Ni leads to a decrease of the stable solution rate for all potentials more negative than + 1.200 volts. (R-general, 2-60; ST, *Ni*)

607-R.* Corrosion of Aluminum and Its Alloys When in Contact With Nonmetallic Materials. G. Fitzgerald-Lee. *Corrosion Technology*, v. 6, June 1959, p. 185-188.
Methods of minimizing corrosion of Al when used with concrete, plaster, soil, wood, adhesives or insulating materials. (R10, R7; Al-b)

608-R.* Fundamental Aspects of Scale on Mild-Steel Strip. S. Garber. *Iron and Steel Institute, Journal*, v. 192, June 1959, p. 153-160.

Nucleation and growth of scale layers. Unstable nature of wustite below 570° C. Structures of scale on ingot, billet and hot rolled strip. Fundamentals of mechanical scale breaking and pickling. 37 ref. (R2q, L12g, L10h; ST, 4-53)

609-R.* Oxidation of Titanium Metal and Titanium-Aluminum Alloys. Masao Adachi and Tokuzo Tsumimoto. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 32-38.

Oxidation rates of Ti metal and its alloys containing up to 8% Al at temperatures between 900 and 1040° C. Structure of oxidation products. Oxidation mechanism. 13 ref. (R1h, 2-62, N1a; Ti-b, *Al*)

610-R.* Effect of Mean Stress on Corrosion-Fatigue Strength. Kanetoshi Iwamoto. *National Research Institute for Metals, Transactions*, v. 1, no. 1, 1959, p. 76.

Endurance limit of 0.15% C steel subjected to repeated torsional stresses in air and fresh water. (R1e, Q7a, Q7h, 2-66, 3-66; CN-g)

611-R.* (German.) The Corrosion of Mild Steel in Sulphur-Containing Gas Streams. T. K. Ross and A. J. Macnab. *Werkstoffe und Korrosion*, v. 10, July 1959, p. 417-422.

In the gas soot process with no excessive air avilable considerable amount of hydrogen and carbon are present. At high temperatures sulphide cinder layers develop and in the presence of tension these layers break loose. Strong corrosion occurs on mild steel surfaces. (R7k, 2-62; CN)

612-R.* (German.) New Investigation in the Field of Vapor Phase Inhibitors. Leo Cavallaro and Giorgio Mantovani. *Werkstoffe und Korrosion*, v. 10, July 1959, p. 422-425.

Protection of cast iron surfaces; data on film forming and acid neutralizing inhibitors such as morpholin ethyamine octadecylamine dicyclohexylam-moniumnitrite and socium benzoate. (R10b; CI)

613-R.* (German.) Application of the Polarization Curve for Investigation of Local Corrosion in Stainless Steels. J. M. Defranoux. *Werkstoffe und Korrosion*, v. 10, July 1959, p. 425-429.

Use of a combination of anodic and cathodic polarization curves permit the dedection of exomorphous galvanic tension for corrosion prevention. (R11m; SS)

614-R.* (German.) Influence of Structural Factors on the Corrosion of Stainless Steel. N. A. Nielsen. *Werkstoffe und Korrosion*, v. 10, July 1959, p. 429-442.

Analysis of progressive corrosion with special emphasis on the passivity and microstructural changes of stainless steel surfaces during the corrosion process. (R-general, R10c, M27; SS)

615-R.* (Italian.) Spontaneous Combustion of Titanium. *Alluminio*, v. 28, no. 7-8, 1959, p. 350.

Complete oxidation and destruction of Ti in media containing oxygen. The oxide layer is dissolved by the metal reaching melting temperature as a result of the oxidation process. (R1h, 2-66; Ti)

616-R. Carbon Steel Has Its Problems, Too: When Piping Steam at 800° F. *Heating, Piping & Air Conditioning*, v. 31, June 1959, p. 108-111.

Graphite formation is not limited to carbon-molybdenum material but also occurs in carbon steel piping at even lower operating temperatures. (R4d, N8s; CN, 4-60)

617-R.* TTS Diagram for Types 304L and 316L Stainless. Hilmer F. Ebling and Merrill A. Scheil. *Metal Progress*, v. 76, Aug. 1959, p. 87-91.

Studies of three types of widely used stainless steels after being reheated or aged for varying times at various temperatures show that their corrosion rates vary widely, and that true "stabilization" may be impracticable by commercial heat treatments. (R11, R2h; SS)

618-R.* (French.) Corrosion Resistance in Marine Atmosphere of Metal Specimens and Parts Protected With Metallized Zinc Coating. J. Cauchetier. *Corrosion-Anticorrosion*, v. 7, June 1959, p. 261-264.

Metallized Zn provides excellent protection for parts and structures continually above or below water. Supplementary measures of various kinds are needed for surfaces subjected to alternating action of salt water and air. (R3p, R4b; ST, Cu, Fe, 8-67, *Zn*)

619-R.* (Italian.) Corrosion Resistance of Stainless Steels. Giampiero Colombo. *Acciaio Inossidabile*, v. 26, May-June 1959, p. 85-101.

Causes of pitting corrosion; methods of prevention. 15 ref. (R2j; SS)

620-R.* The Corrosion of Road Vehicle Engines by Anti-Freeze Solutions. H. H.

Collins and R. I. Higgins. *British Cast Iron Research Assoc., Journal*, v. 7, June 1959, p. 667-691.

Factors believed to be responsible for the rapid oxidation of glycol in antifreeze solutions with a resulting rapid rate of corrosion of the cast iron and steel components include excessive aeration of the coolant; the present of sites of very high temperature in the cooling system; operation of the coolant at consistently high temperatures; presence of large amounts of Cu or Cu alloys in the cooling system. 9 ref. (R7f, T21b; CI, *Cu*)

621-R. Research on Coatings for Protection of Niobium (Columbium) Against Oxidation at Elevated Temperatures. E. C. Hirakis. Horizons Inc. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151684, Feb. 1959, 74 p. $2.

The oxidation rate of Cb at 2000° F. is reduced by a factor of 20 by additions of Ce, Cr, Ti and Al. Flame spraying and electrodeposited coatings give Cb 4 to 6 hr. protection at 2500° F. Arc-melted alloys are superior to pure Cb in oxidation resistance. Specimens produced by the two coating methods equaled or surpassed the minimum standard at 2000° F. (R1h, L23, L17, 2-62, 2-60; Cb, *Ce, Cr, Ti, Al*)

622-R. Oxidation of Experimental Alloys. J. C. Richmond and H. R. Thornton. National Bureau of Standards. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151741, Feb. 1959, 19 p. $.50.

Oxidation resistance of five new high-temperature sheet alloys—two Ni-Mo-Cr alloys and three Fe-Cr-Al alloys. The average depth of external oxidation and maximum depth of oxide penetration were measured for specimens subjected to stress in air at high temperatures for 100 hr. and on specimens stressed in air under fluctuating-temperature conditions for 100 hr. (R1h, 3-66, 2-62; Ni-b, *Mo, Cr, Al*, Fe-b)

623-R.* Germanium and Silicon Surfaces. Sumner P. Wolsky. Paper from "Advances in Semi-Conductor Science". Pergamon Press Inc., New York 22, 1959, p. 114-116.

Oxidation of Ge and Si at 22° C. The Ge samples (0.1 to 3-mm. slices from single crystals) were exposed to ion bombardment or baked in a vacuum. The Si sample (3 mm. thick) was ion bombarded, subsequently exposed to air and then baked. 13 ref. (R1h, 2-67, 2-64; Ge, Si, 14-61)

624-R.* (Czech.) Corrosion Protection of Small Steel Articles. J. Domorazek. *Strojirenstvi*, v. 9, Apr. 1959, p. 283-286.

Protection of needles and small products. Corrosion is minimized by elimination of hand contact and use of wrapping paper and inhibitors. (R10b, R10e; ST)

625-R.* (Japanese.) Stress-Corrosion of Austenite Stainless Steels. M. Tagaya, H. Imagawa and D. Ishihara. *Metal Finishing Society of Japan, Journal*, v. 10, June 1959, p. 227-232.

Influence of cold drawing, heat treatment, presence of oxidizing agents and cathodic protection on susceptibility to stress-corrosion of austenitic stainless steel wires. (R1d, R10d, 2-64; SS-e)

626-R. (Russian.) Mechanism of Intercrystallic Corrosion of Stainless Steels in Nitric Acid. A. I. Krasil'shchikov, L. M. Volkhova, I. K. Burtseva and V. D. Plyasunov. *Doklady Akademii Nauk, SSSR*, v. 125, June 1959, p. 1285-1287.

An electric current is formed when two stainless steel electrodes are immersed in nitric acid of different concentrations. The electrode in the more concentrated acid is the cathode while the electrode immersed in the weaker acid is subjected to anodic dissolution. 4 ref. (R2h, R6q; SS)

627-R.* High Temperature Corrosion of Metals. C. J. Guare. *Materials in Design Engineering*, v. 50, Aug. 1959, p. 110-114.

Types of corrosion and factors which affect the rate. (R-general, 2-62)

628-R.* (German.) Cathodic Protection of Ships by Magnesium Anodes. Anton Schwarz. *VDI-Zeitschrift*, v. 101, Aug. 1, 1959, p. 1063-1064.

Cylindrical anodes are connected to the ship's hull and surrounded with a thick-walled rubber ring to avoid increased current densities likely to damage the paint protecting the hull. (R10d, T22g; ST, *Mg*)

629-R. Corrosion Research. *U. S. National Bureau of Standards, Technical News Bulletin*, v. 43, Aug. 1959, p. 150-154.

Review of NBS research on the fundamental mechanisms of corrosion and the corrosion properties of various materials. (R-general, A9)

630-R.* Corrosion of Aluminum Alloy in Glycol-Water Cooling Systems. N. S. Dempster. *Corrosion,* v. 15, Aug. 1959, p. 13-16.

Galvanic corrosion in 52S Al alloy tubes in an aircraft oil cooler. Corrosion mechanism in presence of dissolved Cu; results of inhibitor tests involving 25 solutions. 22 ref. (R1a, R10b; Al-b, 4-60)

631-R.* Notch Sensitivity Effects in Stress-Corrosion and Hydrogen Embrittlement Tests on High-Strength Steels. B. F. Brown. *Corrosion,* v. 15, Aug. 15, 1959, p. 17-20.

Notch sensitivity may terminate a stress-corrosion test to give erroneous impression of rate of stress-corrosion cracking. Extensive fracture strength data are reported on modified Type 422 steel specimens tempered at 875 and 1075° F. and stress-corrosion cracked. 4 ref. (R11s, Q23s, Q26, 2-64; SS, SGB-a)

632-R.* Uses and Abuses of Aluminum in Wooden-Hulled, Aluminum-Frame Minesweepers. T. H. Rogers and W. K. Chinn. *Corrosion,* v. 15, Aug. 1959, p. 21-26.

Results of laboratory experiments and periodic examinations on board ship to determine service behavior of Al alloys. Corrosion of Al in contact with other metals and materials such as rubber; protection provided by Zn chromate; Al corrosion products, corrosion effects of greases and lubricants containing graphite. (R-general, T22g; Al-b)

633-R.* Zinc in Marine Environments. E. A. Anderson. *Corrosion,* v. 15, Aug. 1959, p. 27-30.

Atmospheric studies of cast and rolled Zn and galvanized Fe; sea-water immersion tests of Zn; atmospheric and sea-water studies of Zn-rich paint. 11 ref. (R3p, R4b, R11; Zn)

634-R.* The Internal Cathodic Protection of Large Steel Pipes Carrying Sea Water. John H. Morgan. *Corrosion,* v. 15, Aug. 1959, p. 35-40.

Theoretical and practical aspects in the corrosion of bare and coated steel pipe. Types and locations of anodes; design of a potential measuring device; comparative costs of various protection methods. 4 ref. (R10d, R4b, T26r; ST)

635-R.* Duct Anode Development and Experience in Protection of Underground Cables From Corrosion. J. E. Johnson. *Corrosion,* v. 15, Aug. 1959, p. 41-45.

Graphite anodes in silt-filled ducts have short life because gases, liberated by electrolysis and trapped by silt, attack graphite binder, tape adhesive and wire insulations. Excellent results are obtained with silicon iron anodes. 4 ref. (R10d, R8, T1b; Pb)

636-R. Corrosion Research at the National Bureau of Standards. *U.S. Dept. of Commerce, Technical News,* STR-2370, July 1959, 12 p.

Current studies on corrosion reactions at metal surfaces. Electrochemical polarization and other electrical phenomena associated with corrosion. Mechanism of stress-corrosion cracking. Effect of free radicals on metals at low temperatures and nature of corrosion in large single crystals. 14 ref. (R-general, A9)

637-R.* Corrosion Problems Associated With Sour Gas Condensate Production. D. R. Fincher. *Corrosion,* v. 15, Aug. 1959, p. 31-34.

Experience in controlling corrosion of stainless steel and Ni alloy components of well and pilot plant designed to separate liquid hydrocarbons from gases containing hydrogen sulphide and carbon dioxide, with ultimate injection of dried residue gases into reservoir. (R7, R10a, T28p, 2-66; SS, Ni-b)

638-R.* Anchor Pattern Profile and Its Effect on Paint Performance. Joseph Bigos. *Corrosion,* v. 15, Aug. 1959, p. 46-50.

Techniques for examination and measurement of anchor pattern profile of cleaned surfaces. Effects of various cleaning techniques on surface roughness of low-carbon steels. Height of anchor pattern profile had limited effect on corrosion protection afforded by paints in atmospheric tests. (R10, L10c, L26n; CN-g)

639-R.* Probability as Related to Stress Corrosion Cracking of Copper Alloys. D. H. Thompson. *Corrosion,* v. 15, Aug. 1959, p. 51-54.

Cases of failure of red-brass pipe, cold drawn Cu water tubing, 70-30 cupro-nickel tubing, admiralty and aluminum brass condenser tubes and yellow brass screw shells. Role of ammonia in causing stress-corrosion cracking of Cu alloys. (R1d; Cu-b, Cu-n, 4-60)

640-R.* Stress Corrosion of Oil Country Tubular Goods. R. L. McGlasson and W. D. Greathouse. *Corrosion*, v. 15, Aug. 1959, p. 55-60.

Two types of failure are sulphide corrosion cracking and sweet corrosion cracking. A new test method is described which used a notched ring loaded to different percentages of yield deformation. Tabular data on hardness, applied stress and time-to-failure in saturated H_2S-brine system using J-55 and N-80. 13 ref. (R1d, Q26, T28p, 4-60, 2-66; AY)

641-R.* Corrosion of Type 310 Stainless Steel by Synthetic Fuel Oil Ash. Hugh L. Logan. *Corrosion*, v. 15, Aug. 1959, p. 61-64.

Minimum temperature at which steel is attacked by a mixture of V_2O_5 and Na_2SO_4 and by mixtures of V_2O_5 and $NaVO_3$ is determined. An unidentified phase was produced at the interface between steel and a V compound, or mixtures of compounds, in the temperature range 1075 to 1890° F. 6 ref. (R7d, 2-62; SS)

642-R.* Filming Amines Control Corrosion Utility Plant Condensate System. Edward E. Galloway. *Corrosion*, v. 15, Aug. 1959, p. 99-100, 103.

Protection of turbines and condensate systems against CO_2 and oxygen corrosion. Effects on corrosion test specimens before and after use of filming amines. Effects of amine on turbine erosion-corrosion. (R10b, R1c, 2-66; ST, Cu, Fe, Cu-b, 1-60)

643-R.* Kinetics of the Oxidation of Uranium by Carbon Dioxide. J. E. Antill and K. A. Peakall. *Journal of the Less-Common Metals*, v. 1, June 1959, p. 227-231.

Rates of oxidation over the range 500-1000° C. The rate increases with temperature from 500 to 780° C. with a sudden marked increase when the metal is near or at the beta-gamma transition (772° C.). At higher temperatures up to 1000° C. the rate decreases with increasing temperature. 4 ref. (R1h, 2-62; U)

644-R. Corrosion of Aluminum Alloys. G. Fitzgerald-Lee. *Automobile Engineer*, v. 49, June 1959, p. 215-217.

Bimetallic corrosion and preventive measures in road transport vehicles. (R1a, T21e; Al-b)

645-R. Sulfide Scaling Under Hydrorefining Conditions. Pt. 1. W. H. Sharp and E. W. Haycock. *Oil and Gas Journal*, v. 57, June 1, 1959, p. 117-120.

Principal variables which determine corrosion rates of steels are hydrogen, sulphide pressure, temperature and composition of steel. (R2q, R7, 2-60, 2-61, 2-74; ST)

646-R.* High Temperature Alloys for the Glass Industry. B. F. Richardson. *Glass Industry*, v. 40, Aug. 1959, p. 421-422. 445.

Alloys are melted in vacuum induction furnace to remove gaseous impurities. These alloys have a Ni base with Cr, Co and Mo additions which strengthens the Ni and increases corrosion and oxidation resistance. (R1h, 2-62, 2-60, T29a, 17-57; SS, *Co, Mo*, SGA-h, 9-69)

647-R.* (Italian.) Corrosion Resistance of Stainless Steels. N. D. Greene and G. Fontana. *l'Acciaio Inossidabile*, v. 26, no. 2, Mar-Apr. 1959, p. 37-50.

Critical analysis of theories and methods of investigating pitting corrosion. Details on theory of absorption, penetration, pH, ion exchange and growth of pits. (R2j; SS)

648-R.* (Italian.) Corrosion Resistance of Stainless Steels. Pt. 10. The Sigma Phase. Lars Morsing. *l'Acciaio Inossidabile*, v. 26, July-Aug. 1959, p. 125-139.

Formation of sigma phase in ferritic, ferritic-austenitic, 18-8 austenitic and highly alloyed austenitic steels, and particularly in a number of Avesta steels. Influence of sigma phase on corrosion resistance and mechanical properties. (R-general, Q26s, N6p; SS)

649-R.* Influence of Sea Water on Corrosion of Reinforcement. R. Shalon and M. Rafael. *American Concrete Institute, Journal*, v. 30, June 1959, p. 1251-1268.

The alkalinity of air-exposed concrete was found insufficient for corrosion inhibition of reinforcements. Sea water used for mixing of air-exposed reinforced structures makes the reinforcement highly vulnerable to corrosion. Adequate surface covering and depth of cover or special surface treatment is suggested. (R4; ST)

650-R.* The Study of Effect of Atmospheric Environment on Corrosion Rates of Steel. K. K. Moore and M. A. Grumbles. *American Paint Journal*, v. 43, Aug. 10, 1959, p. 68, 84.

Corrosion loss during salt water exposure was as much after one month as the loss for similar structures exposed

for two years in a semi-acid region. Corrosion is shown to be dependent on climate, humidity, temperature, exposure time, chloride content, exposure location, precipitation, wind direction and speed. (R3, R4b; ST)

651-R.* Selection and Use of Precipitation Hardening Stainless Steels. M. E. Holmberg. *American Society of Mechanical Engineers*, Paper no. 59-PET-17, 1959, 8 p. $.80.

Mechanical properties and high-temperature strength of Armco 17-4 PH steel. Resistance to stress cracking and brine corrosion. Freedom from Cu acetylide formation. Applications in petroleum and petrochemical industries. (R-general, Q-general, 2-62; SS)

652-R.* Designing to Prevent Corrosion in the Process Industry. F. L. Whitney, Jr. *American Society of Mechanical Engineers*, Paper no. 59-SA-58, 1959, 11 p. $.80.

Plant site and layout. Design of equipment to reduce general process, galvanic, crevice and stress corrosion. (R-general, 17-51)

653-R.* (French.) Study of 2 3/8 In. 10M4 APS Steel Pipe After 18 Months Use in the No. 103/ Gas Well at Lacq. E. Herzog. *Corrosion et Anticorrosion*, v. 7, July-Aug. 1959, p. 281-287.

Weight loss; composition and structure of products of corrosion, and protection they provide. Hydrogen content and mechanical properties of specimens after service. (R7k, T26r; ST, *S, H*)

654-R.* (French.) Protection of Steel Ships Against Corrosion by Sea Water and Electrolysis by Means of Metallizing. Manley H. Clark. *Corrosion et Anticorrosion*, v. 7, July-Aug. 1959, p. 294-297.

Sprayed Al or Zn plus finish painting with polyvinyl Al paint gives excellent protection to steel exposed alternately to sea water and air. (R10, L23, L26, T22j, 8-67; ST, *Zn, Al*)

655-R.* (French.) Structure of the Interface Between Iron and Iron Oxide. Insolubility of Oxygen in Iron Refined by Zone Melting. R. Sifferlen. Paper from 'Symposium on Solid State Diffusion". Centre d'Etude Nucleaires de Saclay, Gif-sur-Yvette (S-et-O), France, 1959, p. 137-145.

High-purity Fe is exposed to a hydrogen atmosphere containing H_2O. Under the oxide layer, a thin metallic zone showing structural irregularities was discovered. Its structure as well as diffusion of oxygen are influenced by degree of purity. 8 ref. (R1h, N1c, 3-69; Fe-a, *O*)

656-R.* Structure and Properties of Austenitic Alloys Containing Aluminum and Silicon. Duane J. Schmatz. *American Society for Metals, Transactions*, v. 52, Preprint no. 160, 1959, 13 p.

Fe-base alloys containing Al, Mn and C were investigated in an attempt to obtain a useful alloy deriving its oxidation resistance from Al and having an austenitic structure and mechanical properties comparable to commercial stainless steels. Among several minor additions only Si was found to improve both the oxidation resistance and strength of the base alloys. One promising alloy contained 8% Al, 30% Mn, 1.0% C, 1.5% Si. 8 ref. (R1h, Q-general, 2-60; Fe-b, *Al, Mn, C, Si*)

657-R.* The High-Temperature Oxidation of Tungsten-Columbium Alloys. J. W. Semmel, Jr. *American Society for Metals, Transactions*, v. 52, Preprint no. 161, 1959, 7 p.

The presence of an inner, continuous oxide and an outer, porous oxide on unalloyed tungsten leads to oxidation which begins parabolically and soon becomes linear with respect to time at 2000° F. At 2300° F., the outer oxide is liquid and semiprotective, resulting in only parabolic oxidation. Tungsten alloys with less than 15 at .% Cb oxidize according to the same kinetic laws as unalloyed tungsten. 5 ref. (R1h, 2-62, 2-60; W-b, Cb)

658-R.* Some Metallurgical Factors Affecting Stress-Corrosion Cracking of Austenitic Stainless Steels. H. H. Uhlig and R. A. White, *American Society for Metals, Transactions*, v. 52, Preprint no. 167, 1959, 18 p.

Tests on stress-corrosion cracking of 18-8 stainless steels in boiling 42% $MgCl_2$ (154° C.) show that alloys low in C or N do not fail within maximum time of exposure (200-260 hr.) Commercial type 304 alloys. fail within 0.2 to 1.4 hr. Stable austenitic 20% Cr, 20% Ni alloys are similarly resistant if the nitrogen content is sufficiently low (about 0.002%). Carbon, contrary to its effect in 18-8, confers resistance to cracking. Effects of Cb, Ti and Si additions. 18 p. (R1d, 2-60; SS, *C, N, Cb, Ti, Si*)

659-R.* Stress Corrosion, the Engineers View. P. H. Wall. *Royal Aeronautical*

Society, Journal, v. 63, June 1959, p. 354-365.

Accelerated rate of corrosion damage by static stress; stress-corrosion cracking as the combined results of stress and corrosion. Percentage losses of strength of stressed and unstressed steels. (R1d; ST)

660-R.* Metallographic Study of Stringers in Inert Atmosphere-Melted Zircaloy-2. J. D. Grozier, L. S. Rubenstein and J. G. Goodwin. *American Society for Metals, Transactions,* Preprint no. 148, v. 52, 1959, 12 p.

A unique corrosion phenomenon associated with the melting of Zircaloy-2 consumably in an inert atmosphere was observed as stringers of tan corrosion product in the black oxide of hot rolled or extruded material which had been corrosion tested in 750° F., 1500-psi. steam or 680° F. water. Corrosion stringers were shown to be directly related to microstructural stringers; microstructural stringers were shown to be related to ingot porosity. 5 ref. (R-general, M27; Zr-b, 5-59, 9-68)

661-R.* The Corrosion Behavior of Titanium-Palladium Alloy. Milton Stern and Claude R. Bishop. *American Society for Metals, Transactions,* Preprint no. 165, v. 52, 1959, 14 p.

Corrosion properties of a consumable arc-melted ingot. The material retains all the desirable properties of Ti. It has equivalent mechanical properties and corrosion resistance in oxidizing environments. In addition, it exhibits good corrosion resistance in a variety of nonoxidizing acids. 4 ref. (R-general; Ti-b, *Pd*)

662-R.* Prime Reasons for Metal Failures. G. A. Nelson. *Chemical Engineering,* v. 66, June 29, 1959, p. 132-136.

Principal causes of failure in industrial plants prove to be effects of temperature and corrosion. (R1e, R-general, Q7b, W-general)

663-R.* (English.) Micro-Organisms and Corrosion of Lead-Sheathed Cables. G. Bonde and Borge Lunn. *Ingenøren,* v. 2, Aug. 1958, p. 103-107.

The "phenol corrosion" of Pb-sheathed cables is not caused by catalytic action from phenols present in the impregnating material but is derived from bacterial decomposition of the jute which develops corrosion-promoting organic acids. (R2, T1b; Pb)

664-R.* (English.) Is the Phenol Corrosion Theory False? H. L. Halstrom. *Ingenøren,* v. 2, Aug. 1958, p. 108-109.

Flaws in cables showed appearance of typical phenol corrosion while jute analysis showed presence of appreciable amounts of phenol. No correlation was found between the presence of phenol and the corrosion of the Pb sheath. This contradicts the accepted theory. (R2, T1b; Pb)

665-R.* (Finnish.) Galvanic Corrosion of Copper Alloys and Stainless Steels in Cellulose Wash Waters. Eino Uusitalo. *Teknilisen Kemian Aikakauslehti,* v. 16, May 1959, p. 273-281.

Corrosion in waters containing sulphur dioxide with pH values ranging from 3.5 to 10 at 18° C. Effect of agitation of the solution on the galvanic couples. (R1a; Cu, SS)

666-R.* Corrosion Inhibitors for Carbon Tetrachloride-Water Vapor Atmospheres. K. W. Calkins and R. W. Hawley. *Corrosion,* v. 15, Sept. 1959, p. 15-17.

Use of 0.4% by weight of 2-aminoethanol in CCl_4 decreased corrosion rate of mild steel in test atmosphere by 99%. (R10b; CN)

667-R.* Screening Tests of Inhibitors to Prevent Chloride Stress-Corrosion. J. H. Phillips and W. J. Singley. *Corrosion,* v. 15, Sept. 1959, p. 18-22.

Tests were run in tilting autoclaves to evaluate performance of selected potential inhibitors in preventing chloride stress corrosion attack of Type 347 austenitic stainless steel in alkaline-phosphate boiler water containing 50 to 500 ppm. chloride. Nitrate appeared to be a satisfactory inhibitor for boiler applications. Sodium sulphite also effectively prevented chloride corrosion cracking by scavenging oxygen. 5 ref. (R10b, R1d, R11s; SS)

668-R.* Action of the XO_4^{N-} Inhibitors. G. H. Cartledge. *Corrosion,* v. 15, Sept. 1959, p. 37-40.

Effect of ions and molecules of type XO_4^{n-} on corrosion of iron and steel. Measurements of electrode potentials in inhibited solutions and effect of foreign electrolytes on these potentials reveal the competitive and reversible nature of surface state associated with inhibition. 28 ref. (R10b, P15m; ST, Fe)

669-R.* Corrosion Processes in Carbonated Beverage Cans. E. L. Koehler, J. J.

Daly, Jr., H. T. Francis and H. T. Johnson. *Corrosion,* v. 15, Sept. 1959, p. 45-50.

Work undertaken to minimize occurrence of perforations and excessive iron pick-up in cans. Corrosion mechanism was attack on steel base of cans stimulated by reduction processes occurring at areas of exposed Sn or other cathodic regions. Best solution was limiting galvanic current in can by reducing corrosivity of beverage, and control of metal exposure in can fabrication. 4 ref. (R1a, R10n, R11a; ST, *Sn,* 8-65)

670-R.* Principles and Criteria for Cathodic Protection of Steel in Sea Water. M. H. Peterson. *Corrosion,* v. 15, Sept. 1959, p. 51-55.

Development of cathodic protection is traced from initial work of Davy to formation of adequate theory of cathodic protection. Techniques used in experimental determination of criteria for protection in laboratory and in field advantages; and limitations of each. 84 ref. (R10d; ST)

671-R.* Four-Tower Water Treatment Test Facility. R. G. Murray and M. E. Tester. *Corrosion,* v. 15, Sept. 1959, p. 60-64.

Corrosion in Freon condenser tubes in a water circulating system, where severe pitting corrosion had occurred on water side of tubes. A two-by-two factorial experiment was run using phosphate-treated water. After a 90-day run, pits were found in tubes from towers operating at low water velocity, with pitting more severe in high-temperature units. (R2j, R4, R11)

672-R.* Use of Magnesium for Cathodic Protection of Pipe Lines in High Resistivity Soil. A. W. Peabody. *Corrosion,* v. 15, Sept. 1959, p. 65-70.

Satisfactory protective potentials were attained on approximately 400 miles of enamel coated pipeline with a total current of 2 to 3 amp. from nine Mg anode beds. (R10d, T26r, 8-71; ST, *Mg*)

673-R.* Mechanisms and Some Theoretical Aspects of Stress Corrosion Cracking of Austenitic Stainless Steels. W. B. Brooks. *Corrosion,* v. 15, Sept. 1959, p. 103, 106, 108, 110.

Review of generally accepted causes of stress-corrosion in stainless steels. Design of heat exchangers intended for use with chloride-containing waters. (R1d, Q26, W13b; SS-e)

674-R.* Case Histories of Differential Aeration Corrosion in Underground Telephone Cables. David T. Jones. *Corrosion,* v. 15, Sept. 1959, p. 116-118.

Cases involving lead-sheathed cables in conditions of water-entrapment due to dips in conduit. Cathodic protection of cables and problems of obtaining sufficient current without causing interference to foreign substructures near cables. 5 ref. (R4f, R10d; Pb)

675-R.* Prevention of Sulfide-Stress Cracking in Sour-Condensate Well Equipment. W. J. McGuire and L. W. Vollmer. *American Society of Mechanical Engineers,* Paper no. 59-PET-36, 1959, 11 p. $.80.

Factors influencing cracking; causes and prevention of service failures; specific data on 4140 steel, 410 stainless and K-Monel. (R1d, R7k, T28; SS, AY)

676-R.* Corrosion Resistance of Titanium Alloys. *Chemical Engineering Progress,* v. 55, July 1959, p. 94-99.

Comparative study of the most commonly used Ti alloys in a variety of corrosive media. Ti alloys proved to be less corrosion resistant in strong acids than commercially pure Ti with the exception of MST 3A1-2.5 V. All alloys were completely resistant to ferric chloride, sodium chloride and sodium hydroxide. A plentiful supply of O_2 reduces the Ti corrosion rates. (R6g; Ti-b)

677-R.* Corrosion of Magnesium Alloys Containing Iron and Nickel. J. H. Greenblatt. *Journal of Applied Chemistry,* v. 9, Aug. 1959, p. 401-405.

Corrosion rates were measured in sea water when these alloys were coupled to steel cathodes of various sizes, inserted in plastic or steel box, and compared with those of Mg alloys corroding alone. Decreased corrosion rates on coupling to steel cathode were due to formation of oxide film over the alloy. 8 ref. (R4b; Mg-b, *Fe, Ni*)

678-R.* (English.) Oxidation of Metals. The General Oxidation Equation. T. Hurlen. *Acta Chemica Scandinavica,* v. 13, no. 4, 1959, p. 695-704.

A general rate equation for metal oxidation is derived in the case of processes controlled by material transport of defect species in the oxide film and where the area of oxidation is constant. (R1h, P13b)

679-R.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Zinc Anodes for Cathodic Protection. T. J. Lennox, Jr. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 534-551.

History of cathodic protection of metals. Application of Zn anodes to the protection of ship's hulls, pilings, lock-gates, storage tanks and pipelines. Variables affecting performance. Protection criteria. 15 ref. (R10d; ST)

680-R.* (German.) The Attack of Liquid Zinc on Iron. K. Ruttewit. *Metall*, v. 13, Aug. 1959, p. 735-738.

The corrosion of soft iron and malleable iron is independent of the purity of the liquid. The effect is pronounced in the temperature range of 440-580° C. and is twice as great for malleable iron as for soft iron. 35 ref. (R6m; Fe, 14-60, Zn)

681-R.* (German.) Cathodic Protection With Zinc as a Sacrificial Anode. E. Eberius and H. Bohnes. *Metall*, v. 13, Aug. 1959, p. 743-746.

Immersion of a Zn-electrode and an iron part in a 3.5%-NaCl solution. Effects of the surface ratio Fe:Zn and of rotation on the dissolution of Zn and the current intensity. 4 ref. (R10d; Fe, *Zn*)

682-R.* (German.) Corrosive Effects of Detergents and Syndets on Zinc. Pt. 1. H. Stupel and F. Koch. *Seifen-ole-Fette-Wachse*, v. 85, July 8, 1959, p. 411-414.

Influence of hard and soft water, hardness composition, syndets and detergent composition on the corrosion of Zn in washing machines. Corrosion is diminished in proportion to the number of times washer is used. (R7m, T10c; Zn)

683-R.* (German.) Corrosive Effects of Detergents With Special Reference to Syndets on Zinc. Pt. 2. H. Stupel and F. Koch. *Seifen-ole-Fette-Wachse*, v. 85, July 22, 1959, p. 435-438.

Effect of surface active agents on Zn. Corrosion of Zn is caused by detergents and sodium carbonate at different concentration levels. Inhibition of corrosion by means of acid orthophosphates. (R7m, R10b; Zn)

684-R.* (German.) Chlorine Ions Influencing the Attack of Nitric Acid on Copper Single Crystals. Eginhart Biedermann. *Zeitschrift fur Metallkunde*, v. 50, Aug. 1959, p. 481-486.

Exposure to the action of HNO_3 containing 0-0.003% Cl-ions, the amount of which was modified by adding diluted HCl. Effect of the ions present on the solubility of Cu in HNO_3 and on the structure of etched surface. 8 ref. (R6g; Cu, 14-61)

685-R.* The Corrosivities of Plastics and Rubbers. H. A. Perry, A. M. Chreitfberg, J. Silver and H. E. Mathews. *Society of Plastics Engineers, 13th Annual National Technical Convention*, v. 3, n.d., p. 33-55.

Abnormal corrosion problems in naval ordnance. Environmental factors contributing to corrosion; effect of plastics and rubbers on Cd-plated steel. Certain plastics contribute to the corrosion of metals in tropical environments. Phenolic molding compounds, foams and casting resins are most corrosive. (R11; ST, *Cd*, 8-62, NM-d31)

686-R. Corrosion of 1100 Aluminum in Boiling H_2O and D_2O. J. E. Draley, S. Mori and R. E. Loess. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-6015, July 1959, 9 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

After an initial exposure period, corrosion rates of 1100 Al are approximately the same in boiling H_2O and D_2O. More corrosion was observed during the initial period in H_2O. This is probably due to differences in the purity of the H_2O. (R4j; Al-b)

687-R. Corrosion of Stainless Alloys in High-Temperature Nitrogenous Environments. Donald L. Keller, Editor. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1361, July 14, 1959, 46 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Atmospheric pressure tests show that small additions of oxygen to nitrogen inhibit the nitriding of 316, 318 and 347 stainless steels, Timken 16-15-6 and Timken 16-25-6. Tests at 200 psi. indicate that the oxidation rate is not affected by pressure. Stress does not influence oxidation rate. (R1d, R1h, J28k; SS)

688-R.* Iron Corrosion Study. *U. S. Dept. of Commerce, National Bureau of Standards, Technical News*, STR-2403, Sept. 1959, 4 p.

Corrosion pitting of prepared Fe specimens in distilled water depends on the

crystallographic orientation of the metal surfaces, according to N.B.S. experiments. Test specimens had flat surfaces cut parallel to the {100} (cubic); {110} (dodecahedral); and {111} (octahedral) planes. General level of attack is lower for the purer Fe specimens. (R2j, 3-72; Fe, 14-61)

689-R. Multicolor Coatings for Corrosion Protection. Norman I. Gaynes. *Metal Finishing*, v. 57, Sept. 1959, p. 73-76.

Salt spray tests on phosphated steel panels treated with five types of primers and five brands of multicolor paints revealed importance of prime coating in corrosion prevention systems. (R10f, R11j, L26n; ST)

690-R. Corrosion Research in Great Britain and Its Results. W. E. Ballard. *South African Institute of Mining and Metallurgy, Journal*, v. 59, July 1959, p. 623.

Review of recent British corrosion research in relation to industrial corrosion problems. (R-general, A9)

691-R.* Inhibition by Sugar of Copper Corrosion in Ammonia Solutions. J. A. Radley, J. S. Stanley and G. E. Moss. *Corrosion Technology*, v. 6, Aug. 1959, p. 229-231.

Corrosion of Cu and Cu alloys by NH_4OH is inhibited by small amounts of glucose and other sugars. The rate of corrosion of Al by NH_4OH is increased by the addition of glucose. (R6j, R10b; Cu, Al)

692-R.* Significance of Copper Deposits Associated With a Boiler Tube Failure. J. C. Spurr. *Corrosion Technology*, v. 6, Aug. 1959, p. 233-237.

Metallic Cu deposits found on burst marine boiler tubes are caused by overheating of the tubes; the Cu is associated with more completely intergranular cracking than is usual in simple cases of failure due to overheating. (R1d, R4c, T26q; Cu)

693-R.* Sacrificial Corrosion and the Relative Corrodibility of Metals. G. Fitzgerald-Lee. *Corrosion Technology*, v. 6, Aug. 1959, p. 245-247.

Corrodibility of metals is correlated with electrode potential, atomic number and atomic weight. (R1a, 17-52)

694-R.* Mechanical Properties and Corrosion Resistance of Zirconium and Its Alloys in Water, Steam and Gases at High Temperatures. R. S. Ambartsumyan, A. A. Kiselev, R. V. Grebennikov, V. A. Myshkin, L. J. Tsuprun and A. F. Nikulina. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 12-33.

Corrosion and properties of alloys in water, steam, oxygen, hydrogen, air and carbon dioxide. Zr-Cb alloys and alloys containing Sn, Fe, Cb and Cu. 10 ref. (R-general, Q-general, 1-62; Zr-b, *Cb, Fe, Cu, Sn*)

695-R.* Electron Diffraction and Kinetic Investigations of the Oxidation Reactions of Zirconium and Some of Its Alloys. I. I. Korobkov, D. V. Ignatov, A. I. Evstyukhin and V. S. Emelyanov. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 60-68.

Oxidation and structure of oxide films of Zr and its alloys with Al, Ti and Sn during heating in oxygen and air at 20-1300° C. 13 ref. (R1h, 2-62, M22h; Zr-b, *Al, Ti, Sn*, 14-62)

696-R.* Development of Zr Alloys Resistant to Gaseous Oxidation. W. G. O'Driscoll, C. Tyzack and T. Raine. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 75-105.

Binary additions of Mo, W and Cu improve oxidation resistance of Zr in CO_2. Additions of Cb and Ta are beneficial up to 0.25 at .%. 27 ref. (R1h, 2-60; Zr-b, *Mo, W, Cu, Cb, Ta*)

697-R.* Corrosion of Aluminum With Additions of Iron and Silicon in High-Temperature Water. Ketil Videm. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 121-127.

Effect of structure and alloying of Fe and Si on grain boundary attack at 20-200° C. 14 ref. (R4, 2-60, 2-62, 3-71; Al-b, *Fe, Si*)

698-R.* Al-Fe-Ni Alloys Corrosion Resistant in Hot Water and Steam. H. Coriou, R. Fournier, L. Grall, J. Herenguel, J. Hure and P. Lelong. Paper from

"Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 128-152.

Corrosion mechanism and kinetics and the influence of microstructure on corrosion in hot water and steam. 29 ref. (R4, 2-62, 2-60, 2-59, M27; Al-b, *Ni, Fe*)

699-R.* Corrosion of Magnesium and Some of Its Alloys in Gas-Cooled Reactors. R. Caillat and R. Darras. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 220-233.

Oxidation of Mg, Mg-Zr alloys and a Mg-Zn-Zr alloy in humid air, dry air, CO_2 and CO_2 water at 350-500° C. Protection during fluoride treatment. 22 ref. (R1h, T11, 2-62; Mg-b, *Zr, Zn*)

700-R.* Magnesium-Beryllium Alloys as Materials for Nuclear Reactors. K. D. Sinelnikov, V. E. Ivanov and V. F. Zelensky. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 234-240.

Mg-Be alloys with low Be content as a protective coating for fuel elements of gas-cooled reactors operating at 530° C. Solubility of Be in Mg, corrosion resistance and $MgBe_{13}$ found. 7 ref. (R1h, P12e, T11g, 2-62; Mg-b, Be, 17-57)

701-R.* Oxidation of Ordinary Steel Heated in Carbon Dioxide Under Pressure. R. Darras, D. Leclercq and C. Bunard. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 261-265.

Weight increases are small after heating at 350° C. for 1300 hr. 16 ref. (R1h, 2-62, 3-74; ST)

702-R. Corrosion Resistance of Mo-0.5% Ti Alloy, Tantalum, and Beryllium in Liquid Bismuth. J. W. Seifert. Babcock & Wilcox Co. *U. S. Atomic Energy Commission*, BAW-1067, May 14, 1959, 20 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

The alloys have good corrosion resistance in liquid bismuth containing small amounts of U, Zr, and Mg. (R6m; Mo-b, *Ti*, Be, Ta)

703-R. High-Temperature Water and Steam-Corrosion Behavior of Zirconium-Uranium Alloys. Stanley Kass. Bettis Plant, Westinghouse Electric Corp. *U. S. Atomic Energy Commission*, WAPD-TM-167, July 1959, 20 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Corrosion behavior of Zr alloys containing 10-60% uranium in 600 and 680° F. water and in 750° F. steam at 1500 psi. Effects of various heat treatments on corrosion resistance. (R4d, R4a, 2-62, 2-64; Zr-b, *U*)

704-R.* Effect of Titanium Addition in Alpha Brass. S. K. Biswas and S. C. Das Gupta. *Indian Institute of Metals, Transactions*, v. 12, June 1959, p. 175-184.

Modification of corrosion resistance, oxidation resistance, mechanical properties and grain growth characteristics of 70:30 brass, resulting from addition of 0.08 to 1.22% Ti. (R1h, 2-62, R4b, R6, Q29n, N3n, 2-60; Cu-n, *Ti*)

705-R. Detergent Resistance of Enamels Tested and Improved. F. G. Morriss. *Industrial Finishing (London)*, v. 12, Aug. 1959, p. 29-30.

Methods of testing and factors affecting resistance. (R6, R7; ST, 8-71)

706-R.* The Stress-Corrosion Cracking of Mild Steel in Coal Gas Liquors. R. N. Parkins and R. Usher. *Journal of Applied Chemistry*, v. 9, Sept. 1959, p. 445-456.

Laboratory and plant studies. Cracking is likely to occur where the liquor has a concentration between 1 and 2 equivalents of NH_3 or total acids (H_2S, CO_2 and HCN). (R1d, R6p; CN)

707-R.* Resistance of Various Steels to Cavitation Corrosion. M. G. Timerbulatov and G. I. Babushkima. *Metallovedenie i Termicheskaya Obrabotka Metallov*, no. 8, 1959, p. 5-12.

A number of toolsteels and high-Cr steels are annealed after quenching to obtain a hardness of Brinell 330-350. Effect of annealing temperature on resistance to cavitation corrosion. Relationship between hardness and cavitation resistance tested with the help of a magnetostrictive vibrator. (R2m, 2-64, Q29n; TS, SS-b)

708-R. (Book—Translation.) Corrosion of Chemical Apparatus. G. L. Shvartz and M. M. Kristal. 250 p. 1959. Consultants

Bureau, Inc., 227 W. 17th St., New York 11, N. Y. $7.50.

Theory of intercrystalline and stress-corrosion; causes and character of corrosion cracking of carbon steels, alloy steels and nonferrous metals. 219 ref. (R1d, T29; CN, ST, EG-a38)

709-R. (Translation—ConBur.) Passivating Properties of Pigments. I. L. Rozenfeld, F. I. Rubinshtein and V. V. Zhebrovskij. *Bulletin of the Academy of Sciences of the USSR*, no. 6, June 1958, p. 659-662.

Electrochemical mechanism of corrosion processes is influenced by film-forming substances and pigments. Their effect on the kinetics of electrode reactions is determined by the corrosion process. The protection of metals is dependent on mechanical insulation of the metal from the corrosive medium and retardation of electrode reactions. (R10c, P15; NM-g30)

710-R.* Studies on the Influence of Chemical Factors on the Corrosion of Metals. W. Feit Knecht. *Chemistry and Industry*, no. 36, Sept. 5, 1959, p. 1102-1109.

Chemistry of solid corrosion products in terms of chemical kinetics of oxidation, hydroxide and carbonate formation of Zn and Cu. Stability of products in acid vapors or aqueous solutions and conditions for formation of protective films. (R1h; Zn, Cu, 2-61, 2-65)

711-R.* The Fundamentals of Wet Corrosion, Its Manifestations and Mitigation. F. P. A. Robinson. *South African Industrial Chemist*, v. 13, June 1959, p. 120-130.

Outline of electrochemistry of corrosion in terms of polarization, passivity, oxide film formation and electron configuration in metals. Methods of corrosion inhibition. (R1h, R10b, P15)

712-R.* Mechanism by Which Nonferrous Metals Corrode in the Atmosphere. P. M. Aziz and H. P. Godard. *Corrosion*, v. 15, Oct. 1959, p. 39-43.

Influence of common atmospheric constituents and pollutants. Composition and properties of corrosion film. 27 ref. (R3, 2-60; Al, Cu, Mg, Ni, Zn, EG-a38)

713-R. (Translation—ConBur.) Study of the Influence of Various Inhibitors on the Corrosion Cracking of Metals. S. A. Balezin, V. V. Romanov and I. I. Podobaev. *Proceedings of the Academy of Sciences of the USSR, Chemistry Technology Section*, v. 122-123, Sept-Dec. 1958, p. 147-151.

See item 432-R, 1959. (R1d, R10b; SS-e, Cu-n)

714-R.* Principles and Procedures Employed in the Design and Interpretation of Atmospheric Corrosion Tests. H. R. Copson. *Corrosion*, v. 15, Oct. 1959, p. 43-51.

Accelerated tests involving specimen size and shape, location of test sites, different atmospheres, influence of alloy elements, mounting procedures; test duration, climatic variations and drainage. 19 ref. (R3, 1-54)

715-R.* Deterioration of Materials in Polluted Atmospheres. John E. Yocom. *Corrosion*, v. 15, Oct. 1959, p. 51-55.

Physical and chemical principles. 34 ref. (R3)

716-R.* Corrosion Experience Associated With Hydrometallurgical Refining of Nickel at Sheritt Gordon Mines. R. B. McIntosh. *Corrosion*, v. 15, Oct. 1959, p. 57-63.

Comparison of pilot plant results with four years refinary operations with reference to 316, 316 ELC, 304, 304ELC and 347 stainless and mild steels. 6 ref. (R6, C19n, 1-52; CN, SS)

717-R.* Simple Screening Test for Determination of Inhibitor Film Persistance. John A. Knox and Roy Stout. *Corrosion*, v. 15, Oct. 1959, p. 64-66.

Results of extended Cu ion displacement tests and standard NACE screening test on 1010 steel with 17 compounds. 6 ref. (R10-b, 1-54; CN)

718-R.* Corrosion Inhibitor Evaluation From Cathodic Polarization Measurements. R. A. Legault and Norman Hackerman. *Corrosion*, v. 15, Oct. 1959, p. 517t-522t.

Relative corrosion rates of Fe and steel from cathodic polarization measurements in the presence of amine inhibitors. (R10b; Fe, CN)

719-R.* Mechanisms by Which Metals Corrode in the Atmosphere. C. P. Larrabee. *Corrosion*, v. 15, Oct. 1959, p. 526t-529t.

Effect of contaminants in the atmosphere and on metal surfaces. Effect of alloying elements in retarding corrosion. Experiments illustrating electrochemical theory. 14 ref. (R3, 2-60, P15; Fe, CN, AY, SS)

720-R. The Ubiquity of Localized Corrosion. R. B. Mears. *Electrochemical Society, Journal*, v. 106, May 1959, p. 467-468.

Localized corrosion develops at dislocation sites, therefore all metals exposed to corrodents develop localized corrosion. 7 ref. (R1a)

721-R. The Role of the Metal-Ion Concentration Cell in Crevice Corrosion. G. J. Schafer and P. K. Foster. *Electrochemical Society, Journal*, v. 106, May 1959, p. 468.

It is concluded that the cell cannot be a mechanism. 6 ref. (R1b)

722-R.* The Anodic Oxides of Lead. Jeanne Burbank. *Electrochemical Society, Journal*, v. 106, May 1959, p. 369-376.

Oxides formed under varying potential and pH. Relation to electrolytic corrosion of Pb. 50 ref. (R1a, R1h; Pb)

723-R.* Some Corrosion Effects in Accelerated Cavitation Damage. W. C. Leith and A. Lloyd Thompson. *American Society of Mechanical Engineers*, Paper no. 59—A-52, 1959, 8 p.

The conjoint mechanical-chemical destruction of metals by accelerated cavitation in a magnetostriction apparatus indicates relative effects of the metal properties (hardness, metallurgical structure, corrosion fatigue limit) and liquid characteristics (temperature, pressure, wettability) which have been confirmed by field experience in hydraulic turbines and water-cooled diesel cylinder liners. 21 ref. (R2m)

724-R.* High-Temperature Alloy Considerations in Steam Turbine Designs. N. L. Mochel. *American Society of Mechanical Engineers*, Paper no. 59-PWR-12, 1959, 31 p.

Action of steam at high temperatures and pressures on ferritic and austenitic steels. Resistance to corrosion and thermal shock; metallurgical stability; effects of oxide films on thermal conductivity. 18 ref. (R4d, 2-62, P11h; SS-a, SS-e)

725-R.* Stainless Steels and Nickel-Containing Alloys in the Chemical Industry. J. Hinde. *Australian Institute of Metals, Journal*, v. 4, Aug. 1959, p. 103-113.

Use of Ni, certain high-Ni alloys and the austenitic Cr-Ni stainless steels. Behavior in nitric acid and sulphuric acid applications. 29 ref. (R6g, T29; SS, Ni-b, 17-57)

726-R.* The Structure of Steel. Edwin Gregory and Eric N. Simons. *Edgar Allen News*, v. 38, July 1959, p. 156-157.

Corrosion, weld decay and work-hardening of stainless steels. (To be continued.) (R1; SS)

727-R.* Aqueous Uranium Corrosion at 100° C. J. B. Schroeder, D. A. Vaughan and C. M. Schwartz. *Electrochemical Society, Journal*, v. 106, June 1959, p. 486-489.

A film of UO_2 and metallic uranium is formed. UO_2 film produced by heating above 400° C. but below 650° C. in O_2 gives temporary protection against H_2O corrosion. Films of beta UH_3 offer no protection. 8 ref. (R4a, R10; U)

728-R.* Oxide Nucleation and the Substructure of Iron. E. A. Gulbransen and K. F. Andrew. *Electrochemical Society, Journal*, v. 106, June 1959, p. 511-515.

Nucleation sites of oxides formed on pure Fe are related to embrittling rather than nonembrittling annealing. Nucleation sites show the substructure of Fe responsible for embrittlement. 10 ref. (R1h, 2-64; Fe)

729-R.* Rectification by Zircaly 2 in High-Temperature Water. J. N. Wanklyn and R. Aldred. *Electrochemical Society, Journal*, v. 106, June 1959, p. 529.

Unexpectedly great corrosion is obtained when alloy is heated in water by alternating current. This is related to rectification produced by the alloy. (R11, R4, 1-66; Zr-b)

730-R.* Current and Potential Relations for the Cathodic Protection of Steel in a High Resistivity Environment. W. J. Schwerdtfeger. *Journal of Research of the National Bureau of Standards*, v. 63C, July-Sept. 1959, p. 37-45.

Laboratory evaluation of potential and current criteria for cathodic protection of bare low-carbon steel exposed to soil having a resistivity of 20,000 ohm-cm. Use of cathodic polarization curves for determination of current density requirements for protection. Protection achieved on specimen controlled at -0.77 volt with reference to a saturated calomel half cell. Importance of *IR* drop caused by the protective current in potential measurement. 11 ref. (R10d; ST)

731-R. Fireside Corrosion of Superheater and Reheater Tubing. James Jonakin, G. A. Rice and J. T. Reese. *American Society of Mechanical Engineers*, Paper no. 59-FU-5, 1959, 8 p. $.80.

Products of combustion from coal containing high sulphur and alkalies are associated with low melting ash temperatures which can form bonded deposits in the temperature range of 1800° F. and result in chemical corrosion. In order to obtain steam temperatures of 1050° F., superheater and reheater tubing are placed in the boiler gas passes where gas temperatures range from 1400 to 2200° F. Consequently, fireside chemical corrosion can result when these conditions are satisfied. (R7k, T26q; SS)

732-R.* Embrittlement of Solid Metals in a Liquid Metal. W. A. Morgen. *Metal Treatment and Drop Forging*, v. 28, Sept. 1959, p. 333-339.

Mercury penetration, molten solder penetration, effect of brazing and other metals. Variables affecting penetration include surface condition, grain size, stress distributions, strain rate, composition and temperature. 57 ref. (R2h, R6m, 2-61, 3-68, 2-60, 3-66; 14-60)

733-R.* Corrosion Inhibition With Sodium Nitrite. Jess Beecher, Charles Dinkel and Steve Corwin. *American Water Works Assoc., Journal*, v. 51 no. 9, 1959, p. 1175-1180.

Results of testing in a cooling-water system with sodium nitrite and zinc sulphate, polyphosphate and sodium nitrite. 6 ref. (R4a, R10b; CN-g)

734-R.* The Investigation of Corrosion Failures of Ferrous Metals. E. E. White and K. A. Chandler. *Chemistry and Industry*, Aug. 15, 1959, p. 1028-1035.

Causes, methods of investigation of factors; analysis of specific failures and preventive measures. (R-general; Fe)

735-R.* Potential Studies on Passivity to Corrosion Induced by Pretreatment Processes. Pt. 2. Comparative Study of Chromate Treatment and Chromate Inhibition. K. S. Rajagopalan and K. Balakrishnan. *Electrochemical Society, Journal*, v. 106, July 1959, p. 562-566.

Potential and polarization studies of Zn in NaCl solution. 8 ref. (R10b, R10c, R11m; Zn)

736-R.* The Study of the Passivity of Metals in Inhibitor Solutions Using Radioactive Tracers. Pt. 2. The Mechanism of Film Growth. O. Kubaschewski and D. M. Brasher. *Faraday Society, Transactions*, v. 55, July 1959, p. 1200-1206.

A direct linear relationship exists between film thickness and logarithm of time of growth of very thin oxide films formed on mild steel in air and chromate solutions at room temperature. 10 ref. (R1h, 3-67; CN, 14-62)

737-R. Corrosion of Aluminum Alloys in High Temperature Water. A Survey. Ketil Videm. *Journal of Nuclear Materials*, v. 1, July 1959, p. 145-153.

Autoclave and loop tests to determine effect of temperature, heat transfer, boiling and flow rate. Influence of alloying elements such as Ni, Fe, Si or Cu. Probable mechanism of grain boundary accelerated and uniform types of attack. Weldability and mechanical properties of corrosion resistant Al alloys. 21 ref. (R4, 2-62, K9s, Q-general, 2-60; Al-b, *Fe, Ni, Si, Cu*, SGA-g)

738-R. The Corrosion of Austenitic Stainless Steels Under Heat Transfer in High Temperature Water. J. N. Wanklyn and D. Jones. *Journal of Nuclear Materials*, v. 1, July 1959, p. 154-173.

Corrosion of 18-8 austenitic stainless steel under stress and boiling heat transfer in oxygen free water at pH 11 and 280° C. Influence of crevices and caustic alkali on intercrystalline stress-corrosion cracking. 14 ref. (R4c, R4d, R2h, 2-62, 3-66; SS-e)

739-R.* Effects of Water Quality on the Corrosion of Metals in Glycol Antifreeze Solutions. M. A. Boehmer and J. W. Compton. *Proceedings of the 45th Mid-Year Meeting of Chemical Specialties Manufacturers Assoc. Inc.*, Mar. 18-20, 1959, p. 73-81.

Al corrodes faster than ferrous metals in antifreeze solutions. Chlorides in water increase corrosion and high sulphate (ppm.) contamination in the absence of chlorides causes high ferrous corrosion. 16 ref. (R4, R6, 2-60; ST, CI, Al)

740-R.* Some Studies of the Abrasion and Corrosion of Fourdrinier Wires. J. D. Boadway, J. Friesse and R. M. Husband. *Pulp and Paper*, Aug. 1959, p. T231-T237.

Effect of operating variables, pH of the water and nature of the paper stock on Cu alloys used in papermaking equipment. Inhibitors and protective coatings reduce corrosion rate. (R1c, R4, R6g, R10, T29r, 4-61; Cu-b)

741-R.* Application of the Formation of Titanium Hydride. Rikuro Otsuka. *Scientific Paper of the Institute of Physical and Chemical Research (Tokyo)*, v. 53, June 1959, p. 66-67.

The thin oxide film formed by oxidation of Ti can be removed in a form suitable for electron microscopy and diffraction study by the action of HCl. (R1h, M20q; Ti)

742-R.* Iron-Aluminum Base Alloys—Cheap Stainless of the Future? Blake King, J. J. Mueller, N. N. Ida and F. G. Tate. *Society of Automotive Engineers, Transactions,* v. 67, 1959, p. 335-342.

Fe-Al base alloys have higher high-temperature oxidation resistance than stainless. 11 ref. (R1h, 2-62; Fe-b, *Al, Cr*)

743-R.* Chalk River Experience With Zircaloy-2 and Aluminum-Nickel-Iron Alloys in High-Temperature Water. F. H. Krenz, G. J. Biefer and N. A. Graham. Paper from "Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials". United Nations, Geneva, 1958, p. 241-249.

Effects of heat flux, hydriding and flowing water on corrosion rates of Al and Zr alloys. Characteristics and mechanism of sheath failure. 15 ref. (R4d; Zr-b, Al-b, *Fe, Ni*)

744-R.* Titanium and Zirconium as Primary Cell Anodes. Milton A. Thompson, Allen B. Scott, Donald Chittick and Paul M. Gruzensky. *Electrochemical Society, Journal,* v. 106, Sept. 1959, p. 737-741.

Polarization and corrosion rates for Ti and Zr electrodes were measured in various electrolytic solutions. (R-general, R1j, P15n; Ti, Zr)

745-R.* Electrochemical Behavior and Passivitiy of Titanium. Milton Stern and Herman Wissenberg. *Electrochemical Society, Journal,* v. 106, Sept. 1959, p. 755-759.

Controlling the corrosion of Ti by addition of low amounts of metals not easily oxidized to the Ti, rendering the metal passive. (R1j, R10c; Ti-b)

746-R.* The Influence of Noble Metal Alloy Additions on the Electrochemical and Corrosion Behavior of Titanium. Milton Stern and Herman Wissenberg. *Electrochemical Society, Journal,* v. 106, Sept. 1959, p. 759-764.

Controlling corrosion of Ti by addition of small amounts of noble metals, rendering the metal passive. (R1j, R10c, 2-60; Ti-b, EG-c)

747-R.* High-Temperature Sulfiding of Iron Alloys in Hydrogen Sulfide-Hydrogen Mixtures. E. W. Haycock. *Electrochemical Society, Journal,* v. 106, Sept. 1959, p. 764-771.

Rates of sulphide scale formation on pure Fe and Cr steel measured from 400-550° C. under pressures of 600 psi. with an H_2S partial pressure of 0.6 psi. for periods up to 500 hr. (R2q, 2-62; Fe-a, SS, 14-68)

748-R.* Use of Nickel-Aluminum Alloy Coatings for the Protection of Molybdenum From Oxidation. W. Beck. *Electrochemical Society, Journal,* v. 106, Sept. 1959, p. 783-786.

Coatings produced on Mo by electrodeposition, protecting it from high-temperature oxidation. Composition of Ni-Al phases determined by metallographic analysis. (R1h, 2-62; Mo, Ni-b, Al-b, 8-62)

749-R.* The Intercrystalline Cracking of Binary and Complex Beta Brasses Resulting From Moisture in the Atmosphere. A. R. Bailey. *Institute of Metals, Journal,* v. 87, July 1959, p. 380-384.

Cracking in binary and complex brasses under a sustained tensile load is found to take place only in moist atmospheres and does not occur in dry argon or in dried air. Effect of moisture is particularly noticeable with binary (beta + gamma) alloys, which display distinctly better strength and ductility in a dry atmosphere than in the ordinary air. 8 ref. (R2h, R3; Cu-n)

750-R. Erosion of Magnesium. Albert H. Peters and R. G. Beck. E. I. du Pont de Nemours & Co. *U. S. Atomic Energy Commission,* DP-377, June 1959, 11 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Mg alloy specimens containing 8, 3 and 1% Al exposed to flowing deionized water at 40° C. Erosion rates were established at 0.1, 0.2 and 0.5 in. per year, respectively. Erosion rate was several times higher for specimens with lower concentration of Al. (R1c, R4, 2-60; Mg-b, *Al*)

751-R. Behavior of Structural Materials Exposed to an Organic Moderated Reactor Environment. N. J. Gioseffi and H. E. Kline. Atomics International. *U. S. Atomic Energy Commission,* NAA-SR-2570, Oct. 1, 1959, 36 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.25.

Behavior of 1020 carbon steel, Types 304 and 410 stainless steel, 4130 alloy steel, Al and Mg in relation to corrosion resistance after neutron irradiation. (R7, 2-67; CN, SS, AY, Mg, Al, SGB-s)

752-R.* (French.) Oxidation After Heat Treatment of Germanium Surfaces Oriented on a Plane. Pt. 3. Leone Gouskov. *Comptes Rendus*, v. 249, Aug. 3, 1959, p. 671-673.

Corrosion figures and oxide products visible on Ge monocrystals under microscope after oxidation at 450° C. under pressures of 10^{-2} and 10^{-4} mm. Hg. (R1h, R2g, M26c, 2-64, 1-73; Ge, 14-61)

753-R. (Flemish.) Corrosion of Pipe in Ships. V. Ferdinande. *Revue de Mecanique (Tijdschrift)*, v. 5, no. 2, 1959, p. 67-75.

12 ref. (R1a, T22; Cu-b, Cu-n, CI-r, 4-60)

754-R.* The Action of Cathodically Evolved Hydrogen on Iron and Nickel as Special Cases of Corrosion-Embrittlement of Metals. Michael Smialowski. *Chemistry and Industry*, no. 35, Aug. 29, 1959, p. 1078-1083.

Tempering temperature and hydrogen diffusion affect corrosion embrittlement. 15 ref. (R1e, Q26s; Fe, Ni, CN)

755-R.* (Japanese.) Conductometric Test of the Efficiency of Rust Preventive Oil. Ken'ichi Goto and Teruzo Asahara. *Metal Finishing Society of Japan, Journal*, v. 10, Aug. 1959, p. 301-305.

Steel wire and Cu ribbon were treated with rustproof oil and exposed to electrolytes. Corrosion was determined by measuring the electrical resistivity. (R11h, R10; ST, Cu-a, 4-61, NM-h)

756-R. (Russian.) Changes of Internal Friction and Frequency of Natural Oscillations of Kh18N9 Type Steel Caused by Intercrystalline Corrosion. M. A. Vedeneeva and N. D. Tomashov. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat Moscow, 1958, p. 483-494.

Samples of varying composition were quench hardened and tempered. Effect of intercrystalline corrosion, produced by boiling in an acid, on internal friction, resistivity and natural oscillation. 9 ref. (R2h, Q22, P15, 3-67; SS)

757-R. (Russian.) Effect of Static Tensile Loads and Alternate Loading on Corrosion of 1Kh18N9 Steel. N. D. Tomashov, M. A. Vedeneeva and K. N. Gedgovd. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 574-583.

Samples exposed to tensile or cyclic loads and subjected simultaneously to the action of a 0.8 N solution of HNO_3 containing $FeCl_3$. Effects of stress, previous heat treatment and the amount of $FeCl_3$ on intercrystalline corrosion. 14 ref. (R2h, 2-64, 2-66, 3-66; SS)

758-R. (Russian.) Pitting Corrosion of Stainless Steel. N. D. Tomashov, N. P. Zhuk and N. K. Kernich. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers, no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 584-602.

Measurement of the electrical potential that destroys the protective surface layer of the sample surrounded by a corrosive medium. Factors that influence pitting such as composition, pH number and temperature of electrolyte. Alloying elements improving or decreasing corrosion resistance. 17 ref. (R2j, 2-66, 2-60, 2-61; SS)

759-R. (Russian.) Correlation Between the Tendency of Copper Alloys to Cracking and Properties of the Alloying Component. A. V. Bobylev. *Tsvetnye Metally*, no. 2, 1959, p. 65-70.

12 ref. (R1d, 2-61; Cu-b)

760-R.* (Japanese.) Corrosion Resistance of Aluminum and Aluminum Alloys. Takuichi Morinaga, Shigeo Zaima and Motoo Kagami. *Light Metals*, v. 9, July 1959, p. 22-37.

Corrosion of Al containers by ethyl alcohol. (R7f; Al)

761-R. Corrosion in Steam and Steam-Condensate Systems. J. S. Connors and C. L. Seyer. *Petrochemical Industry*, v. 2, May 1959, p. 27.

(R4d; Fe)

762-R. Corrosion Control at Grand Isle. A. E. Hiller. *Petroleum Engineer*, v. 31, July 1959, p. B41-B42, B44-B45.

Cathodic protection of steel against salt water corrosion. (R4b, R10d; ST)

763-R. Anodic Polarization and Anodic Protection of Titanium in Hydrochloric and Sulphuric Acid. Rikuro Otsuka. *Scientific Papers of the Institute of Physical and Chemical Research (Tokyo)*, v. 53, Mar. 1959, p. 9-12.

5 ref. (R10, R6g; Ti)

764-R. (Russian.) Corrosion Resistance of Metal-Ceramic Alloys on TiC Base. I. S.

Brokhin and I. I. Ol'khov. *Tsvetnye Metally*, no. 3, 1959, p. 61-66.

Corrosion resistance at 900-1100° C. Effect of composition. .13 ref. (R1h, 2-62, 2-61; 6-70, *Co, Ta*)

765-R.* External Corrosion of Superheaters in Boilers Firing High-Alkali Coals. P. Sedor, E. K. Diehl and D. H. Barnhart. *American Society of Mechanical Engineers*, Paper no. 59—A-76, 1959, 10 p.

Effects of ash deposits soluble and insoluble on 18-8, Type 321 and 25-20 and Type 310 tubes show the latter more corrosion resistant. MgO reduced corrosion on 18-8 at 1200° F. by 85%. (R6p, T26q; SS)

766-R.* Titanium Valves and Piping Resist Corrosive Slurry at 500° F. Gordon Weyermuller and L. F. Engle. *Chemical Processing*, v. 22, Nov. 1959, p. 113-115.

Produced from Ti plate with a yield strength of 55,000 psi. and maximum Brinell hardness of 210. Test and pilot plane operations show a corrosion rate of essentially zero. (R6; Ti, 4-60)

767-R.* The Oxide Films Formed on Copper Single Crystal Surfaces in Pure Water. Pt. 1. Nature of the Films Formed at Room Temperature. Jerome Kruger. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 847-853.

Physical and chemical characteristics of oxide films on clean Cu surfaces as determined by crystallographic orientation, pH, irradiation by light and gases present. Epitaxial relation to Cu substrate. (R2r, M22g, 2-66; Cu-a, 14-61)

768-R.* An Electron Microscopic Study of the Formation of Oxide on Copper Single Crystals Immersed in an Aqueous Solution of Copper Sulfate. G. Tyler Miller, Jr., and Kenneth R. Lawless. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 854-856.

Oxide film on Cu single crystal in aqueous solution of $CuSO_4$ examined by electron microscope and electron diffraction methods. Effect of pH and dissolved oxygen upon growth of oxide polyhedra. (R2r, M21e, M22h, 2-66; Cu-a, 14-61)

769-R.* Influence of Silicon on the High-Temperature Oxidation of Copper and Iron. J. W. Evans and S. K. Chatterji. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 860-866.

Oxidation rates determined by glass-spring thermobalance for pure Cu, Fe, Fe-Si and Cu-Si alloys. Diffusivity of oxygen in base metal is related to depth of subscale. (R1h, 2-62, 2-60; Cu-a, Fe-a, Fe-b, Cu-b, *Si*)

770-R.* The Behavior of Rhenium in Electron Tube Environments. Gordon B. Gaines, Chester T. Sims and Robert I. Jaffee. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 881-885.

Re subjected to carburizing atmospheres, contact with alumina, water-cycle attack and boron-containing atmospheres forms borides rather than carbides and is more stable than tungsten. Re-clad W and Th-clad Re filaments examined. (R2g, 2-60, 2-62; Re)

771-R.* Oxides on the Silver Electrode. Charles P. Wales and Jeanne Burbank. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 885-890.

Mechanism of oxide formation on Ag determined by X-ray diffraction and electrode potentials. Structure of Ag oxides. (R1a, R1h, M22; Ag-a)

772-R.* The Diffusion of Corrosion Hydrogen in Aluminum Alloys. W. E. Tragert. *Electrochemical Society, Journal*, v. 106, Oct. 1959, p. 903-904.

Absorption of hydrogen into Al and consequent corrosion is inhibited in 1% Ni alloy by the reduced permeability to hydrogen of the corrosion product film rather than local cathodic discharge of hydrogen. (R10b, 2-60; Al-b, *Ni*)

773-R.* Studies on the Metallurgy of Silicon Iron. Pt. 4. Kinetics of Selective Oxidation. A. U. Seybolt. *Metallurgical Society of AIME, Transactions*, v. 215, Oct. 1959, p. 756-759.

Kinetics of a 3.2% Si-Fe to form SiO_2 was explored over a temperature range 800 to 1000° C. using a flowing gas mixture of water and hydrogen. Results at 850° C. seem to admit the possibility of a lowered Si activity due to partial Fe-Si ordering in the alloy solid solution. The presence of 0.023% C. caused a pronounced reduction in the rate of gain in weight. (R1h, 2-62; Fe-b, *Si*, 14-67)

774-R.* (German.) Cavitation Phenomena. H. H. Piltz. *Metalloberflache*, v. 13, Sept. 1959, p. 285-288.

Cavitation is considerably accelerated by chemical and electrochemical processes. Hardness, strength and surface

workability qualities of the material are of secondary importance in cavitation resistance. The principal factor is the structural condition of the metal. (R2m)

775-R.* (German.) Zinc Additions in Protection Paints. H. J. Schuster. *Werkstoffe und Korrosion,* v. 10, Aug. 1959, p. 490-494.

Corrosion resistance of Zn coatings is based on the electrochemical interaction between the pigment and the parent metal surface. A nonsoluble basic Zn composition is thereby created which insulates and therefore protects the cathodic regions of the base metal. (R10, R10d; Zn, NM-g30)

776-R.* (German.) Contact Corrosion Between Metals and Nonmetallic Materials Both in the Atmosphere and in Electrolytes. F. Podbreznik. *Werkstoffe und Korrosion,* v. 10, Aug. 1959, p. 495-498.

Galvanic corrosion of two metals with potential difference; physical contact of two metals by means of infiltration, gaseous and liquid media. (R1a, R4b)

777-R. Chromate Inhibitors Furnish Effective Low-Cost Corrosion Control. Gordon Weyermuller. *Chemical Processing,* v. 22, Nov. 1959, p. 56-59.

Chromate is blended with other compounds to form a synergized product to provide better protection in cooling water systems. (R10b)

778-R. (German.) Recent Applications of Epoxy Resins to Surface Protection. H. Zumstein. *Werkstoff und Korrosion,* v. 10, Oct. 1959, p. 605-608.

(R10; NM-g33)

779-R. (German.) The Inhibition of Hydrogen Corrosion of Iron by Phenylthiourea. H. Kaesche. *Werkstoffe und Korrosion,* v. 10, Oct. 1959, p. 622-624.

7 ref. (R10b; Fe, *H*)

780-R. (German.) Mechanism of Anaerobic Microbiological Corrosion of Metals in Soil. J. Horvath and M. Solti. *Werkstoffe und Korrosion,* v. 10, Oct. 1959, p. 624-630.

12 ref. (R8)

781-R. Studies on the Nature of Passivity in "K" Monel. Ryocho Wada. *Hokkaido University, Memoirs of the Faculty of Engineering,* v. 10, Oct. 1958, p. 523-537.

8 ref. (R10c; Ni-b, *Cu*)

782-R. (English.) Protective Value of Surface Treatment With Superheated Steam. P. Szeki. *Acta Technica (Budapest),* v. 25, no. 3-4, 1959, p. 371-375.

Protection of the oxide layer formed on steam-treated steel and cast iron. (R10g; ST, CI)

783-R. (English.) Behavior of Structural Steel Subjected to Corrosion Fatigue. Shunzo Okamoto and Hideo Kitagawa. *Proceedings of the Eighth Japan National Congress for Applied Mechanics,* (1958), Mar. 1959, p. 187-195.

19 ref. (R1e; CN)

784-R. (Russian.) Cracking of Aluminum Bronze Tested in an Ammonia Atmosphere. D. G. Butomo, N. G. Ginsburg, N. I. Zedin and L. N. Sergeev. *Tsvetnye Metally,* no. 6, 1959, p. 84-85.

Development of cracks while under stress and surrounded by an ammonia atmosphere. (R6p; Cu-s, *Al,* 9-72)

785-R.* Effect of Moisture and Oxygen on Tantalum Heating Elements. R. Lorenz. *Fansteel Metallurgy,* Sept. 1959, p. 2-3.

Suggestions to improve life expectancy of Ta heating elements in high-temperature vacuum furnaces by minimizing the presence of oxygen and water. (R1h, T1p, W27; Ta)

786-R.* High-Temperature Oxidation of Iron Whiskers. J. V. Laukonis and R. V. Coleman. *Journal of Applied Physics,* v. 30, Sept. 1959, p. 1364-1368.

Experiments using single crystal alpha Fe whiskers to study high-temperature oxidation products on Fe surfaces. (R1h, 2-62; Fe-a, 14-61)

787-R.* (German.) Theory of Localized Corrosion and Pitting of 18-8-Cr Ni Steels. W. R. Fischer. *Technische Mitteilugen Krupp,* v. 17, Sept. 1959, p. 137-145.

The possibility exists that passive and active pits are present on the metallic surface. Investigation on a carbon-low, unstable 18-8 Cr-Ni steel with and without the effect of centrifuging. 12 ref. (R2j; SS)

788-R. (French.) Cast Irons Resistant to Sulphuric Acid. *Journal d'Informations Techniques des Industries de la Fonderie,* no. 109, Oct. 1959, p. 9-11.

(Q6g; CI)

789-R.* (Japanese.) Effect of Tellurium on Oxidation Resistance of Zirconium Alloys. Tadao Sano, Shosuke Imoto, Mungyu Kang

and Yasuo Hashimoto. *Japan Institute of Metals, Journal*, v. 23, Aug. 1959, p. 486-489.

Alloying Zr with 0.016% Te increases resistance to oxidation by air and oxygen at 750-900° C. 6 ref. (R1h, 2-60; Zr-b, *Te*)

790-R. (German.) Intercrystalline Corrosion of Weldments. H. Thielmann. *Chemische Rundschau*, v. 12, Sept. 1959, p. 528. (R2h; 7-51)

791-R. (German.) Corrosion of Austenitic Steels With Special Reference to Stress-Corrosion of Weldments. W. Ruttmann. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 528. (R1d; SS-e, 7-51)

792-R. (German.) Development of Stainless, Acid and Heat Resisting Steels. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 532-534. (R6g, R7b; SS, SGA-h, SGA-g)

793-R. (French.) Inhibition of the Corrosion of Magnesium in Humid Air at 350-500° C. Raymond Darras and Roger Caillat. *Comptes Rendus*, v. 249, Oct. 19, 1959, p. 1517-1519.

5 ref. (R3; Mg)

794-R. (Hungarian.) Dezincification of Brass Tubes by Corrosion in a Power Plant Condenser. H. Zoltan and S. Levente. *Kohaszati Lapok*, v. 92, Aug. 1959, p. 369-372. (R2k; Cu-n)

795-R. (Hungarian.) Stress-Corrosion of Brass Condenser Tubes. L. Janos. *Kohaszati Lapok*, v. 92, Aug. 1959, p. 375-380. (R1d; 4-60, Cu-n)

796-R. Controlling Internal Corrosion of Tank Ships. J. Franklin Koehler. *Corrosion*, v. 15, Nov. 1959, p. 557t-560t.

Methods include partial and complete cathodic protection, inhibition, coatings and combinations of these methods. Coatings currently are considered to offer the best promise of adequate control at lowest costs. (R-general, R10, T22)

797-R. Electrical Bonding of Cathodically Protected to Unprotected Ships. G. A. Bennett, N. S. Dempster and A. J. Wallace. *Corrosion*, v. 15, Nov. 1959, p. 587t-590t.

A need is established for low resistance electrical bonding between a cathodically protected and an unprotected ship when berthed together. (R10d, T22)

798-R. (Russian.) Effect of Sea Acorns on the Corrosion of Stainless Steels. I. B. Yulanovskii, N. T. Tarasov and Yu. M. Korovin. *Doklady Akademii Nauk, SSSR*, v. 125, May, 1959, p. 1015-1018.

Behavior of Black Sea acorns in contact with 1KH13 and 1KH18V9T stainless steel. Corrosion is galvanic in nature. 7 ref. (R1a; SS)

799-R. (Russian.) Heat Resistance of Silicon Cast Iron. B. S. Milman and N. N. Alexandrov. *Liteinoe Proizvodstvo*, Sept. 1959, p. 35-37.

5-6% of Si assures adequate heat resistance. Scale resistance is attained because of a protective oxide of the spinel type formed on the metal's surface. 5 ref. (R1h, 2-60; CI, *Si*)

800-R. (Russian.) Removal of Corrosion Products From Various Steels. M. A. Tolstaya, S. V. Bogtyreva and G. N. Gradusov. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1205-1206.

Methods for stainless steel. (R11; SS)

801-R. (Russian.) Evaluation of Results Obtained in Pitting Corrosion Tests. M. D. Bezboradko and G. S. Krivoshein. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1238-1240.

5 ref. (R2j)

802-R.* Can Corrosion Problems. *Corrosion*, v. 15, Nov. 1959, p. 100-102, 104, 106.

Various types of internal and external can corrosion normally encountered and their effects on the technical adequacy of the container and on consumer acceptance. Methods presented for corrosion control include product modification, container materials selection, packaging methods, storage conditions, protective coatings and chemical treatments. (R-general, T29p; ST, *Sn*, 8-65)

803-R.* Corrosion of Titanium in Boiling 2N Hydrochloric Acid. Roger Buck, Billy W. Sloope and Henry Leidheiser, Jr. *Corrosion*, v. 15, Nov. 1959, p. 566t-570t.

Rate of corrosion of Ti when contacted to Al, Cd, Sn, Zr, Pb, Bi, Hg, Ag, Cu, Sb, V, 70:30, 50:50 and 30:70 Cu-Ni alloys, Fe, Pd, Co, Ni, Au, Rh, Pt and Ir. Corrosion measurements of the same type were also made in 0.6 and 2N H_2SO_4. 13 ref. (R6g; Ti)

804-R.* Lead-Silver Alloy Anodes in Cathodic Protection of Ships. K. N. Barnard, G. L. Christie and D. G. Gage. *Corrosion*, v. 15, Aug. 1959, p. 581t-586t.

A Pb alloy with 2% Ag has been used experimentally as an impressed current system for cathodic protection of an active destroyer. Comparison of performance and costs are made with existing impressed current and galvanic systems. (R10d, T22; Pb-b, *Ag*)

805-R.* Some Platinum Anode Designs for Cathodic Protection of Active Ships. H. S. Preiser and B. H. Tytell. *Corrosion,* v. 15, Nov. 1959, p. 596t-600t.

Voltage-current relationships determined for Pt wires, gauze and disk and a Pt-clad Ta disk in sea-water tests in the laboratory and in Boston harbor. The Pt-clad Ta disk produced the best current-voltage ratio. 32 ref. (R10d, T22; Pt-b)

806-R.* The Residual Oil Ash Corrosion Problem. C. J. Slunder. *Corrosion,* v. 15, Nov. 1959, p. 601t-606t.

Review of progress being made in combatting accelerated high-temperature corrosion caused by combustion products of residual fuel oils. Available high-temperature alloys do not have adequate resistance to oil-ash attack at temperatures above 1200° F. Improved corrosion resistance has been attained with certain experimental alloys but these have inferior mechanical properties. Surface treatments such as aluminizing, chromizing and siliconizing appear to have some inherent protective value, but further development of procedures for applying impervious and adherent coatings is needed. 57 ref. (R6, 2-62; SGA-h)

807-R. Electrical Resistance Method for Studying Corrosion Inhibitors in Automotive Anti-Freezes. J. C. Cessna. *Corrosion,* v. 15, Nov. 1959, p. 607t-612t.

Corrosion of Fe, Al and cuprous metals under varying test conditions of temperature, glycol concentrations and synthetic waters. Effect of some corrosion inhibitors upon these metals. 16 ref. (R7f, R10b, R11, 2-61; Fe, Al, Cu)

808-R.* Effect of Silicon on High Temperature Oxidation of Stainless Steels. John F. Radavich. *Corrosion,* v. 15, Nov. 1959, p. 613t-617t.

Growth of oxide films at 600 and 800° C. on a series of 16-10 Cr-Ni stainless steels with Si contents ranging from 0.17 to 3.55%. As the Si content increases, oxidation resistance increases rapidly until at the Si level, 3.55%, a very thin oxide film is formed at 600 and 800° C. and very little oxide scale forms at 1000° C. Mechanism of oxidation resistance imparted by Si appears to be that it decreases the number of defects in the initial oxide films formed at the metal-oxide interface. 10 ref. (R1h, 2-62, 2-60; SS, *Si*)

809-R.* Corrosion Resistance of Non-Ferrous Castings. A. H. Rollins. *Corrosion Technology,* v. 6, Sept. 1959, p. 259-262.

Factors in the selection of desirable alloys for castings intended for use in corrosive or heavy stress conditions. Data on performance of Monel, Al bronze, gunmetal, Cu-Zn and Cu-Sn alloys. (R-general; 5-60, Cu-b, Cu-s, Zn, Sn, Al, SGA-g)

810-R.* Corrosion Resistance of Aluminum Bronzes. G. Fitzgerald-Lee. *Corrosion Technology,* v. 6, Sept. 1959, p. 263-266, 284.

Behavior of aluminum bronze in gaseous, liquid and solid corrosive media. The addition of Al to Cu results in a marked improvement in corrosion resistance. (R-general, 2-60; Cu-s, *Al*)

811-R.* Observations on the Corrosion Products of Tin. T. K. Ross and W. Harris. *Corrosion Technology,* v. 6, Sept. 1959, p. 269-271.

White deposits formed on Sn by corrosive action in relation to crystal structure and behavior under various conditions of time, surface and concentration of corrosive agent. (R6; Sn)

812-R.* The Hot-Dip Galvanized Coating and Corrosion Resistance. Pt. 1. John H. Nicholls. *Corrosion Technology,* v. 6, Sept. 1959, p. 275-276, 284.

Corrosion under conditions of immersion in water of various compositions, burial and attack by micro-organisms and exposure to corroding atmospheres. (To be concluded.) (R-general; ST, 8-65, *Zn*)

813-R.* The Growth of Barrier Oxide Films on Aluminum. W. J. Bernard and J. W. Cook. *Electrochemical Society, Journal,* v. 106, Aug. 1959, p. 643-646.

Weight, capacitance and rate measurements on barrier oxide films show an increase in thickness at constant voltage. 5 ref. (R1h; Al)

814-R.* Kinetics of the Dissolution of Copper in Oxygen-Containing Solutions of Various Chelating Agents. J. Halpern, H. Milants and D. R. Wiles. *Electrochemical*

Society, Journal, v. 106, Aug. 1959, p. 647-650.

Dissolution rate is found to be zero-order in oxygen and first order in complexing agent. Rate-determining process is believed to be the chemical attack of oxygen-covered Cu surface by complexing agent. 7 ref. (R7j; Cu)

815-R.* Influence of Crystallographic Orientation on the Pitting of Iron in Distilled Water. Jerome Kruger. *Electrochemical Society, Journal,* v. 106, Aug. 1959, p. 736.

Surfaces of Armco iron and a purer Fe having an orientation near the {110} plane showed greatest amount of pitting. Pitting was lower for the purer Fe. (R2j, R4e; 3-72; Fe-a)

816-R.* Simultaneous Action of Organic Inhibitors and Cathodic Polarization on the Corrosion of Iron. L. I. Antropov. *Journal of Scientific & Industrial Research,* v. 18B, Aug. 1959, p. 314-319.

Calculation of increase in cathodic protection of metals, particularly Fe, by alteration of anodic and cathodic polarization. Data show a decrease in corrosion rate when electric current is applied to organic inhibitors in solutions. (R1b, R10d; Fe)

817-R.* Corrosion by Liquid Metals and Aqueous Solutions. P. H. Eisenberg. Paper from "Metals for Nuclear Reactors". American Society for Metals, Metals Park, Novelty, Ohio, 1959, p. 47-62.

Mass transfer and intergranular penetration in corrosion of Inconel and stainless steels by liquid metals. Reaction of impurities in liquid metal and purification techniques. Intergranular corrosion, stress-corrosion cracking and galvanic corrosion of stainless steels by aqueous solutions at high temperatures. Static and dynamic testing. (R1, R2, R4, R6m; SS, Ni-b)

818-R.* (French.) The Cathodic Protection of Steel Immersed in Sea Water. A. Hache. *Corrosion et Anticorrosion,* v. 7, Sept. 1959, p. 307-311.

Summary of previously published results of work at IRSID's Biarritz corrosion testing station. Projected program for study of cathodic protection. (R1d, R4b, R10d; AY)

819-R.* (French.) Results of Marine Corrosion Tests on 4% Chromium Steels. E. Herzog. *Corrosion et Anticorrosion,* v. 7, Sept. 1959, p. 312-316.

Weight loss and depth of corrosion of specimens containing slight additions of Ni or Al. Conditions included exposure to marine atmosphere, immersion in sea water, various types of surface preparation and heat treatment and asphalt painting of surfaces. 6 ref. (R3p, R4b, L26n, 2-60, 2-64; AY, *Cr, Ni, Al*)

820-R.* (French.) Marine Corrosion. G. Dechaux. *Corrosion et Anticorrosion,* v. 7, Sept. 1959, p. 317-321.

Electrolytic corrosion of floating and stationary steel structures; effect of bacteria and other organisms and impurities found in sea water; cathodic protection and protection afforded by antirust paints. (R3p, R4b, R10d, 3-69, T22; ST, SGB-s)

821-R.* (French.) Use of Titanium and Titanium Alloy Anodes for Cathodic Protection With an Independent Current Source. H. Richaud. *Corrosion et Anticorrosion,* v. 7, Sept. 1959, p. 322-324.

Cathodic protection tests in sea water on steel using Ti anodes due to the inertia of Ti to corrosive media, particularly chloride solutions. A 4% Mn-Ti alloy gave good results for anodic voltages of 10 to 15 milliamp. per sq. dm. For higher voltages, Pt-coated Ti anodes were used with great success. (R4b, R10d, R11m; ST, Ti, Ti-b, *Mn*)

822-R. (Translation—AIP.) Regarding the Problem of the Volume of Molten Metal During Electrical Erosion. A. S. Zingerman. *Soviet Physics, Solid State,* v. 2, no. 1, n.d., p. 255-260.

Expression for depth of the molten metal zone during electrical erosion determined. 31 ref. (R1c; ST, Al, Cu, 14-61)

823-R. (Translation—ATS.) Effect of Sulphur-Bearing Diesel Fuels on Metals Under Conditions of Prolonged Contact. G. G. Koznov. *Chemistry and Technology of Fuels and Oils,* v. 4, no. 8, 1959, p. 68-71.

Corrosion of steel and Cu in fuel with 0.9 and 1.25% sulphur is compared with that in sulphur-free fuel. (R7k; ST, Cu)

824-R. (Translation—ATS.) Effect of Some Organic Compounds in the Anodic Oxidation of Aluminum. L. Donev and L. Boyadzhiev. *Journal of Applied Chemistry of the U.S.S.R.,* v. 32, no. 9, 1959, p. 2031-2034.

Ethanol, glycerol and aniline hydrosulphate tested as inhibitors with the latter proving the most effective. 8 ref. (R7, R1h; Al)

825-R. (Translation—ATS.) A Study of Corrosion Stability of Sheet Iron. A. S. Afanas'ev and B. Sh. Shteinberg. *Journal of Applied Chemistry of the U.S.S.R.*, v. 32, no. 9, 1959, p. 2046-2056.

Effect of structure and chemical composition on corrosion resistance in various atmospheres. 17 ref. (R3, 3-71, 2-60; Fe-b, 4-53)

826-R. (Translation—Brutcher no. 4611.) Alloying of Metal Borides With Silicon. K. I. Portnoi, G. V. Samsonov and K. I. Frolova. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 117-121.

Effect on oxidation resistance. (R1h, 2-60; Ti, Cr, 14-68)

827-R. (Translation—ConBur.) Electrochemical Behavior of Zirconium in Sulfuric Acid. N. A. Balashova and B. N. Kabanov. *Proceedings of the Academy of Sciences of the USSR, Physical Chemistry Section*, v. 121, July-Aug. 1958, p. 489-491.

Cathodic and anodic behavior of Zr, and the potential change in 1N H_2SO_4 solution at 25° C. in the absence of current. 7 ref. (R6g, P15; Zr)

828-R. (Translation—ConBur.) Electrochemical Properties and Corrosion Behavior of Titanium in Sulfuric Acid Solutions. V. V. Andreeva and V. I. Kazarin. *Proceedings of the Academy of Sciences of the USSR, Physical Chemistry Section*, v. 121, July-Aug. 1958, p. 577-580.

Relationship between dissolution rate, H_2SO_4 concentration and temperature. 4 ref. (R6g, P15j; Ti)

SECTION S

INSPECTION and CONTROL

1-S. (German.) Research Institute for Iron and Steel Metallurgy in Moscow. Rudolf Kraus. *Giessereitechnik.* v. 4, no. 8, 1958, p. 194-195.

Survey on chemical, polarographic, spectrographic, mechanical, metallographic and physical testing methods. 5 ref. (S-general, A9h)

2-S. (Russian.) Eddy Current Inspection of Rails. V. V. Vlasov. *Fizika Metallov i Metallovedenie,* v. 6, no. 2, 1958, p. 246-254.

10 ref. (S13h, T22q)

3-S. (Russian.) Eddy Current Inspection of Rails, Pt. 4. V. V. Vlasov. *Fizika Metallov i Metallovedenie,* v. 6, no. 8, 1958, p. 426-432.

8 ref. (S13h, T23q)

4-S. (Russian.) Relation Between Some X-Ray Spectographic and Magnetic Characteristics of Iron-Base Alloys. S. A. Nemnonov and K. M. Kolobova. *Fizika Metallov i Metallovedenie,* v. 6, no. 8, 1958, p. 466-474.

Dependence of asymmetric indices of line series $K_{\alpha}{}^{1}$ and $K_{\beta}{}^{5}$ in Fe, on the Al and Zn concentration forming a binary alloy with Fe. The alloy range was 10 to 75% Al and 28 to 75% Zn. 12 ref. (S11k, P16; Fe, *Al, Zn*)

5-S. (Russian.) Application of Arsenate Reagents for Determination of Rare Metals. A. F. Kuteinikov. *Zavodskaya Laboratoriya,* v. 24, no. 9, 1958, 1050-1052.

Arsenate reagents used for determination of very small metallic additions-a tenth of a microgram in a 1 ml. solution. 4 ref. (S11j; EG-b)

6-S. (Russian.) Photometric Determination of Magnesium With Phenozane Reagents. V. I. Kuznetsov, L. M. Budanova and L. A. Nenasheva. *Zavodskaya Laboratoriya,* v. 24, no. 9, 1958, p. 1053-1056.

Use is made of quality of hydroxy-magnesium to adsorb many tinted organic substances and change its own coloration. The reagent used is a dark brown powder which does not dissolve in water, but dissolves with a yellow tint in alcohol, chloroform and benzole. 12 ref. (S11a; Mg)

7-S. (Russian.) Amperometric Determination of Iron in Different Materials Using a Trilon B. Yu. I. Usatenko and M. A. Vitkina. *Zavodskaya Laboratoriya,* v. 24, no. 9, 1958, p. 1058-1059.

Study based on anodic diffusion waves released by trilon B upon oxidation at pH-8, on mercury dropping electrodes. (S11j; Fe)

8-S. (Russian.) Spectrum Analysis of Precision Alloys. N. V. Buyanov and N. P. Kaminskaya. *Zavodskaya Laboratoriya,* v. 24, no. 9, 1958, p. 1086-1090.

Method designed to speed analysis of permalloy and ferro-alloy metals for Ni, Mo, Mn and Si based on principle that with increased concentration of Ni and Cr there is a corresponding decrease in Fe. 4 ref. (S11k; Mn, Mo, Ni, Si, AD-n31)

9-S.* Hydrogen in Ferrosilicon—Analytical Methods and Average Hydrogen Contents of Some Commercial Grades. N. Christensen and K. Gjermundsen. *Iron and Steel Institute, Journal,* v. 190, Nov. 1958, p. 248-254.

Apparatus and methods for determination of the total hydrogen content of ferro-silicon. Hydrogen in ferro-silicon

shows severe segregation depending on the presence of hydrated lime and alumina in the sample. 13 ref. (S11; Si, AD-n31, H)

10-S. Gravimetric Determination of Tungsten in the Presence of Molybdenum. A. Claeys. *Analytica Chimica Acta*, v. 19, 1958, p. 114-118.

10 ref. (S11b; W, *Mo*)

11-S. New Method Based on Paper Chromotography for Estimation of Thorium and Uranium in Monazite. I. I. M. Elbeih and M. A. Abou-Elnaga. *Analytica Chimica Acta*, v. 19, 1958, p. 123-128.

7 ref. (S11g; Th, U, RM-n)

12-S. Polarographic Determination of Indium in Zinc-Base Alloys. Pt. 4. Determination of Indium in Mazak Alloys. G. F. Reynolds and H. I. Shalgosky. *Analytica Chimica Acta*, v. 19, 1958, p. 190-194.

(S11m; Zn-b, *In*)

13-S. Neutron Activation Analysis of Aluminum-Base Alloys. William A. Brooksbank, Jr., George W. Leddicotte and John A. Dean. *Analytical Chemistry*, v. 30, Oct. 21, 1958, p. 1785-1788.

Method applied to determination of Cu, Mn, Ni, Fe, Zn and Ti in National Bureau of Standards Al alloys. Accuracy of method is generally 5-7% for the major constituents of Al alloys. 13 ref. (S11g; Al-b, *Cu, Mn, Ni, Fe, Zn, Ti*)

14-S. Separation and Determination of Small Amounts of Rare Earths in Uranium. Charles V. Banks, James A. Thompson and Jerome W. O'Laughlin. *Analytical Chemistry*, v. 30, Oct. 21, 1958, p. 1792-1795.

Spectrophotometric method. (S11a; U, *EG-g*)

15-S. Determination of Oxide Films on Tin Plate. A. R. Willey and D. F. Kelsey. *Analytical Chemistry*, v. 30, Oct. 21, 1958, p. 1804-1806.

Rapid coulometric procedure. 14 ref. (S11m; Sn, 4-53)

16-S. Determination of Cadmium in Zinc Concentrates and Other Zinc-Rich Materials. Silve Kallmann, Hans Oberthin and Robert Lin. *Analytical Chemistry*, v. 30, Oct. 21, 1958, 1846-1848.

9 ref. (S11; Cd, *Zn*)

17-S. Recent Developments in NBS Spectrographic Standard Samples of Iron-Base Alloys. Robert E. Michaelis. *Applied Spectroscopy*, v. 12, no. 4, 1958, 114-116.

Infrared spectra of Numol mulls of several xanthates, oxyxanthates and dixanthates. (S11k, S22, 15-74; Fe, Co)

18-S. X-Ray Spectrographic Analysis of Nickel-Containing Alloys With Varied Sample Forms. C. M. Davis and G. R. Clark. *Applied Spectroscopy*, v. 12, no. 4, 1958, p. 123-126.

8 ref. (S11p; Ni-b)

19-S. Spectral Analysis of Metals. Passereau. *Microtecnic*, v. 12, no. 2, 1958, p. 64-68.

Equipment, procedures, advantages. (S11k)

20-S. Rapid Determination of Vanadium in Navy Special Fuel Oil by X-Ray Fluorescence. M. B. Cavanaugh and R. M. Roe. Naval Research Laboratory. *U. S. Office of Technical Services*, PB 131786, July 1958, 7 p. $ .50.

(S11p; *V*, RM-k)

21-S. Determination of Hydrogen in Zirconium Hydride. W. H. Jones. Wright Air Development Center. *U. S. Office of Technical Services*, PB 131972, Dec. 1957, 10 p. $ .50.

Vacuum extraction technique in which equilibrium pressure of hydrogen over the metal is measured in a closed system under predetermined conditions. (S11r, 2-61, 1-73; Zr, *H*)

22-S. Extraction Procedure for the Determination of the Metallic Constituents in Greases. L. A. Harrah. Wright Air Development Center. *U. S. Office of Technical Services*, PB 151027, May 1958, 15 p. $ .50.

(S11f; NM-h)

23-S. Summary of Analytical Methods Used in the Chemical Processing Plants at Hanford. R. J. Brouns and R. A. Schneider.

Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1833, 1958, 12 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Gamma spectrometry, X-ray absorptiometry and coulometric methods of analysis for U and Pu. 19 ref. (S11; U, Pu)

24-S. Determination of Boron in Gaseous Carbon Dioxide. *United Kingdom Atomic Energy Authority*, IGO-AM/W-176, 1958, 10 p. (Available from British Information Service, 30 Rockefeller Plaza, New York, N. Y.) 2 sh.

Absorptiometric procedure by which the gas sample is absorbed in sodium hydroxide and the B separated by distillation as methyl borate and collection in a mixed glycerol sodium hydroxide reagent. (S11g; B)

25-S. (German.) Determination of Tantalum and Columbium in Minerals and Ferro-Alloys. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 11, Oct. 1958, p. 465-470.

Ta_2O_5 plus Cb_2O_5 can be separated quantitatively from accompanying Ti and Sn. Since W and P are separated at the same time, special tests are necessary to obtain the sum Ta_2O_5 plus Cb_2O_5. Four methods are recommended, taking the above into consideration. 16 ref. (S11; Cb, Ta, 14-59, AD-n)

26-S. (Japanese.) Determination of Oxygen in Titanium by Vacuum Fusion Method. Yasumoto Otake. *Sumitomo Metals*, v. 10, Apr. 1958, p. 111-124.

Apparatus, procedure and analytical results. Sample is reacted with molten iron bath in a graphite crystal in the presence of tin to form stable carbide of Ti and reduce the oxides; with a furnace temperature of 1850 to 1900° C. complete reduction of the oxides is affected within 30 min. Evolved gases extracted and analyzed. 25 ref. (S11r; Ti, *O*)

27-S. Determination of Trace Amounts of Aluminium in Cast Iron. R. C. Rooney. *Analyst*, v. 83, Oct. 1958, p. 546-554.

23 ref. (S11f; CI, *Al*)

28-S. Decomposition of Cyanates in Acid Solution, With Reference to the Analysis of Chromium-Bearing Minerals and Alloys. L. D. Scott, *Analyst*, v. 83, Oct. 1958, p. 588-591.

4 ref. (S11; Cr-b, RM-n)

29-S. Quantitative Spectrographic Analysis of the Rare Earth Elements. Pt. 9. Determination of Rare Earth Impurities Commonly Associated with Purified Samarium, Gadolinium, Terbium and Yttrium. R. N. Kniseley, V. A. Fassel, B. B. Quinney, C. Tremmel, W. A. Gordon and W. J. Hayles. *Spectrochimica Acta*, v. 12, Oct. 1958, p. 332-337.

9 ref. (S11c; Sm, Gd, Tb, Y)

30-S. Analytical Chemistry of Plutonium at the Los Alamos Scientific Laboratory. Charles F. Metz. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/926, 1958, 16 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Potentiometric methods for Pu assay, radio-chemical methods for gamma-counting of Am in Pu, and methods of separating Pu for measurement by alpha-counting techniques. Ion exchange and precipitation methods for separating Pu from a number of alloying elements such as Co, Ni, Cu, In, U, V, Cd, Bi. (S11, Pu, *Co, Ni, Cu, In, U, V, Cd, Bi*)

31-S. (French.) Practices Recommended in the Radiographic Testing of Fusion Welded Joints of Steel Sheet Under 50 Mm. *Revue de la Soudure*, v. 15, no. 3, 1958, p. 141-145.

(S13e; ST, 4-53, 7-51)

32-S. (German.) Highly Sensitive Method of Determining Sulphur or Sulphur and Carbon by a Recording Conductivity Measuring Instrument. Walter Koch, Siegfried Eckhard and Hanns Malissa. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 543-546.

4 ref. (S11g; C, S)

33-S. (German.) Rapid Analysis of Ores and Similar Materials. Alfred Neuberger, Ernst Schoffmann and Karl Herkenhoff. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 547-552.

Photometric and flame photometric methods. 8 ref. (S11a; RM-n)

34-S. (German.) Economic Aspects of the New German Standard DIN 41000. Welded

Building Structures, Calculation and Design. Walter Wrycza. *Schweissen und Schneiden,* v. 10, Oct. 1958, p. 401-404.

(S22, T26, 7-51)

35-S. (Japanese.) Paint Tests. Shigeo Tamehiro. *Metals (Supplement),* v. 28, Oct. 1958, p. 15-18.

Standard tests recommended by Japanese Industrial Standards. (S22, L26n, NM-g 30)

36-S. X-Ray Spectroscopy of Rare-Earth Elements. F. W. Lytle, K. R. Stever and H. H. Heady. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1425, 1958, 11 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Qualitative and quantitative analysis of rare earths in ion exchange elutriants; determination of trace amounts of rare earth elements in high-purity rare earth oxides produced by ion exchange and by liquid-liquid extraction. 7 ref. (S11p, C19; EG-g)

37-S. Quantitative Separation of Small Amounts of Rare Earths From Thorium, Uranium, and Zirconium by Ion Exchange. Henry J. Hettel and V. A. Fassel. Ames Laboratory. U. S. Atomic Energy Commission. ISC-851, Dec. 1956, 66 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.

Procedure is based on the ion-exchange chromatographic separation of the rare earths plus added yttrium carrier from the Th, followed by emission spectrometric determination of the rare earth impurities in the Y carrier. 45 ref. (S11f, Th, U, Zr, *Y,* EG-g)

38-S.* (German.) International Classification and Marking of Carbide Cutting Tools. Rauhut. *Werkstattstechnik and Maschinenbau,* v 48, Oct. 1958, p. 555-556.

Product groups should be established based on the chip forming characteristics of the materials for which the tools are intended. (S22, T6n; 6-69)

39-S. Industrial Uses of Radioisotopes. *National Industrial Conference Board, Inc., Studies in Business Policy,* no. 87, 1958, 86 p. $5.

Nature of radioisotopes and their application in gaging, radiographic inspection and as tracers in such applications as study of wear, corrosion, flow rate, location, chemical reaction and chemical analysis. Other utilizations including ionization sources, luminescence, atomic batteries, sterilization, training of personnel for handling radioisotopes. Health and safety practices, waste disposal, licensing and training programs of the U.S., Canada and United Kingdom. (S11q, S13e, S14e, A-general, 1-59, 14-63)

40-S.* (Czech.) Most Suitable Conditions for the Use of Radiocesium Cs^{137} for Radiation of Welds and Castings. Miroslav Baimler. *Hutnicke Listy,* v. 13, no. 9, 1958, p. 853-862.

Sensitivity of gammagraphic method was in the range of about 2.5% of steel thickness for fine grain film. Suitable zone of application for Cs^{137} was steel 35 to 85 mm. thick and best sensitivity was obtained in range from 50 to 60 mm. 17 ref. (S13e; ST, *Cs,* 5-60, 7-51)

41-S.* (French.) Spectrometric Analysis of Basic Bessemer Pig Iron and Steel by the Scanning Slit Method. M. D. E. Jonckers and A. Daniels. *Revue de Metallurgie,* v. 55, July 1957, p. 601-612.

For routine production control prism spectrograph is used to determine C, Mn, P and Si. Analysis is performed by spark discharge or continuous arc with reference to a reflected polychromatic beam. High precision results are obtained. 12 ref. (S11k; CI-a, ST-g, *Mn, P, Si*)

42-S.* (German.) Magnetic Powder Test. H. J. Marschall. *Werkstatt und Betrieb,* v. 91, Nov. 1958, p. 649-653.

Applications, processes, reliability. (S13j)

43-S.* (Swedish.) Use of Radioactive Isotopes in the Mining and Iron and Steel Industries. Lars G. Erwall. *Jernkontorets Annaler,* v. 142, no. 7, 1958, p. 369-400.

Fundamentals of radioactivity and instruments for its measurement; applications in metallurgical industries. Examples include sorting of minerals, study of flotation, mechanism of corrosion, measurement of refractory wear

in blast furnaces, gas and material transport in various types of furnaces, distribution studies between slag and metal, wear and thickness measurements. 34 ref. (S14e, A-general, 1-59; Fe)

44-S. A Group Separation Method for Gamma Spectrometry of Complex Radionuclide Mixtures—With Special Application to Stainless Steel and Its Corrosion Products. K. Samsahl. *Acta Chemica Scandinavica,* v. 12, no. 6, 1958, p. 1292-1296.

5 ref. (S11g, S11f, R-general; SS)

45-S. Data Sheets. *Australian Institute of Metals,* 1956-1957, 8 p.

First issue of a series of data sheets covering Al temper designation system; Al alloy compositions; Ti; 5% Cr tool-steel; $2\frac{1}{2}$% Ni-Cr-Mo steel; hardness conversion charts. (S22, Ti, Al, TS, SS, 11-68)

46-S. Application of the Spectrograph to Foundry Practice. E. Humphries. *Castings,* v. 4, Oct. 1958, p. 15, 17, 19

(S11k, E25; CI, Ni)

47-S. Rapid Quantitative Methods for Determination of Brighteners, Levellers and Anti-Pitting Agents in Nickel Electroplating Baths. K. Szmidt, T. Zak and Zb. Kwiatkowski. *Institute of Metal Finishing, Transactions,* v. 36, Autumn 1958, p. 17-21.

13 ref. (S11, L17a; Ni)

48-S. Iron Analysis in Chromium Solutions. A. Salka. *Metal Finishing,* v. 56, Dec. 1958, p. 64.

(S11g; Fe)

49-S. Ethylenediamine Tetra-Acetic Acid and Allied Compounds in Metallurgical Analysis. E. G. Brown. *Metallurgia,* v. 58, Sept. 1958, p. 149-158.

Surveys literature on the application of complexones or EDTA in metallurgical analysis used in determination of Al, Be, Bi, Cd, Ce, Cr, Co, Cu, Ga, Au, In, Fe, Pb, Mg, Mn, Mo, Ni, Si, Ag, Th, Sn, Ti, U, Zn and Ar. Application to analysis of Al, Be, Co, Mg, Mn, Se and S in ferrous alloys. 83 ref. (S11j, S11a)

50-S. Mutual Determination of Iron and Tropolone. Yoshinaga Oka and Shigeki Matsuo. *Tohoku University, Science Reports of the Research Institutes,* v. 10, Aug. 1958, p. 299-305.

Data on absorption spectra and composition of tropolone iron complexes. Utilization of complexes in the neutral spectrophotometric determination of iron and tropolone. (S11a; Fe)

51-S. Analysis of Sodium Metal and Sodium-Potassium Alloy. United Kingdom Atomic Energy Authority, IGO-AM/CA-110, Mar. 1958, 41 p. (Available from British Information Services, 30 Rockefeller Plaza, New York, N. Y.)

Chemical methods for the determination of C, O (as NaO_2) and K; emission spectroscopic methods for determination of Rb and Cs. (S11; *C, Rb, Cs, O,* K, Na, 14-68)

52-S. A Pulsed Eddy Current Technique for Measuring Clad Thickness. D. L. Waidelich, J. A. DeShong and W. J. McGonnagle. Argonne National Laboratory. U. S. Atomic Energy Commission, ANL-5614, July 1958, 49 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Electromagnetic field is applied at the surface of the clad fuel element by means of a probe coil. When the waves encounter a sudden discontinuity, such as an interface, "echoes" are produced. The crossing point between the positive and negative peaks or the amplitude of the echo is used to determine the thickness. (S14c, T11g; 8-66)

53-S. (Czech.) Graphic Correlation Analysis and Its Use for the Analysis of Metallurgical Production. Radim Vojta. *Hutnicke Listy,* v. 13, no. 9, 1958, p. 795-800.

9 ref. (S12j)

54-S. (Czech.) Complexometric Determination of Lead in Antifriction Metals and Solders. Karel Studlar and Ivan Janousek. *Hutnicke Listy,* v. 13, no. 9, 1958, p. 805-808.

88 ref. (S11j; Pb, SGA-c)

55-S. (German.) Apparatus for Determinating Gas Content of Aluminum Alloys During Melting and Casting. C. E. Ransley, D. E. J. Talbot and H. C. Barlow. *Aluminium,* v. 34, Nov. 1958, p. 643-646.

9 ref. (S11r; Al, 14-60)

56-S. (German.) Bonded Aluminium. *Aluminium*, v. 34, Nov. 1958, p. 665.

40 ref. (S22, S13; Al-b, 7-58)

57-S. (German.) Use of Oversize Spectroscopes in Testing Iron and Steel. Georg Graue, Siegfried Eckhard and Robert Marotz. *Archiv fur das Eisenhuttenwesen*, v. 29, Oct. 1958, p. 619-626.

Difficulties in the evaluation of numerous lines appearing in small areas of the spectrum; example of Al determination in steel. 16 ref. (S11k, 1-53; ST, *Al*)

58-S. (German.) Photometric Method for Rapid Determination of Chromium in Copper-Chromium Alloys. H. Wiedmann. *Metall*, v. 12, Nov. 1958, p. 1000.

(S11a; Cu-b, *Cr*)

59-S. (German.) Rapid Quantitative Determination of Tin, Copper, Lead, Iron and Nickel in Red Brass and Bronze. H. Wiedmann. *Metall*, v. 12, Nov. 1958, p. 1005-1007.

Chemical and photometric methods. 5 ref. (S11j, S11a; Cu-n, Cu-s, Cu, *Fe, Pb, Sn, Ni*)

60-S. (German.) New DIN-Standards for Copper and Copper Alloys. W. Bund. *Metall*, v. 12, Nov. 1958, p. 1017-1018.

(S22; Cu, Cu-b)

61-S. (Japanese.) New Analytical Method by Spectrophotometer of Naphthalene Disodium Sulfonate. Teruo Yamanouchi and Takanori Yoneyama. *Metal Finishing Society of Japan, Journal*, v. 9, Aug. 1958, p. 292-295.

Analyzing naphthalene disodium sulphonate, a brightener for Ni plating. Consumption of brightener with electrolysis. (S11a, L17a; Ni)

62-S. (Russian.) Analysis of Indium Antimonide and Arsenide in Gallium Arsenide. Yu.A. Chernikhov and T.V. Cherkashina. *Zavodskaya Laboratoriya*, v. 24, no. 9, 1958, p. 1057-1058.

Investigation of intermetallic compounds in study of pure metals for use as semiconductors. (S11g; In-b, *As, Sb*, EG-j31)

63-S. (Russian.) Use of Diphenylcarbazone in the Photometric Determination of Copper in Iron and Steel. L. N. Lapin and N. V. Reis. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 4, 1958, p. 426-429.

12 ref. (S11a; Fe, ST, *Cu*)

64-S. (Russian.) Determination of Indium in Germanium. V A. Nazarenko, E. A. Biryuk and R. V. Ravitskaya. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 4, 1958, p. 446-448.

Diphenylcarbazone, In in a slightly acid medium (optimum at pH = 5 to 6), gives out a violet color. This property is made use of in the photometric method described. (S11a; Ge, *In*)

65-S. (Russian.) Analytical Application of 8-Mercacto-Quinoline (Thiooxine and Its Derivities). Pt. 2. Photometric Determination of Small Amounts of Palladium. Yu. A. Bankovskii and A. F. Tevihhyi. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 5, 1958, p. 509-512.

(S11a; Pd)

66-S. (Russian.) Separation of Thorium, Titanium, Zirconium and Other Elements by Homogeneous Precipitation. F. V. Zaikovskii and L. Gerkhadt. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 5, 1958, p. 513-518.

(S11f; Th, Ti, Zr)

67-S. (Russian.) Determination of Bi and Trivalent Titanium in Slags Containing Metallic Bivalent Iron. L. I. Veselago. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 5, 1958, p. 562-566.

(S11g; Ti)

68-S. (Russian.) Separation of Uranium and Vanadium. Yu. V. Morachevskyi, A. I. Belyaeva and L. V. Ivanova. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 5, 1958, p. 572-575.

(S11f; U, V)

69-S. (Russian.) Spectrochemical Determination of Tantalum in Zirconium. S. V. Elinson, K. I. Petrov and A. T. Rezova. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 5, 1958, p. 576-579.

(S11k; *Ta*, Zr)

70-S. (Russian.) Determination of Calcium, Magnesium, Aluminum, Silicon and

Tin in Refined Platinum. S. A. Borovik, A. V. Babaeva, I. I. Ushakova and E. R. I. Rudyi. *Zhurnal Analitichoskoi Khimii*, v. 13, no. 5, 1958, p. 580-582.

Spectrographic analysis of Pt and Pd. (S11k; *Ca, Al, Mg, Si, Sn,* Pd, Pt)

71-S.* (Book.) Classified Radiographs for Defects in Aluminium Fusion Welds. P. T. Houldcroft, J. G. Young and A. A. Smith. 51 p. 1958. British Welding Research Assoc., 29 Park Crescent, London, W.1, England.

Defects classified, origin explained, suggestions for prevention. (S13e; Al-b, 9-72, 9-71, 7-51)

72-S. (Book.) ASTM Manual on Quality Control of Materials. *American Society for Testing Materials,* STP 15-C, Jan. 1951, (1957 reprint), 134 p. $2.50.

Presentation of data; presenting ± limits of uncertainty of an observed average; control chart method of analysis and presentation of data. (S12g)

73-S. (Book-Russian.) Color Metallurgy. H. A. Suvorovskaia. 567 p. 1957. Metallurgizdat, Moscow, USSR. 13 R, 75 K.

Word "color" is applied to those elements which have chromatic colors, includes S, Ni, Mg and Fe. Manual of quantitative chemical analysis of ores, slags, pure metals, electrodes, hard fuels and alloys. Gravimetric, colorimetric, electrolytic and combustion methods. (S11)

74-S. (Translation—SLA, 58-1733.) Considerations on the Interpretation of Ultrasonic Examination in the Investigation of Defects in Steel. E. Marianeschi and T. Tili. *Metallurgia Italiana,* v. 4, 1957, p. 275-289.

See item 310-S, 1957. (S13g; ST)

75-S. (Translation—SLA, ASLIB-GB80.) Detectability of Faults in the Nondestructive Testing of Steel With High-Energy X-Rays. R. Schittenhelm. *Zeitschrift fur Angewandte Physik,* v. 8, no. 12, 1956, p. 596-

(S13e; ST)

76-S. (Translation—SLA, ASLIB-GB95.) Automatic Inspection in the Plant of Mild Steel Billets by Electromagnetic and Ultrasonic Methods. V. Husarek and L. Beaujard. *Revue de Metallurgie,* v. 54, Feb. 1957, p. 135-146.

(S13; CN, 4-52)

77-S.* Segregation in Uranium-Aluminum Alloys and Its Effect on the Fuel Loading of Aluminum-Base Fuel Elements. W. C. Thurber and R. J. Beaver. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2476, Sept. 19, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Techniques for quantitatively determining the accuracy of potentiometric U analyses in U-Al alloys containing up to 55% U and for evaluating the segregation existing in U-Al alloys. From the observed U segregation, the U content of a hypothetical fuel element was predicted by means of several sampling techniques. (S11m; 9-69, U, *Al*)

78-S. Evaluation of Steels. A. O. Schaefer. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, p. 2-14.

Radiography, ultrasonic inspection, notched bar impact tests applied to forgings. Adequacy of tests for brittle fracture. (S13, Q6, Q26s; ST, 4-51)

79-S.* (French.) Contribution to the International Standardization of Copper Alloys. Pierre-Julien le Thomas and Dominique Arnaud. *Fonderie,* no. 154, Nov. 1958, p. 515-530.

Tabular surveys of the variation of mechanical properties of the bronzes, their chemical composition and tensile strength as a function of composition. (S22, Cu-s, 5-60)

80-S. (French.) Radiospectrographic Inspection of the Structural Condition of Lifting Chains. G. A. Homes and R. Pankowski. *Revue de Metallurgie,* v. 55, Sept. 1958, p. 865-871.

(S13e, T7e; ST)

81-S. (German.) Rapid Sampling of Molten Cast Iron. Wolfram Ruff and Hans-Jurgen Wirth. *Giesserei,* v. 23., Nov. 6, 1958, p. 700-701.

Molten iron is transformed into tiny pellets by a water stream projected through a funnel which is connected to a nozzle. Dispersed pellets are caught in immersed pan, dried and mortar tested. (S12h; CI, 14-60)

82-S. (Russian.) Colorimetric Determination of Hexavalent Molybdenum With Tungsten and Other Elements. A. I. Busev and

Li. Gyn. *Zhurnal Analiticheskoi Khimii*, v. 13, no. 5, 1958, p. 519-527.
(S11a; Mo)

83-S. (Russian.) Tentative USSR Standard for Coke Pig Iron. L. I. Gol'denberg and V. S. Monakhova. *Liteinoe Proizvodstvo*, Aug. 1958, p. 1-3.
(S22; CI-a)

84-S. (Russian.) Ultrasonic Inspection of Welds in Welded Cast Structures. I. N. Ermolov. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 29-32.
(S13g; 5-60, 7-51)

85-S.* (English.) Nondestructive Testing in the Large Mechanical Industry. *Fiat Stabilimento Grandi Motori*, v. 5, Oct-Dec., 1957, p. 105-121.
Apparatus and principles of penetrating liquid, magnetoscopic, X-ray, ultrasonic methods and gamma rays for testing flaws. 4 ref. (S13)

86-S.* (German.) Rapid Determination of Lead in Free-Cutting Steel. Siegfried Meyer and Othmar G. Koch. *Archiv fur das Eisenhuttenwesen*, v. 29, Nov. 1958, p. 677-682.
Gravimetric determination by dissolving the steel in dilute sulphuric acid and precipitation of Pb as molybdate or chromate. In photometric method described the Pb is determined immediately from the solution as iodide. (S11b, S11a, S11g; ST, SGA-k, *Pb*)

87-S. Determination of Molybdenum in Uranium and in Molybdenum-Uranium and Molybdenum-Niobium Mixtures. C. O. Granger. *Analyst*, v. 83, Nov. 1958, p. 609-615.
Spectrophotometric method. (S11a; *Mo*, U, Cb)

88-S. Colorimetric Determination of Aluminium in Steel With Solochrome Cyanine R. P. H. Scholes and D. Valerie Smith. *Analyst*, v. 83, Nov. 1958, p. 615-623.
14 ref. (S11a; *Al*, ST)

89-S. Determination of Small Amounts of Silicon in High-Purity Iron. H. G. Short and A. I. Williams. *Analyst*, v. 83, Nov. 1958, p. 624-627.
Activation method. (S11q; *Si*, Fe)

90-S. Stainless Steel Correlation Charts. *Design News*, v. 13, Dec. 8, 1958, p. 87-98.
Tabulates uses and composition for AISI Types 201 through 502; producers listed alphabetically; trade names and numbers. (S22, SS, 17-57)

91-S. Two-Color Pyrometry in the Steel Industry. T. P. Murray and Vincent G. Shaw. *I. S. A. Journal*, v. 5, Dec. 1958, p. 36-41.
Advantages over Pt-Pt/Rh thermocouples and total radiation methods. (S16a, X9r; ST)

92-S. Determination of Tungsten in Steel Not Containing Niobium and Tantalum. *Iron and Steel Institute, Journal*, v. 190, Sept. 1958, p. 51-55.
Gravimetric procedure for determination of W in range 3 to 32% W with particular attention to analysis of high-speed steel containing Mo. (S11b; TS-m, *W*)

93-S. Polarography of Beryllium. G. Venkataratnam and BH. S. V. Raghava Rao. *Journal of Scientific & Industrial Research*, v. 17B, Sept. 1958, p. 360-362.
Data on half-wave potentials and diffusion current of Be in solution. (S11m; Be)

94-S. Rapid Polarographic Procedure for Estimation of Uranium in Its Ores. G. V. Subbarayudu and BH. S. V. Raghava Rao. *Journal of Scientific & Industrial Research*, v. 17B, Sept. 1958, p. 363-365.
(S11m; U, RM-n)

95-S. Preliminary Experiments on Radiometric Estimation of Traces of Thorium. K. R. Kar and B. C. Sawhney. *Journal of Scientific & Industrial Research*, v. 17B, Sept. 1958, p. 365-366.
6 ref. (S11q; *Th*)

96-S. (Czech.) Automatically Operated Apparatus for Differential and Gravimetric Thermo-Analysis. Rudolf Splitek. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 697-705.
112 ref. (S11b, X9s)

97-S. (Czech.) Indirect Polarographic and Complexometric Determination of Small Amounts of Arsenic in Iron and Its Ores. Alois Cerny. *Hutnicke Listy*, v. 13, no. 8, 1958, p. 715-717.
(S11j, S11m; Fe, *As*)

98-S. (French.) Recent Progress in the Complexometric Determination of Calcium and Magnesium in Slags. V. Kuhn. *Chimie Analytique*, v. 40, Sept. 1958, p. 340-344.
Ca in presence of Mg can be determined by EDTA with help of new indicator, RF chromium blue black. Use of Teriochromium black then permits determination of Mg in same solution. In analysis

of slags and refractories, elements that would impede analysis are first removed in form of complexes by chloroform extraction. 6 ref. (S11j; Ca, Mg, RM-q)

99-S. (French.) Methods of Improving the Exactness and Reproducibility of Spectral Sources. H. Guyer. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 308-312.

Parameters influencing character and reproducibility of spectrographic discharge. Design of new rotary interruptor based on theoretical requirements and previously known but seldom used high-frequency device for measuring energy crossing analytical gap. 8 ref. (S11k, X3b)

100-S. (German.) Reducing Scrap by Statistical Methods of Control. Heribert A. Krall. *Giesserei*, v. 45, June 5, 1958, p. 321-325.

Magnitude of scrap in production of castings. Calculation of scrap control limits. Evaluation of current production. 5 ref. (S12g, S12j, E-general; RM-p)

101-S. (German.) Rapid Method for Quantitative Analysis of Nickel Plating Baths. Hans Birik Bomskov. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Nov. 1958, p. 487-489.

Rapid titration analysis for Ni in solutions of nickel chloride and sulphate and boric acid. Also with organic additives. (S11j, L17c; Ni)

102-S. (German.) Limitations of Gamma Radiographs in Flaw Detection as Used for Circumferential Pipe Welds. W. H. Papke. *Schweissen und Schneiden*, v. 10, Nov. 1958, p. 439-441.

Relationship between wall thickness, intensity and focus. Distortion of results. 4 ref. (S13e; 4-60, 7-51)

103-S. (Italian.) Influence of Photographic Emulsion on Effective Line Width. A. Lais and R. Intonti. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 296-300.

Fine-grain emulsions give steeper log b/log t curves. 6 ref. (S11k, X5s)

104-S. (Italian.) Advantages of Selective Volatization and Phenomena of Enhancement in Spectrographic Analysis. G. Rigault. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 301-304.

Methods of increasing spectral sensitivity with excitation in a d-c. arc; application in analysis of rare earth elements, Ga and In. 14 ref. (S11k; Ga, In, EG-g)

105-S. (Italian.) Observations on So-Called Flame Spectrophotometry. V. Gazzi. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 305-307.

Apparent simplicity of use of this technique leads to neglect of factors influencing line intensity and measures required to reduce errors. Elements that can be successfully "flame-analyzed" and appropriate lines. (S11k)

106-S. (Italian.) Production Control With the "Spectro-Lecteur". H. Pfundt. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 313-316.

Device used primarily to analyze fusion products and follow charging of furnaces. Results on three types of Al alloys. Workroom conditions and analytical errors. (S11k; Al-b)

107-S. (Italian.) Applications of Effective Line Widths. A. Fiorenza and M. Lachin. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 319-324.

Application to spectrographic analysis of high-concentration mixtures of metallic powders; procedures, equipment, methods of evaluation. Use of effective line widths offers considerable extension of analytical curves, compensation for variations of emission, rectification of instrumental variations, remarkable independence from characteristics of photographic emulsion. Hypothesis on interpretation of compensating method inherent in "method of averages". 10 ref. (S11k; 6-68)

108-S. (Italian.) Spectrographic Control of the Bath During Zinc Plating of Steel Strip by the Sendzimir Process. A. Porta. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 325-328.

Method uses arc-like discharge between a flat Zn specimen and a graphite counter-electrode. Al is determined in concentration field ranging from 0.01 to 0.30%, Pb between 0.05 and 0.60%. Preparation of standard specimens, reproducibility, precision of method. 8 ref. (S11k, L17; Al, Pb, *ST, Zn*)

109-S. (Italian.) Spectrographic Analysis of Leaching Solutions of Lead and Zinc Ores. M. Civera. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 329-331.

Direct analysis of solutions permits rapid preparation of samples, gives approximate results. Elements furnishing reference lines under conditions of operation are: Tl for Zn, Ag for Fe and Zn simultaneously, Cu for Fe and Pb simultaneously. Also, new simple method

of testing solution by spark technique. (S11k; Pb, Zn, RM-n)

110-S. (Italian.) New Spectrophotometric Method for Rapid Visual Analysis of Metals. C. Mielenz. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 332-336.

New Spectrophotometer (Feuss "Spekromat") incorporates ultra-luminous and highly dispersive self-collimating spectroscrope with optical system equivalent to five prisms and active base of about 460 mm.; provides wide slit even in line-rich steel spectra; makes possible accurate quantitative analysis; solves previously unsolved problem of quantitative determination of Si. (S11a, X3c; Si)

111-S. (Italian.) Effects of Variation of Pressure on Intensity of Emission in Arc of Some Elements. Giulio Brautti. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 340-342.

Variation of pressure of gas in which arc burns causes increase or dimunition of intensity of emitted lines; effect was observed with Cu and Zn electrodes in N_2, Ne, A, air and CO_2. (S11k)

112-S. (Japanese.) Chloride Content of Galvanized Coatings. Yoshifumi Mima. *Metal Finishing Society of Japan, Journal*, v. 9, Nov. 1958, p. 411-415.

Photometric analysis of coating on cast iron and steel. (S11a; *Zn*, ST, CI, 8-65)

113-S. (Russian.) Checking Metal for Seams in Billets and Finished Products. G. S. Chernyak and M. I. Vinograd. *Stal'*, v. 18, Oct. 1958, p. 946-947. 4 ref.
(S13; ST, 4-52, 9-71)

114-S. (Russian.) Improved Steel Quality Control. I. A. Dvorchik. *Metallurg*, v. 3, Nov. 1958, p. 44-45.

Measures and results at Tselyabinsk tube mill. (S13; ST, 4-60)

115-S. (Russian.) Measuring Openhearth Roof Temperature With Thermoelectric Pyrometers. I. S. Roginskii. *Stal'*, v. 18, Nov. 1958, p. 997-998.
7 ref. (S16, X9r, W18r)

116-S. (Spanish.) Use of the Tungsten Electrode in the Potentiometric Determination of Manganese in Steels. Ramon Suarez. *Instituto del Hierro y del Acero*, v. 11, July-Sept. 1958, p. 177-179.

Comparative study of results obtained using the W electrode as zero semi-element instead of calomel electrode. Tables of values, procedure. Results and values for concentration of Mn coincide perfectly, although absolute potentials do not. 4 ref. (S11m, T1f; *Mn*, ST)

117-S. (Swedish.) Standards for Cast Aluminum Alloys. *Gjuteriet*, v. 48, Oct. 1958, p. 154-156.
(S22; Al-b, 5)

118-S.* X-Ray Spectrophotographic Determination of Tantalum, Niobium, Iron, and Titanium Oxide Mixtures. B. J. Mitchell. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1894-1900.

Accurate analysis of metal oxides found using arithmetic correction factors based on empirical calibration curves to compensate for interelement effect. 12 ref. (S11k; Ta, Cb, Ti, Fe, 14-68)

119-S.* Spectrographic Determination of Boron and Silicon in Low-Alloy Steel by Fluoride Evolution. James E. Paterson and William F. Grimes. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1900-1902.

After decomposing and distilling copper fluoride, the fluorides give spectrum lines of Si and B. Determines concentration in steels in range of 0.001 to 0.02% with a coefficient of variations of ± 3% for B and ± 3.2% for Si. 5 ref. (S11c; AY, *Si, B*)

120-S.* Ion Exchange Spectrographic Method for Determination of Impurities in Uranium and Plutonium. James K. Brody, John P. Faris and Robert F. Buchanan. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1909-1912.

Separation of impurities from Pu by the ion exchange-hydrochloric acid system reduces the amount of radioactive material on the electrodes compared with the carrier distillation method. In the ion exchange-copper spark produced each electrode pair contained about 4 microns each of Pu and americium. 11 ref. (S11c, S11f; U, Pu, 9-51)

121-S.* Spectrophotometric Determination of Copper in Titanium and Titanium Alloys by Dithizone Extraction. Howard W. Pender. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1915-1917.

Rapid, quantitative method determining Cu in range 0.0001 to 1% without preliminary chemical separation. 6 ref. (S11a; Ti-b, *Cu*)

122-S.* Determination of Tungsten or Molybdenum by X-Ray Emission Spectrography. J. E. Fagel, Jr., H. A. Liebhafsky

and P. D. Zemany. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1918-1920.

W in alkaline solution determined when bromine used as internal standard. Mo in ores or residues with known W content found by measuring ratio of Mo K alpha to W L gamma . (S11p; Mo, W)

123-S.* Determination of Titanium With Cupferron. K. L. Cheng. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1941-1945.

(Ethylenedinitrilo) tatraacetic acid as masking agent. Photometric method. 5 ref. (S11a; Ti)

124-S.* Polarographic Determination of Iron and Manganese in Ores and Metallurgical Products. I. M. Issa, R. M. Issa and I. F. Hewaidy. *Chemist-Analyst*, v. 47, Dec. 1958, p. 88-90.

Sulphite used to remove dissolved oxygen and hydrogen peroxide after tri-ethanolomine had been used. Permits study in steel, cast iron, ores and synthetic mixtures. 8 ref. (S11m; ST, CI, *Fe, Mn,* RM-n)

125-S.* Photometric Determination of Manganese in Steel and Cast Iron. J. E. Bolzan. *Chemist-Analyst*, v. 47, Dec. 1958, p. 95-96.

Persulphate-silver method employing a filter photometric and bleached blank. 4 ref. (S11a; ST, Ci, *Mn*)

126-S.* Determination of Hydrogen in Steel by a Carrier Gas Technique. E. A. Shanahan and F. Cooke. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 381-385.

H content can be determined by heating the sample at about 650° C. in a stream of an inert carrier gas. Evolution of the H occurs substantially at the same rate as in the well-known vacuum heating technique. The rate-controlling factor is the diffusion of the H within the solid sample. The procedure overcomes the need for vacuum apparatus. 4 ref. (S11r; ST, *H*)

127-S.* Gamma Radiography With Iridium. R. A. Mintern and J. C. Chaston. *Platinum Metals Review*, v. 3, Jan. 1959, p. 12-16.

Gamma ray spectrum or iridium 192. Radiographic technique, exposure, availability of sources. (S13e; Ir, 14-63; 17-57)

128-S.* Sample for Rapid Measurement of Gas in Aluminum. H. V. Sulinski and S. Lipson. *Modern Castings*, v. 34, Jan. 1959, p. 102-110.

Gas content is determined by a single weighing of a 20-cc. sample solidified at approximately 0.1 atmospheric pressure. Resin-bonded shell mold and knock-off riser system of special design permit control of as-cast specimen volume. 5 ref. (S11r; Al, 5-60)

129-S.* (Polish.) Comparison of Two Methods of Preliminary Isolation of Inclusions of Oxides in Low-Carbon Steels by Electrolysis. J. Foryst, J. Orzechowska and W. A. Mczedliszwili. *Prace Instytutow Ministerstwa Hutnictwa*, v. 9, no. 4, 1957, p. 161-165.

Chemical composition of oxide inclusions was determined in low-carbon steel deoxidized by Fe-Mn-Si-Al. 9 ref. (S11; CN-g, 9-69)

130-S. Colorimetric Determination of Bismuth in Alloys. Morris P. Grotheer and Jack L. Lambert. *Analytical Chemistry*, v. 30, Dec. 1958, p. 1997-1999.

(S11a; *Bi*)

131-S. Determination of Reduced Titanium Chlorides in Fused Salt Melts. Svante Mellgren and Marshall B. Alpert. *Analytical Chemistry*, v. 30, Dec. 1958, p. 2061-2063.

Analysis for total soluble Ti by titration with ferric ammonium sulphate. 15 ref. (S11j; Ti)

132-S. (Russian.) Amperometric Determination of Arsenic and Selenium by Direct Iodine Method. O. A. Songina and A. P. Voiloshnikova. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1331-1336.

(S11j; As, Se)

133-S. (Russian.) Determination of Tantalum by Differential Spectrophotometry. B. M. Dobkina and T. M. Malyutina. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1336-1343.

(S11a; Ta)

134-S. (Russian.) Flurometric Determination of Sulphate Ions and Spectrophotometric Determination of Thorium With Aid of Trioxy-Fluorine Derivatives. V. A. Nazarenko and M. B. Shustova. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1344-1346.

(S11a; Th)

135-S. (Russian.) Flurometric Determination of Tellurium With Carbon Rhodamine. D. P. Shcherbov and A. I. Ivankova. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1346-1349.

(S11j; Te)

136-S. (Russian.) Rational Selection of Analytical Methods. V. I. Kuznetsov. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1358-1366.
(S11)

137-S. (Russian.) Quantitative Determination of Aluminum and Titanium in Polyethylene of Low Pressure by Spectrum Analysis. G. P. Fratkina. *Zavodskaya Laboratoriya*, v. 24, no. 11, 1958, p. 1373-1374.
(S11k; Al, Ti)

138-S.* (Hungarian.) Determination of Combustion Temperature by Means of Thermodynamic Computations. Aurel Horvath. *Kohaszati Lapok*, v. 13, Feb-Mar. 1958, p. 91-96.
Three methods of computation for determining the temperatures attainable in metallurgical equipment. 5 ref. (S16, D11j)

139-S. (Translation-BISI, 1048.) The Determination of the Titanium Nitride in Steel. Yu. A. Klyachko. *Zavodskaya Laboratoriya*, v. 23, no. 2, 1957, p. 140-143.
See item 218 S, 1957. (S11f; SS, Ti, 14-68)

140-S. (Translation—ConBur.) Determination of Sodium and Potassium in Minerals by Flame Spectrophotometry. N. S. Poluetkov, M. P. Nikonova and R. A. Vitkun. *Journal of Analytical Chemistry of the USSR*, V. 13, Jan-Feb. 1958, p. 49-56.
16 ref. (S11a; *Na, K*, 14-59)

141-S. (Translation—ConBur.) Determination of Gallium in Minerals by Means of the Rhodamine Photometric Method. V. S. Saltykova and E. A. Fabrikova. *Journal of Analytical Chemistry of the USSR*, v. 13, Jan-Feb. 1958, p. 65-67.
7 ref. (S11a; *Ga*, 14-59)

142-S. (Translation—ConBur.) Photometric Determination of Tantalum in Titanium and Its Alloys by Means of Arsenazo Reagent. E. I. Nikitina. *Journal of Analytical Chemistry of the USSR*, v. 13, Jan-Feb. 1958, p. 75-81.
6 ref. (S11a; Ti, *Ta*)

143-S. (Translation—ConBur.) A Spectrographic Method for the Determination of Small Amounts of Lead, Tin, Cadmium, Antimony and Bismuth in Metallic Rhenium. Iu. I. Kutsenko. *Journal of Analytical Chemistry of the USSR*, v. 13, Jan-Feb. 1958, p. 115-119.
6 ref. (S11k; Rh, *Pb, Sn, Cd, Sb, Bi*)

144-S. (Translation—ConBur.) Spectrochemical Determination of Platinum and Palladium in Uranium. O. I. Bufatin, A. N. Zaidel and N. I. Kaliteevskii. *Journal of Analytical Chemistry of the USSR*, v. 13, Jan-Feb. 1958, p. 127-128.
(S11k; U, *Pt, Pd*)

145-S. Practical Planning for Non-Destructive Testing by Use of Radiation. F. S. Sutherland. *Modern Castings*, v. 34, Jan. 1959, p. 71-75.
250,1000 or 2000-kv. X-ray betatron; conditions and protective materials. (S13e, X8g)

146-S. (German.) Determination of Manganese in Iron and Steel. Hans Joachim Thomann. *Giessereitechnik*, v. 4, Nov. 1958, p. 292-294.
6 ref. (S11j; Fe, ST, *Mn*)

147-S. (German.) Analytic Determination of Mo in Galvanizing Baths. R. Weiner and P. Boriss. *Metallwaren-Industrie und Galvanotechnik*, v. 49, no. 12, 1958, p. 517-519.
(S11, L17a; *Mo*)

148-S. (German.) Rapid Determination of the Purity of Anodes. Max Straschill. *Metallwaren-Industrie und Galvanotechnik*, v. 49, no. 12, 1958, p. 520-529.
Methods given for Zn, Cd, Cu, Pb, Ni and Sn anodes. (S11, W3h; Zn, Cd, Cu, Pb, Ni, Sn)

149-S. (Russian.) Inspecting Welded Joints by Means of Electronic Optical Converter. M. A. Gromov. *Svarochnoi Proizvodstvo* Dec. 1958, p. 35-36.
4 ref. (S13d, 7-51)

150-S. (Russian.) Comparative Evaluation of Analytical Methods for Oxides in Steel. V. A. Mchedlishvili. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1171-1178.
24 ref. (S11; O, *ST*)

151-S. (Russian.) Method of Acid Decomposition in Determination of Thorium and Uranium in Sandstones. V. I. Kuznetsov, I. V. Nikol'skaya and G. I. Malofeevd. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1178-1179.
Decomposition of silicates by heating under pressure in hydrochloric acid. (S11f; Th, U)

152-S. (Russian.) Decomposition of Difficult-to-Dissolve Cast and Openhearth Slags by Means of Sintering. Yu. I. Ustenko

and N. P. Fedash. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1180-1181.
Analysis results. 5 ref. (S11; RM-q)

153-S. (Russian.) Determination of Phase Composition of Silica Slags. M. V. Babaev and N. M. Kostyanovskaya. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1183-1189.
(S11; RM-q)

154-S. (Russian.) Determination of Metallic Iron in Presence of Ferrous Oxide and Ferric Oxide. I. T. Taranenko. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1184-1185.
(S11; Fe)

155-S. (Russian.) Spectrophotometric Determination of Palladium With Nioxime and Alpha-Benzil-Dioxime. N. K. Pshenicin and O. M. Ivonina. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1185-1189.
15 ref. (S11k; Pd)

156-S. (Russian.) Determination of Aluminum With "Alberon". E. A. Kashkovskaya and I. S. Mustafin. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1189-1192.
(S11; Al)

157-S. (Russian.) Colorimetric Determination of Germanium With Phenylfluorone. F. G. Zharovskii and A. T. Pilipenko. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1192-1194.
(S11a; Ge)

158-S. (Russian.) Colorimetric Determination of Tin in Metallic Lead With Phenylfluorone. S. D. Gur'ev and N. F. Saraeva. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1195-1196.
5 ref. (S11a; Sn, *Pb*)

159-S. (Russian.) Ultrasonic Quality Control of Spot and Seam-Welded Lap Joints. S. T. Nasarov and J. P. Panov. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1214-1217.
Determination of actual diameter of weld; location of pores and cracks. (S13g; 7-51)

160-S. (Russian.) Rapid Determination of Silicon in Carbon-Free and Low-Carbon Ferrochrome. M. I. Gasik and B. I. Emlin. *Zavodskaya Laboratoriya*, v. 24, Oct. 1958, p. 1218-1219.
Determination of Si during the smelting process; utilizing the thermo-electric properties of the vapor. 5 ref. (S11g; Si, AD-n)

161-S.* A Review of Methods for Assessing Non-Metallic Inclusions in Steel. T. R. Allmand. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 359-372.
Microscopic, microradiographic and magnetic methods, with typical inclusion-count results. Main factors affecting results of inclusion counts are rolling, method of sampling, type of microscope used, selection of field to be examined. Recommendations for more effective use of existing methods. 23 ref. (S11; 9-69, ST)

162-S.* Development of Methods for Isolating Structural Constituents in Steels. W. Koch and H. Sundermann. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 373-381.
Items of apparatus, electrolytes used and possible sources of error. Electrolytic dissolution of steel specimens can be classified as ferrous iron active, ferrous iron partly passive, and ferric iron active. Structural components isolated are carbides, oxides, sulphides, phosphides and nitrides. 32 ref. (S11g; ST, 9-69, 14-68)

163-S.* Electromagnetic Testing of Tubing: Standardization of Specifications and Test Methods. Pt. 1. Richard Hochschild. *Nondestructive Testing*, v. 16, Nov-Dec. 1958, p. 495-499.
Standardization is impeded by discontinuities (flaws, porosity, inclusions, etc.), heat treatment condition, chemical composition, internal and applied stresses, crystal orientation, lattice dislocations, noise pick-up and temperature. (S13h; 4-60)

164-S.* Magnetic Flaw Detection. A. G. Gardner. *Metallurgia*, v. 58, Dec. 1958, p. 309-312.
Principles of the magnetic particle method of detecting flaws in iron and steel components. Method can be used to disclose defects other than cracks, such as slag streaks, which can be detrimental under certain conditions of service. (S13j; ST, CI)

165-S.* (Swedish.) Isolation and Investigation of Oxidic Slag Inclusions in an Acid Openhearth Steel With 0.7% C. N. A. Hovgard. *Jernkontorets Annaler*, v. 142, no. 10, 1958, p. 589-612.
Isolates were analyzed spectrographically, by X-ray diffraction and microscopically. Inclusions appear to be mainly endogeneous and consist chiefly

of SiO_2 or Al_2O_3 and are not deformed by hot rolling. A uniform distribution of Al was not attained before solidification when the Al was added in the mold. 22 ref. (S11; ST, 9-69, *Si, O,* Al, NM-a34)

166-S.* (Russian.) Magnetic Testing of Rails. Pt. 2. Use of Analogies in Examination of Electromagnetic Phenomena. V. V. Vlasov. *Fizika Metallov i Metallovedenie,* v. 6, no. 1, 1958, p. 74-81.

Method and apparatus for examining electromagnetic phenomena produced by moving magnetic field. 41 ref. (S13h, T23q)

167-S. Determination of Uranium in Flotation Concentrates and in Leach Liquors by X-Ray Fluorescence. G. L. Smithson, R. L. Eager and A. B. VanCleave. *Canadian Journal of Chemistry,* v. 37, 1959, p. 20-28. 9 ref. (S11p; U)

168-S. Analysis of Gases in Metals. *Metal Industry,* v. 94, Jan. 2, 1959, p. 6, 11.

Methods of analyzing hydrogen in Ti and oxygen in Mo, Si, Ta and Ge. (S11r; Ti, Mo, Si, Ta, Ge, *H, O*)

169-S. Principles of Eddy Current Testing. Friedrich Foerster. *Metal Progress,* v. 75, Jan. 1959, p. 101-105.

This versatile method of nondestructive testing is becoming more and more useful by the day. A defective sample will cause the impedance of a test coil to vary; these variations can be measured to determine several properties such as hardness, tensile strength, diameter, conductivity and permeability. (S13h)

170-S. Volumetric Determination of Magnesium in Aluminum Alloys by Ethylene-Diamine-Tetra-Acetic Acid (EDTA). R. C. Jackson, W. Stross and L. H. Wadsworth. *Metallurgia,* v. 58, Dec. 1958, p. 305-308.

Elimination of interference by Ca has now been achieved. (S11j; Al, *Mg*)

171-S. The Absorptiometric Determination of Molybdenum in Uranium Metal. *United Kingdom Atomic Energy Authority,* IGO-AM/S-120, June 1958, 5 p.

Metal is dissolved in HCl, extracted as the thiocyanate-complex into diethyl-ether-petroleum ether mixture and determined absorptiometrically. (S11k; U, *Mo*)

172-S. The Absorptiometric Determination of Nickel in Uranium Metal. *United Kingdom Atomic Energy Authority,* IGO-AM/S-42, Apr. 1958, 6 p.

Ni is extracted as its dimethyl glyoxime complex into chloroform from an alkaline solution of the metal. The chloroform solution is acid extracted and the Ni in the extract determined absorptiometrically as the oxidized dimethyl glyoxime complex. (S11k; U, *Ni*)

173-S. The Spectrographic Determination of Calcium in Uranium Metal. *United Kingdom Atomic Energy Authority,* IGO-AM/S-118, July 1958, 7 p.

The metal is ignited to U_3O_8 and arced on Cu electrodes at 7 amp. The spectra are recorded on a Jarrell-Ash fully automatic grating spectrograph. (S11k; U, *Ca*)

174-S. The Absorptiometric Determination of Combined Nitrogen in Uranium Metal Including Swarf and Powder. *United Kingdom Atomic Energy Authority,* IGO-AM/S-121, June 1958, 9 p.

N is converted to ammonia which is then steam-distilled and determined absorptiometrically using phenate reagent. (S11k; U, *N*)

175-S. The Spectrographic Determination of Aluminium in Uranium Metal. *United Kingdom Atomic Energy Authority,* IGO-AM/S-125, June 1958, 12 p.

The metal is ignited to U_3O_8 which is mixed with sodium fluoride and spectrographed using the carrier distillation technique. (S11k; U, *Al*)

176-S. The Absorptiometric Determination of Boron in Uranium Metal. *United Kingdom Atomic Energy Authority,* IGO-AM/S-124, June 1958, 15 p.

The metal is dissolved in HCl and oxidated with the minimum quantity of nitric acid. B is separated by distillation as methyl borate and the B determined absorptiometrically. (S11k; B, *U*)

177-S. Uranium Analysis by Gamma Absorptiometry. R. E. Connally, U. L. Upson, P. E. Brown and F. P. Brauer. Hanford Atomic Products Operation. *U. S. Atomic Energy Commission,* HW-54438, May 20, 1958, 28 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Major advantages of the absorptiometer as compared to the X-ray photometer are dependability and simplicity of the source, essentially monochromatic emission, and low cost. (S11k; U)

178-S. X-Ray Methods of Analysis. L. S. Birks. Naval Research Laboratory. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Technology". *U.S. Atomic Energy Commission,* TID-7555, p. 216-226.

Applications of X-ray spectroscopy to determine Fe, Cr and Ni content. (S11p; Fe, Cr, Ni)

179-S. (English.) Determination of Traces of Iron in Tungsten-Cobalt Alloys With the Aid of Paper Chromatography. Liang Yu-chen. *Scientia Sinica,* v. 7, Nov. 1958, p. 1054-1059.

8 ref. (S11f; *Fe,* W, Co)

180-S. (Russian.) Continuous Gaging of Metal in Process of Hot Rolling. A. B. Chelyuctkin. *Stal',* Dec. 1958, p. 1103-1107.

(S14, F23)

181-S. (Russian.) Testing Boiler Plate. A. C. Zhuravlev. *Stal',* Dec. 1958, p. 1133-1134.

(S-general; T26q)

182-S. (Russian.) Chromotographic Separation of Iron and Cobalt Ions. I. A. Korshunov, A. P. Subbotina and V. I. Gnezdov. *Zhurnal Neorganicheskoi Khimii, Akademiya Nauk SSSR,* v. 3, no. 9, 1958, p. 2128-2130.

(S11f; Co, Fe)

183-S.* (German.) Methods for Testing Metal Bonds Developed for Standardization. H. Winter and H. Meckelburg. *Aluminium,* v. 35, Jan. 1959, p. 21-28.

Testing heat, humidity, corrosion resistance, and fatigue behavior with static and dynamic tests. Bonding techniques. 7 ref. (S13, L22, Q7, R11, 1-54; 8-66)

184-S.* (German.) Comparative Tests on Heavy Forgings by Ultrasonic Waves and by Betatron. Lutz Brand. *Stahl und Eisen,* v. 79, Jan. 8, 1959, p. 32-36.

Investigating cavities, sand inclusions and cracks. 7 ref. (S13g, S13e; ST, 4-51)

185-S.* (Hungarian.) Instrumental Control of Alumina Content in Cryolite-Alumina Melts. Jozsef Kerti. *Kohaszati Lapok,* v. 91, July 1958, p. 333-336.

Instrument based on interrelation of alumina content and critical current density. (S18, C23n, 1-53; Al)

186-S.* (Russian.) Electromagnetic Method for Inspection of Case Hardened Surfaces. B. A. Kuznetsov. *Stanki i Instrument,* Dec. 1958, p. 27-29.

Determination of structure and depth of hardened surface. Alternating field (eddy currents) as well as permanent field methods are used. (S13h)

187-S. Spectrographic Analysis of Zircaloys. J. Allen Wheat. *Applied Spectroscopy,* v. 12, no. 5, 1958, p. 152-154.

12 ref. (S11k; Zr-b)

188-S. Determination of Small Amounts of Aluminum in Cast Iron. R. C. Rooney. *British Cast Iron Research Assoc., Journal,* v. 7, Dec. 1958, p. 436-441.

Spectrophotometrically with 8-hydroxyquinoline in chloroform. 7 ref. (S11a; CI, *Al*)

189-S. Determination of Magnesium in Nodular Graphite Cast Iron. R. C. Rooney and Beryl Carter. *British Cast Iron Research Assoc., Journal,* v. 7, Dec. 1958, p. 442-445.

Rapid stoichiometric method Mg titrated with ethylene-diaminetetra-acetate (E.D.T.A.). 9 ref. (S11j; CI-r, *Mg*)

190-S. A New Approach to the Analysis of Brass, Cadmium and Zinc Plating Solutions Using Ethylenediamine Tetra-Acetic Acid and Fast Sulphon Black F. K. E. Langford. *Electroplating and Metal Finishing,* v. 11, Dec. 1958, p. 439-441.

Alternative accurate volumetric method is preferable to the classic ferrocyanide titrations for Cd and Zn and particularly well adapted to the routine control of solutions of approximately known composition. (S11j; L17a, Cu-n, Zn, Cd)

191-S. Department of Defense Titanium Sheet-Rolling Program: Uniform Testing Procedures for Sheet Materials. Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121649, Sept. 1958, 30 p. $1.25.

(S22, F23; Ti, 4-53)

192-S. (French.) Statistical Control Applied to the Foundry. J. Largeteau. *Fonderie,* Aug. 1958, p. 361-373.

(S12, E-general)

193-S. (French.) Determination of Free Carbon and Combined Carbon by Selective Oxido-Reduction. Application to Mixtures of Cementite, Metallic Iron and Graphite as Well as Industrial Cast Irons. Fernand Marion. *Societe Chimique de France, Bulletin,* Aug-Sept. 1958, p. 1181-1187.

16 ref. (S11g; Fe, CI, C)

194-S. (German.) Chemical Isolation of Sulphides in Steel. Walter Koch and Elfriede Artner. *Archiv fur das Eisenhuttenwesen*, v. 29, Dec. 1958, p. 737-744.

Various steels were treated in an electrolyte. Solid solutions of manganese and iron sulphide, pure iron sulphide and the sulphides of Ti, Zr and Mn were isolated. 23 ref. (S11f; ST, *S*, NM-a)

195-S. (German.) Gaging of Castings. Rudolph Wiest. *Giesserei*, v. 46, Jan. 1959, p. 11-14.

(S14, 5)

196-S. (German.) Lead Foil Provides Optimum Amplification Effect and Flaw Detection in Ir-192 and Cs-137 Gamma-Radiographs. W. H. Papke. *Schweissen und Schneiden*, v. 10, Dec. 1958, p. 463-466.

Using 150-micron foil, radiographs of increased contrast, compared with radiographs made with a 20-micron foil, were obtained with shorter exposures. 14 ref. (S13e, K9r; ST, 4-56, 4-53, 4-60, 7-51)

197-S. (Hungarian.) Determining the Si, Mn, P, Cr, and Mo Contents of Pig and Cast Irons From a Single Solution. L. Egri. *Kohaszati Lapok-Ontode*, v. 9, no. 8, 1958, p. 194-196.

Combination of gravimetric, titrimetric and photometric methods. 3 ref. (S11; CI-a, CI-b, *Si, Mn, P, Cr, Mo*)

198-S. (Hungarian.) Data for Determining the Silicon Contents of Al-Si Alloys. Istvan Somosi. *Kohaszati Lapok*, v. 13, no. 8, 1958, p. 390-392.

Tests ± 3 to 4% spectroscopic analysis. 4 ref. (S11k; Al-b, *Si*)

199-S. (Hungarian.) Fluorine Content Determination of Cryolite and Aluminum-Fluoride. Janos Bognar and Lajos Nagy. *Kohaszati Lapok*, v. 91, July 1958, p. 338-340.

Potentiometric titration producing semi-micro data. (S11j; Al, *F*, NM-a33)

200-S. (Hungarian.) Determination of Small Amounts of Cu in Iron Ores. Bela Simon. *Kohaszati Lapok*, v. 91, July 1958, p. 341-343.

Process based on the copper-pyridin-rodanid complex. 4 ref. (S11g; Fe, *Cu*, RM-n)

201-S. Large-Scale Optical Inspection. John Wanner. *Metalworking Production*, v. 103, Jan. 30, 1959, p. 184-185.

Checking the antennas of the distant early warning radars. (S13d, X15q)

202-S. Specialized Foundry Statistical Controls Improve Customer Satisfaction. Buford M. Appleman. *Modern Castings*, v. 35, Feb. 1959, p. 62-72.

(S12g, E-general)

203-S. Determination of Uranium Ores, Leach Solutions, and Mill Products. M. A. DeSesa. National Lead Co. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U. S. Atomic Energy Commission, TID-7555*, 1958, p. 57-77.

Volumetric, fluorometric and spectrophotometric methods. (S11; U, RM-h)

204-S. Recent Developments in the Analytical Chemistry of Thorium and Its Compounds. Charles V. Banks. Iowa State College. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U. S. Atomic Energy Commission, TID-7555*, 1958, p. 79-114.

Gravimetric, titrimetric, spectrophotometric and polaraographic methods for the detection, separation and determination of diverse elements in Th and Th compounds. (S11; Th)

205-S. Recent Developments in the Analytical Chemistry of Zirconium. E. B. Read and F. A. Bauman. Nuclear Metals Inc. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U. S. Atomic Energy Commission, TID-7555*, p. 116-126.

Gravimetric, volumetric, colorimetric or spectrophotometric, spectrographic, X-ray fluorescent, and vacuum fusion methods for the determination of Zr, Hf and the weight ratio of Hf to Zr in metals, compounds, and solutions. 13 ref. (S11; Th, Hf)

206-S. Recent Developments in the Analytical Chemistry of Titanium. Arnold L. Gahler. Electro Metallurgical Co. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U. S. Atomic Energy Commission, TID-7555*, 1958, p. 127-137.

Methods for determination of O, H, N, C and Fe which adversely affect properties of Ti alloys. Comparative test results for two vacuum fusion methods for determining O. (S11; Ti-b, *O, H, N, C, Fe*)

207-S. Analytical Chemistry of Beryllium. E. Stanley Melick. Brush Beryllium

Co. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Technology". *U. S. Atomic Energy Commission, TID-7555,* 1958, p. 158-174.

Gravimetric, volumetric or colorimetric methods for estimation of Be in Be ores, process materials, biological and air samples and for the determination of 21 components in Be metal and alloys. 78 ref. (S11; Be)

208-S. Determination of Trace Elements in Reactor Materials by the Methods of Neutron Activation Analysis. G. W. Leddicotte, W. T. Mullins, L. C. Bate and J. F. Emery. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission, TID-7555,* 1958, p. 192-215.

Elements determined include U in low-grade ores; Cr, Cu, Fe, Hf, Si, Ni, Mo in Zr metal; Cu, Zn, Mn, Ti and U in Be; Si, Cu, W, Y, Ni, Mn in Ti and its compounds. 13 ref. (S11q; U, Cr, Cu, Fe, Hf, Si, Ni, Mo, Mn, Ti, Be, W, Y)

209-S. Spectrochemical Analysis of Reactor Materials. Cyrus Feldman. Oak Ridge National Laboratory. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Technology". *U. S. Atomic Energy Commission, TID-7555,* 1958, p. 227-238.

Spectrochemical analysis of uraniferous ores, reactor materials and radioactive samples. Spectrographic estimation of O in metals and the isotope dilution techniques for the determination of H in metals. 9 ref. (S11c; U, RM-n, O, H)

210-S. (German.) Suggested Standards for Electrochemical Tinning on Steel, Copper and Copper Alloys. B. Keysselitz. *Galvanotechnik,* v. 50, Jan. 15, 1959, p. 36-37.

(S22, L17; ST, Cu-b, *Sn*)

211-S. (Russian.) Eddy Current Inspection of Rails. V. V. Vlasov. *Fizika Metallov i Metallovedenie,* v. 6, no. 4, 1958, p. 628-632.

5 ref. (S13h, T23q)

212-S. (Russian.) Separation of Iron From Other Metals by Ion Exchange Chromatography. R. N. Galovatyi. *Ukrainskii Khemicheskii Zhurnal,* v. 24, no. 3, 1958, p. 379-383.

Separation of Fe from Ca, Mg, Al, Co, Ni, Cu and Ti by use of bisodium salt of ethylenediamine tetra-acetate oxide-trilon B. 8 ref. (S11f; *Fe,* Ca, Cu, Al, Co, Mg, Ni, Ti)

213-S.* (German.) Measurement of Roof Temperature in Openhearth Furnaces With the Aid of Photoelectric Pyrometer. A. K. Adabaschjan. *Neue Hutte,* v. 3, Oct. 1958, p. 615-619.

Temperature measuring technique in openhearth plants of the USSR. New measuring techniques developed for determining roof temperatures. Water-cooled photoelectric pyrometers proved the most reliable. (S16, W18r, X9r)

214-S.* (German.) Results of Flame Radiation Measurements in Openhearth Furnaces. Horst Schicke. *Neue Hutte,* v. 3, Oct. 1958, p. 622-629.

Brightness of the flame characteristic of heating adequacy in openhearth; color brightness pyrometers used to measure flame temperature and soot radiation. Influence of natural gas and oil properties, of gas preheating, heat supply and air on flame properties. Relation between soot radiation and melting-down capacity. 4 ref. (S16c, D11p, X9r)

215-S.* Magnetic-Particle Inspection Paces Production Line at Griffin Wheel. A. J. Panozzo. *Modern Castings,* v. 35, Feb. 1959, p. 38-40.

Inspection of cast steel railroad car wheels, using the continuous wet method of fluorescent magnetic particle inspection. (S13j, T23p; ST-f, 5)

216-S. Analysis of Uranium and Its Compounds. C. J. Rodden. New Brunswick Area Office, AEC. Paper from "First Conference on Analytical Chemistry in Nuclear Reactor Applications". *U. S. Atomic Energy Commission, TID-7555,* 1958, p. 24-42.

Separation of rare-earth elements by ion-exchange; methods for determination of C, N, O, H and Si in U metal; methods for estimation of Mo, Ni, Cr, Mn, W, V, Si, S and phosphate in UO_3, UF_4 and in other compounds of U. 32 ref. (S11f; U, EG-g, C, N, O, H, Si, Ni, Cr, Mn, W, V)

217-S. (Pamphlet.) Steel Products Manual; High Strength Low Alloy Steel. *American Iron and Steel Institute,* Dec. 1958, 57 p. Free.

Tolerances, inspection, definition, manufacturing processes and properties of sheet, strip, plate, structural shapes. bar and bar sections. (S22; AY-n, 4-53, 4-55, 4-57)

218-S. (Book.) First Conference on Analytical Chemistry in Nuclear Reactor Technology. C. D. Susano, H. S. House and

Margaret A. Marler. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission, TID-7555,* Aug. 1958, 261 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $3.50.

Recent advances in methods for analysis of reactor construction materials, fuels, moderators, coolants and blanket materials, presented at a conference held at Gatlinburg, Tenn., Nov. 4-6, 1957. Papers abstracted separately. (S11, T11)

219-S. (Translation—BISI, no. 1159.) Investigation of Ingot Cooling. V. M. Dementev and M. M. Kotrovsky. *Stal',* Sept. 1958, p. 847-851.

See item 752-S, 1958. (S16, X9q, X9r; ST, 5-59)

220-S. (Translation.) Composition of Anosovite and Titanium Sesquioxide in Titanium-Rich Slags. V. V. Lapin, N. N. Kurtseva and O. P. Ostrogorskaya. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, p. 264-268.

8 ref. (S11; Ti, RM-q)

221-S. (Translation.) Analytical Determination of Carbon Fluorides in Anode Gases From Aluminum Baths. V. P. Mashovets and E. L. Zakharov. Paper from "Soviet Research in Fused Salts". Pt. 2. Consultants Bureau, Inc., New York, 1958, p. 152-160..

16 ref. (S11r, C23n; Al)

222-S.* Investigation of Radioisotopes for Inspection of Ship Welds. D. Polansky, D. P. Case and E. L. Criscuold. *Nondestructive Testing,* v. 17, Jan-Feb. 1959, p. 21-25.

Technique and sensitivity curves for thulium, iridium, cesium and cobalt. For the inspection of welds in 1/2-in. to 1-in. plate, iridium is the most promising isotope. 6 ref. (S13e, T22, K9r, 1-59)

223-S.* Ultrasonic Weld Inspection. John E. Bobbin. *Nondestructive Testing,* v. 17, Jan-Feb. 1959, p. 26-28.

Advantages include instantaneous results, no work stoppage, sensitivity, safety and low cost. 6 ref. (S13g, K9r)

224-S.* Radiographic Inspection of Welded Turbine Wheels for Jet Starters. Albert R. Potenski. *Nondestructive Testing,* v. 17, Jan-Feb. 1959, p. 29-31.

Turbine wheels manufactured from a hub and individual blades which are joined by fusion welding. Radiographic inspection procedure and standards evolved. (S13e, T7h; 7-51)

225-S.* Qualitative Analysis of Brazed Sandwich. Frank J. Filippi. *Nondestructive Testing,* v. 17, Jan-Feb. 1958, p. 39-45.

Principles of radiographic, ultrasonic and thermal gradient methods. 7 ref. (S13; 7-59)

226-S. (Spanish.) Radiographic Inspection of Welded Structures. Alfonso Ruiz. *Ciencia y Tecnica de la Soldadura,* v. 8, Sept-Oct. 1958, 7 p.

Final acceptance tests greatly facilitated by this method. Principles, comparative study of X-ray and gamma-ray techniques, including facility of use of apparatus, safety, quality of radiographs, etc. (S13e, 7-51)

227-S. Production of Ball and Roller Bearings. *Machinery (London),* v. 94, Jan. 21, 1958, p. 120-131.

Quality control methods and equipment at Hoffman Manufacturing Co., Ltd., Chelmsford, England. (S-general, T7d, 1-52)

228-S. Ultrasonic Testing Procedures. J. B. Morgan. *Nondestructive Testing,* v. 17, Jan-Feb. 1959, p. 32-36.

Effect of the following factors on tests; alloy composition, distance of discontinuity below entry surface, thermal treatment, discontinuity size, direction of ultrasonic beam, nature of the product, working or reduction. (S13g; SS, TS, SGA-h)

229-S. (German.) Noise Interference in Ultrasonic Flaw Detection. Pt. 1. F. Linhardt. *Metall,* v. 12, Dec. 1958, p. 1085-1092.

27 ref. (S13g, X8)

230-S. (Russian.) Spectrophotometric Determination of Molybdenum in Alloys. K. B. Yatsimirskii and I. I. Alekseeva. *Zavodskaya Laboratoriya,* v. 24, Dec. 1958, p. 1427-1429.

Determination of Mo in steel and Ni alloys by measuring light absorption by alkaline molybdate. 7 ref. (S11a; ST, Ni-b, *Mo*)

231-S. (Russian.) Photocolorimetric Determination of Minute Quantities of Vanadium in Chromium. P. Ya. Yakovlev and G. P. Rasumova. *Zavodskaya Laboratoriya,* v. 24, Dec. 1958, p. 1430-1431.

(S11a; Cr-b, *V*)

232-S. (Russian.) Cobalt Determination in Nickel. B. B. Resnik, R. E. Dwgach and R. T. Pudskaya. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1431-1432.
4 ref. (S11a ; Ni-b, *Co*)

233-S. (Russian.) Determination of Strontium in Silicates and Carbonates by a Photometer Flame and a Liquid Light Filter. G. I. Ksandopuldo and D. P. Shcherbov. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, pf. 1432-1434.
11 ref. (S11a; Si, *Sr*, NM-a)

234-S. (Russian.) Chromatographic Determination of Magnesium in Zirconium. S. V. Blinson and M. S. Limonik. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1434-1436.
(S11a; Zr-b, *Mg*)

235-S. (Russian.) Separation of Zinc From Indium by Electrolysis With Mercury Electrode. M. G. Sayun, P. P. Tsyb and K. Kh. Latkher. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1436-1439.
(S11g; In, *Zn*)

236-S. (Russian.) Rapid Method of Analyzing Lead and Zinc in Brasses by Potentiometric Titration or Precipitated Metal Sulphides. V. A. Kremer, E. I. Vail', F. P. Frizyuk and L. S. Sonchik. *Zavodskaya Laboratoriya*, b. 24, Dec. 1958, p. 1440-1441.
4 ref. (S11j; Cu-n, Zn, Pb)

237-S. (Russian.) X-Ray Investigation of Spot-Welded Duralumin. D. G. Bykhovskii. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1458-1459.
Micro-X-ray photography and X-ray structure analysis. (S13e; Al-b, Cu, 7-51)

238-S. (Russian.) Measuring Thicknesses by the Ultrasonic Thickness Gage. I. F. Lopatko and G. I. Usoskin. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1464-1467.
Measuring apparatus for objects that are accessible from one side only. (S14g, X20c)

239-S. (Russian.) Determination of Impurities in Ferro-Columbium by Spectrographic Analysis. A. B. Shaevich, Ya. M. Kalinskii, N. I. Chabachenko and M. A. Perepelkkina. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1478-1479.
Determination of Al, Ti, Cr, Zr, Sn, Cu and Mn. (S11k; AD-n31, Cb, *Al, Ti, Cr, Zr, Sn, Cu, Mn*)

240-S. Comparison of Various Methods of Spectrographic Determination of Nickel in Steel. E. I. Brainin. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1479-1483.
Accurate results produced where a spark was used for spectra excitation. (S11k; ST, *Ni, Cu*)

241-S. (Russian.) Spectrographic Analysis of Binary Iron-Chromium Alloys. E. V. Lifshits, V. G. Konovalov and V. F. Erko. *Zavodskaya Laboratoriya*, v. 24, Dec. 1958, p. 1483-1484.
(S11k; Fe-b, *Cr*)

242-S.* The Use of Radioisotopes in Metallurgical Research and Industry. A. Kohn. *Metallurgical Reviews*, v. 3, no. 10, 1958, p. 143-201.
Production and characteristics of radioisotopes; autoradiographic methods and measurement of activity. Use of radioactive tracers for study of segregation, chemical composition, solid phase diffusion, evaporation, condensation, chemical processes, friction and wear of dies in cutting tools, blast furnace processes and steel refining. Radioisotopes as source of radiation for inspection by gamma radiography and in thickness gaging. 161 ref. (S11q, S13e, S14e, Q9n, Q9p, 1-59)

243-S. In Selecting Copper and Copper Alloys Make the Specifications Work for You. Pt. 2. *Canadian Machinery*, v. 70, Jan. 1959, p. 69-71.
(S22; Cu)

244-S.* (German.) Measuring Anodic Layers on Al. W. Illig. *Metalloberflache*, v. 13, Feb. 1959, p. 33-35.
Optical method termed "light section process" measures the difference in light diffraction caused by the surface layer with a special microscope. (S14d; Al, 8-73)

245-S.* Porosity Detection in Magnesium Alloys Using Paraffin Containing Pd^{109}. S. M. Makin. *International Journal of Applied Radiation and Isotopes*, v. 4, Jan. 1959, p. 253-255.
Pores extending from a surface area of 1.5×10^{-5} sq.cm. and within 0.4 mm. of the surface can be detected on samples soaked in hot oil containing Pd^{109}. A polished surface and a finish equivalent to 0000-grade emery gave satisfactory autoradiographs, but roughly turned samples were unsuitable. (S13e, 1-59; Mg-b, 9-68)

246-S.* Ingot Surface-Temperature Measurement in Forging Furnaces. J. R. Pattison. *Iron and Steel Institute, Journal,* v. 191, Feb. 1959, p. 163-171.

Performance of surface pyrometers inside furnaces. Design of a disappearing filament pyrometer incorporating a hemisphere enclosure to correct for surface emissivity. Effects of scale on temperature readings. 8 ref. (S16b, X9r; ST, 4-52)

247-S.* Ultrasonic Testing at Douglas. W. C. Hitt. *Metal Progress,* v. 75, Mar. 1959, p. 80-85.

Internal soundness and good bonds are essential in forgings and honeycomb panels for today's aircraft. Improvements in ultrasonic testing methods help the produces of components to maintain quality at all times. (S13g, T24)

248-S. (Translation—BISI no. 803.) Determination of Trace Elements in Steel With Moving Electrodes. Siegried Eckhard and Walter Koch. *Archiv fur das Eisenhuttenwesen,* v. 28, Nov. 1957, p. 731-738.

See item 216-S, 1958. (S11k; ST)

249-S. (Translation—BISI no. 1028.) Magnetic Separation of Electrolytically Isolated Structural Constituents From Metallic Materials. Walter Koch and H. Sundermann. *Archiv fur das Eisenhuttenwesen,* v. 29, Apr. 1958, p. 219-224.

See item 382-S, 1958. (S11f; ST)

250-S. (Translation—BISI no. 1029.) Electrochemical Basis of the Isolation of Structural Components in Steels. Walter Koch and Heinz Sundermann. *Archiv fur das Eisenhuttenwesen,* v. 28, Sept. 1957, p. 557-566.

See item 102-S, 1958. (S11g, 1-53; ST)

251-S. (Translation—Brutcher no. 4382.) Electrical Method of Measuring Carburized Case Depths and Thickness of Nonmagnetic Electrodeposited Coatings. T. I. Pavlov. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 67-69.

Precise determination of depth of carburized cases on steel; quality of case as well is indicated. Application of method to measurement of thickness of nonmagnetic electrodeposits. (S14c, J28; ST, 8-62)

252-S. (Translation—Brutcher no. 4418.) Flaw Detection by a Coloring Technique. N. V. Khimenko. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 803-806.

See item 541-S, 1957. (S13d, 9-21)

253-S. (Translation—Brutcher no. 4419.) Improved Methods of Flaw Detection by Coloring. S. I. Kalashnikov and N. P. Kichin. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 806-808.

See item 542-S, 1957. (S13a, 9-21)

254-S.* (German.) Coulometric Determination of Oxygen in Steel by Melt-Extraction Process in Argon Stream. Karl Abresch and Helmut Lemm. *Archiv fur das Eisenhuttenwesen,* v. 30, Jan. 1959, p. 1-6.

5 ref. (S11m; ST, O)

255-S.* (Italian.) Theoretical and Practical Bases for a Rational Standardization of Cast Irons. G. Cola. *Fonderia Italiana,* v. 7, Nov. 1958, p. 433-471.

Collective research by 20 Italian foundries provided data for proposed standard specifications covering mechanical properties of gray iron castings. 17 ref. (S22; CI-n)

256-S.* Use of the Beam Deflector to Ultrasonically Test Bronze Castings. John C. Smack. *Nondestructive Testing,* v. 17, Mar-Apr. 1959, p. 85-88.

Immersed ultrasonic testing of gears for fine porosity. (S13g, T7a; Cu-s, 5-65, 9-68)

257-S. Spectrographic Determination of Scandium, Yttrium and the Rare Earths in Thorium. J. P. Faris. *Applied Spectroscopy,* v. 12, no. 6, 1958, p. 157-161.

9 ref. (S11k; Th, *Sc, Y,* EG-g)

258-S. Structure of Steel. Simple Explanation for Students, Engineers and Buyers of Steel. Edwin Gregory and Eric N. Simons. *Edgar Allen News,* v. 38, Feb. 1959, p. 32-35.

Flaw detection methods. (To be continued.) (S13; ST)

259-S. Quantitative Spectrographic Analysis of the Rare Earth Elements. Pt. 10. Determination of Rare Earth Impurities Commonly Associated With Purified Thulium, Ytterbium, Lutetium and Scandium. R. N. Kniseley, V. A. Fassel, R. W. Tabeling, B. G. Hurd and B. B. Quinney. *Spectrochimica Acta,* v. 13, Jan. 1959, p. 300-303.

4 ref. (S11k; Lu, Sc, Tn, Yb, EG-g)

260-S. Status Report on Eddy Current Theory and Application. C. J. Renken, R. G. Myers and W. J. McGonnagle. Argonne National Laboratory. *U. S. Atomic Energy Commission, ANL-5861,* Nov. 1958, 76 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $2.00.

Applications of eddy current testing include gaging plating thickness, testing liquid metal bonding and measurement of the thickness of claddings on alloys. (S14c)

261-S. (German.) Various Test Methods for Determining Oxygen Content of Steel. Eberhard Grossfuss. *Neue Hutte*, v. 3, Oct. 1958, p. 608-615.

Comparative tests made with various methods such as the hot extracting process, the Gotta-process and the residue isolation process. 31 ref. (S11r; ST, *O*)

262-S. (Italian.) Measurement, Regulation and Recording of Temperatures. *Trattamenti Termici*, v. 1, Nov-Dec. 1958, p. 22-25.

(To be continued.) (S16)

263-S. Make the Specifications of Copper Alloy Rod and Bar Serve You Better. Pt. 3. G. S. Mallett. *Canadian Machinery*, Mar. 1959, p. 86-92.

(S22; Cu, 4-55)

264-S. Why and How to Use Die Castings. David Laine. *Modern Castings*, v. 35, Mar. 1959, p. 45-46.

Application of American Die Casting Institute product standards. (S22, 5-61)

265-S. Rotary Radiographic Scanner, an Aid to the Inspection of Swaged Tubing. Alvin N. Hammer. *Nondestructive Testing*, v. 17, Mar-Apr. 1959, p. 89-91.

(S13e, X8g; Al-b, 4-60)

266-S.* (Italian.) Ultrasonic Testing of Light Alloy Extrusions by a Semi-Automatic Dip Method. M. Robba and C. Fatigati. *Alluminio*, v. 28, Jan. 1959, p. 5-17.

New apparatus developed by Light Metals Experimental Institute (Novara, Italy) and results obtained on hundreds of 65 TA Ergal extrusions. 6 ref. (S13g, 1-52; Al-*b*, 4-58)

267-S. Methods of Determining Surface Roughness. M. K. Testerman. University of Arkansas. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151268, June 1958, 48 p. $1.25.

Measurement of polarization capacitance to determine surface roughness by the bridge method on inert metals such as stainless steel, Cu and Ni. (S15e; SS, Cu, Ni)

268-S.* (Russian.) Effect of Surface Finish on the Precision of Spectral Analysis. S. I. Berger. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 235.

An adequate machine finish is preferable to an emery finish. The composition of machine finished steel samples was determined more exactly than that of emery finished samples. (S11k, 3-70; AY, CN)

269-S.* Recommended Practice for Radiographic Inspection of Fusion-Welded Joints. *British Welding Journal*, v. 6, Mar. 1959, p. 126-128.

Techniques for gamma or X-ray examination of welded steel plates up to 2 in. thick. Image quality indicators; sensitivity of method. (S13e; ST, 7-51, 4-53)

270-S.* (German.) Degree of Purity of Aluminum as a Decisive Factor in Finishing Operations. H. Ginsberg. *Metall*, v. 13, Mar. 1959, p. 171-174.

Techniques for testing the quality, surface structure, electric conductivity, corrosion resistance and chemical composition of Al sheets. (S-general, F-general; Al, 4-53)

271-S. Specifications for Copper-Alloy Ingots and Castings. *Foundry Trade Journal*, v. 106, Mar. 19, 1959, p. 337-338.

Suggestions on impurity content advanced by the British Bronze and Brass Ingot Manufacturer's Assoc. (S22, 3-69; Cu-b, 5-59, 5-60)

272-S. Is Laminated Steel Your Problem? John M. St. John. *Industry & Welding*, v. 32, Apr. 1959, p. 45, 96.

Application of ultrasonic testing. (S13g; ST, 4-53, 9-71)

273-S. (Russian.) Automatic Inspection for Point Shaped Defects in Enamel Insulated Wire. K. Z. Strashun. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 231.

(S13c; 8-71, 4-61)

274-S. (Russian.) Use of the Stylometer ST-7 for Rapid Spectral Analyses of Steel and Slag. E. I. Babadzhan and L. D. Rosenshtrauch. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 233-234.

(S11k, 1-53; ST, RM-q)

275-S.* Spectrochemical Analysis Using the Quantovac. Digest of "The Quantovac—a Direct Reading Instrument for the Control of Carbon, Phosphorous, Sulphur and Other Important Elements in Iron and Steel". H. W. Clakins and M. F. Hasler. Paper presented at the A.I.M.E. Electric Furnace Steel Conference, Pittsburgh, Dec. 1957. *Metal Progress*, v. 75, Apr. 1959, p. 172, 174.

Instrument extends the spectrum range available for useful, high-speed spectrochemical analysis into the far ultraviolet. The all-important, most sensitive arc lines of carbon, P, S, Hg, As and Se lie in this region as well as the most sensitive spark lines of Sb, Ge, He, Al, Pb, Au, Pt, Si and Bi. (S11k; CI, ST, *P, S, Hg, As, Se, Sb, Ge, He, Al, Pb, Au, Pt, Si, Bi*)

276-S. (Translation.) New Method of Detecting Welding Stresses. W. Radeker. *Engineers' Digest*, v. 20, Feb. 1959, p. 83-86. (From *Schweissen und Schneiden*, v. 10, Sept. 1958, p. 351-358.)

See item 615-K, 1958. (K9r, Q25, 1-54; 7-51, ST)

277-S. (Translation—BWRA.) Simultaneous Spectrographic Determination of Carbon and Other Elements in Iron and Steel. A. S. Dem'yanchuk. *Automaticheskaja Svarka*, v. 65, Aug. 1958, p. 39-44.

High-frequency discharge spark excitation permits spectra for determining both the carbon and the other alloying elements to be photographed simultaneously. (S11k; ST, Fe, C)

278-S. (Translation—ConBur.) Spectrographic Determination of Calcium, Magnesium, Aluminum, Silicon and Tin in Refined Rhodium and Iridium. A. V. Babaeva and O. N. Evstaf'eva. *Journal of Analytical Chemistry of the USSR*, v. 13, May-June 1958, p. 341-345.

(S11k; Ir, Rh, *Ca, Mg, Al, Si, Sn*)

279-S.* (German.) Polarized Radiation of Liquid Iron and Steel. Effect of Direction. Werner Pepperhoff. *Archiv fur das Eisenhuttenwesen*, v. 30, Mar. 1959, p. 131-135.

Polarization caused by the surface of flowing metals and metals in molten state can affect the precision of pyrometric measurements. Use of polarized radiation in measurements is considered. 4 ref. (S16a; ST, Fe, 14-60)

280-S. Control of Magnetic Particle Testing. J. W. Schweikert. *Metal Progress*, v. 75, Apr. 1959, p. 84-87.

Suspensions can be tested in 2 min. with a hand-operated centrifuge; the settling test outlined by most specifications lasts 30 to 60 min. A new method, easily managed by machine operators, makes it simple to keep magnetic particle baths within specification limits. (S13j)

281-S. Inspection by Projection at G.E.C. W. N. Sprigg. *Metalworking Production*, v. 103, Mar. 27, 1959, p. 531-536.

Optical gaging of telephone components. (S13d)

282-S. Measurement of Chromium Plate Thickness on Molybdenum Alloy Turbine Buckets by X-Ray Fluorescence. W. M. Spurgeon and Ottis Isaacs. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 145-149.

X-ray method of plate measurement is capable of application to the curved surfaces of turbine buckets with an accuracy comparable to that of microscopy. 10 ref. (S14e, W11m; Mo-b, Cr, 8-62)

283-S. (German.) Rapid Spectrometric Analysis of Gases in Steel. Walter Koch, Siegfried Eckhard and Freidrich Stricker. *Archiv fur das Eisenhuttenwesen*, v. 30, Mar. 1959, p. 137-144.

13 ref. (S11k, ST)

284-S. (German.) Surface Roughness and Methods for Its Measurement. Pt. 2. Ulrich Krause. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 371-376.

Optical methods comprising light section, interference and photometric processes, pneumatic and electric instruments, various mechanical methods and processes involving replicas. 22 ref. (S15)

285-S. Spectrographic Analysis of Tungsten Metal Powder. Rudolph Dyck and Thomas J. Veleker. *Analytical Chemistry*, v. 31, Mar. 1959, p. 390-392.

Determination of Al, Ca, Fe, Mg, K and Si. 6 ref. (S11k; W, *Al, Ca, Fe, K, Mg*, Si, 6-68)

286-S. Ferrous Metallurgy. H. F. Beeghly. *Analytical Chemistry*, v. 31, Apr. 1959, p. 706-712.

Review of applied analysis including emission and X-ray spectroscopy. 182 ref. (S11; Fe, ST)

287-S. Nonferrous Metallurgy. G. H. Farrah and M. L. Moss. *Analytical Chemistry*, v. 31, Apr. 1959, p. 713-723.

Review of applied analysis including spectroscopy. 368 ref. (S11; EG-a38)

288-S. Determination of Trace Amounts of Cobalt in Iron and Steel and Some Associated Materials. *Iron and Steel Institute, Journal*, v. 191, Mar. 1959, p. 236-240.

Photometric method. (S11a; ST, Fe, *Co*)

289-S. (French.) X-Ray Testing of Steel Weldments. R. Grabovsky and A. Bancila. *Metalurgia si Constructia de Masini,* 1958, p. 34-42.
17 ref. (S13e; ST, 7-51)

290-S. (German.) Spectroscopy of Metals in the Plant Laboratory. *Draht,* v. 10, Mar. 1959, p. 97.
New spectroscope using visual comparison of emission line intensities. (S11k, 1-53)

291-S. (Russian.) Ultrasonic Control of Rivet Welds. A. F. Erashov and V. M. Anfimov. *Svarochnoe Proizvodstvo,* Mar. 1959, p. 35-37.
(S13g, 7-51, 9)

292-S.* Gases in Iron and Steel. C. E. A. Shanahan. *Iron & Coal Trades Review,* v. 178, Apr. 10, 1959, p. 845-851.
Oxygen, hydrogen and nitrogen. 7 ref. (S11r, D11; ST, *H, O, N*)

293-S.* Fluoroscopy Proves Fast Method in Checking Honeycomb Panels. W. R. Bear and W. S. Diehl. *Iron Age,* v. 183, May 7, 1959, p. 106-108.
Equipment, techniques, layout. (S13e; SS, 7-59)

294-S.* (French.) Magnetoscopic Inspection of Ferrous Alloy Parts. Pt. 3. *Machine Moderne,* v. 53 Apr. 1959, p. 57-62.
Testers, powders, liquids, procedures; interpretation of images; detection of cracks in base metal underneath metallized coating. (To be continued.) (S13j, X8k; Fe-b, 5)

295-S.* (Italian.) Interference Microscopy Compared With Other Techniques for Measuring Surface Roughness. P. L. d'Ancona. *Macchine,* v. 14, Mar. 1959, p. 239-243.
Six other measurement techniques and types of results obtained. Description of interference microscopes with principles of operation. 10 ref. (S15, X3q)

296-S. Standard Samples for Gases-in-Metals. *Technical News From U. S. National Bureau of Standards,* STR-2368, May 1959, 4 p.
Eight bars of ferrous materials, in which oxygen and nitrogen content are precisely determined, comprise a new type of standard sample. (S11r)

297-S. (Swedish.) Standards for Cast Copper Alloys. *Gjuteriet,* v. 49, no. 3, 1959, p. 81-86.
(S22; Cu-b)

298-S.* (Hungarian.) Measuring Sheet Metal Thickness With Radioisotopes. Zoltan Remport. *Kohaszati Lapok,* v. 91, Dec. 1958, p. 559-564.
Use of Co^{60}, Ce^{137}, and Ra^{226}. Intensity of radiation penetration permits direct calculation of thickness. 11 ref. (S14e; 4-53)

299-S. (German.) Ingot Testing With Gamma-Rays and Extremely Hard X-Rays. Otto Nickel. *Zeitschrift fur Metallkunde,* v. 49, July 1958, p. 368-375.
Use of the isotope Co^{60} and of a 15-MEV. betatron in testing. 14 ref. (S13e; 5-59)

300-S. (German.) Rapid Determination of Tin, Copper, Lead, Iron and Nickel in Gun Metal and Bronzes. Hugo Wiedmann. *Zeitschrift fur Metallkunde,* v. 49, Oct. 1958, p. 545-547.
Volumetric and photometric analyses. (S11a, S11j; Cu-b, Cu-d, *Pb, Fe, Ni*)

301-S. (Spanish.) Inspection of Weldments. *Fusion de Metales,* v. 21, Jan-Feb. 1959, p. 8-17.
Inspection methods using X-rays, gamma-rays or ultrasonics, audible sound waves and penetrants. (S13, 7-51)

302-S. (Spanish.) Destructive Testing. Pt. 2. *Fusion de Metales,* v. 21, Jan-Feb. 1959, p. 18-28.
Survey on testing methods in use. (S13b, 7-51)

303-S.* Analyzing Segregates by Spectrograph. J. K. Hurwitz. *Metal Progress,* v. 75, May 1959, p. 72-75.
A motor-driven specimen stage and photographic plate enable continuous analyses to be made across segregated zones in polished samples. Banded structures, welds and nonmetallic inclusions can be readily analyzed by this method. (S11k, 9-69)

304-S.* (Hungarian.) Method for Rapid Analysis of Cast Iron. Ferenc Strebenz. *Kohaszati Lapok,* v. 92, Jan. 1959, p. 11-16.
Colorimetric method recommended for applications in foundry practice as the most rapid and simple process to determine chemical composition. Data on reagents and techniques for analyzing various constitutents such as Si, Mn, P, Cr and Ni. 5 ref. (S11a; CI, *Si, Mn, P, Cr, Ni*)

305-S.* (Portuguese.) Sonics in Modern Industry. L. X. Nepomuceno. *Engenharia,*

Mineracao e Metalurgia, v. 29, Feb. 1959, p. 65-68.

Applications of sonics and ultrasonics to alloying, soldering metals, nitriding. History of sonics with types, frequencies and power output of mechanical and electromechanical transducers. (S13g, J2k, 1-74)

306-S.* Inspection of Large Rotor Forgings. George E. Danner. Paper from "Symposium on Brittle Failure of Rotor Forgings". American Society for Testing Materials, STP no. 231, 1958, p. 3-9.

Ultrasonic inspection of turbine rotor and generator shaft forgings. Heat indication; magnetic particle; metallographic; Charpy and other tests. (S13, S13g, T7h; ST, 4-51)

307-S.* Influence of Geometric Factors on Results of Ultrasonic Testing of Heavy Forgings. Helmut Krainer and Ekkehardt Krainer. Paper from "Symposium on Brittle Failure of Rotor Forgings". American Society for Testing Materials, STP no. 231, 1958, p. 28-36.

Ultrasonic indication of artificial flaws in steel specimens. Influence of depth and size of defect; specimen size; orientation; shape of reflecting wall and coupling face. Simplified expressions of relationships. 5 ref. (S13g; ST, 4-51)

308-S. Specifications for Copper-Alloy Ingots and Castings. *Foundry Trade Journal*, v. 106, Apr. 30, 1959, p. 507-509.

Comment on draft standard. (S22; Cu-b, 5)

309-S. (German.) Determination of Oxygen in Zinc and Magnesium. Helmut Hartmann, Wilhelm Hofmann and Gerhard Strohl. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 461-463.

Oxygen determination based on the reaction $ZnO + H_2S = ZnS + H_2O$. 5 ref. (S11g; Zn, Mg, O)

310-S. (German.) Radiographic Thickness Measurements on Plane Surface Coatings. Otto Eberspacher. *Zeitschrift fur Metallkunde*, v. 49, Sept. 1958, p. 495-498.

Measurements of the intensity of X-rays as a function of the angle of incidence permit the determination of coating thickness. Testing of Ag and Rh coatings on Cu and of Au and Ag on polycrystalline ceramics. 20 ref. (S14e; 8, Cu, Ag, Rh)

311-S. (Book.) 1958 Book of ASTM Standards Including Tentatives. Pt. 2. Non-Ferrous Metals (Specifications), Electronic Materials. 1354 p. 1958. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Cu and Cu alloys, and Ni-base alloys, Al and Al alloys, Mg and Mg alloys, alloys, and miscellaneous nonferrous metals and alloys. (S22, T1; EG-a38, 17-57)

312-S. (Book.) 1958 Book of ASTM Standards Including Tentative. Pt. 1. Ferrous Metals (Specifications). 1594 p. 1958. American Society for Testing Materials, 1916 Race St. Philadelphia 3, Pa.

Steel products, wrought iron, cast iron, malleable iron, ferro-alloys, iron powder parts, welding electrodes, Ti and Ti alloys. (S22, W29h; CI, CI-s, Fe-m, ST, Ti, AD-n, 6-72)

313-S. (Book.) Specifications for Aluminum and Aluminum Alloys. 2nd Edition. HA Series—1958. 159 p. 1958. Canadian Standards Assoc., 235 Montreal Road, Ottawa 2, Ont., Canada. $5.25.

Specifications for ingots, plate, sheet, wire, bar, rod, extruded shapes, forgings and castings. (S22; Al)

314-S.* (German.) Nondestructive Determination of the Thickness of Anodized Films by Means of the Interference Microscope. G. Elssner. *Aluminium*, v. 35, Apr. 1959, p. 202-204.

Results based on production of interference curves of equal thickness (Newton's band). The method can be applied to rough and profiled surfaces and permits the determination of the thickness and variations as well as defects in the protective film. (S14, X20, X3q; Al, 8-71)

315-S.* Ultrasonic Attenuation in Cast Aluminum. H. Smolen and H. Rosenthal. *Modern Castings*, v. 35, May 1959, p. 55-60.

Ultrasonic attenuation is suitable for evaluating porosity and mechanical property gradients in premium quality castings. (S13g; Al-b, 5-60)

316-S.* Cast Surfaces Evaluation for Roughness Standards. Eldon Swing. *Modern Castings*, v. 35, May 1959, p. 98-102.

Visual comparator gages for cast surfaces used with satisfactory results in many production applications are the most practical methods of controlling cast surfaces for the majority of casting applications. (S22, S15d, X23p; 5)

317-S. Anodic Stripping Method for Determination of Local Thickness of Electro-

plates: Pt. 1. Design of Electronic Relay and Its Application to Measurement of Thickness of Chromium Electrodeposits. S. Satyanarayana and D. H. Roy. *Journal of Scientific & Industrial Research*, v. 18A, Feb. 1959, p. 75-78.
17 ref. (S14; Cr, 8-62)

318-S. Axial Test Bore in Turbo-Generator Rotors. K. Kreitz. Paper from "Symposium on Brittle Failure of Rotor Forgings". American Society for Testing Materials, STP no. 231, 1958, p. 37-43.
Advantages and disadvantages of axial bore tests. (S13b, T7h; ST, 4-51)

319-S. (Czech.) Quantitative Spectrographic Analysis. Frantisek Plzak and Boh Lizal. *Hutnicke Listy*, v. 14, Apr. 1959, p. 297-301.
Methods and apparatus. (S11k, 1-53)

320-S. (Czech.) Determination of Oxygen in Aluminum by Vacuum Melting. Lubos Kopa. *Hutnicke Listy*, v. 14, Apr. 1959, p. 322-324.
Survey on classical methods. 4 ref. (S11g, 1-73; Al)

321-S. (Czech.) Polarographic Determination of Mo in Steel. Miloslav Habrcetl. *Hutnicke Listy*, v. 14, Apr. 1959, p. 324-325.
8 ref. (S11m; ST, *Mo*)

322-S. (German.) Ultrasonic Inspection of Weldments in Manufacturing. W. H. Papke. *Industrie-Anzeiger*, v. 81, Jan. 9, 1959, p. 35-37.
Ultrasonic waves reflected by flaws are made visible on screen of a Braun tube. 14 ref. (S13g; 7-51)

323-S. (German.) Standards for Welding Operations, Equipment and Materials. *Schweissen und Schneiden*, v. 11, Apr. 1959, p. 139-142.
(S22, K-general)

324-S. The Rating of the Quality of Uranium Metals by Microscopic Stringer Counts. S. J. Broderick and A. J. Busch. New Brunswick Laboratory, A.E.C. *U. S. Atomic Energy Commission, NBL-152*, Feb. 1959, 23 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.
Method consists of counting the total length of stringers in a polished sample at 100 magnification with the aid of a $\frac{1}{2}$ in. sq. ruled grid screen. Slugs from dingot metal are relatively free from stringers. Only scattered single inclusions are found. 4 ref. (S13e; 9-69, 5-59, U)

325-S. (German.) Standardization. *Materialprufung*, v. 1, Jan. 20, 1959, p. 33-36.
Standards for tests and materials. (S22)

326-S. (German.) Instrument for Measuring Thickness of Metal Plating. V. Breitling. *Metalloberflache*, v. 13, May 1959, p. 145-147.
Thickness measurements based on the electrolytic dissolution of plating. (S14c; 8)

327-S. (German.) Photometric Determination of Nickel in Cobalt and Its Salts. Walter Nielsch. *Zeitschrift fur Metallkunde*, v. 50, Apr. 1959, p. 234-236.
(S11a; Co, *Ni*)

328-S. (Italian.) Measurement, Control and Recording of Temperatures. Pt. 3. *Trattamenti Termici*, v. 2, Mar-Apr. 1959, p. 20-22.
(S16, X9)

329-S.* Sampling Liquid Steel for Hydrogen. J. G. Bassett. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 80-93.
Design and use of vacuum tube for sampling directly from metal bath. Reproducibility of immersion samples. Hydrogen content of acid openhearth steel during refining and tapping. 10 ref. (S12h, S11r, D2; ST)

330-S.* (German.) Calculation of Ingot Reheating Temperatures. Rolf Wartmann. *Stahl und Eisen*, v. 79, May 10, 1959, p. 703-711.
Internal temperature of ingots can be calculated provided the surface temperature and chemical composition of steel tested are known. (S16b; ST, 5-59)

331-S.* (German.) Flaw Detection in Rolling Round Steel Bars by the Magneto Induction Eddy-Current Method. Helmut Knueppel, Gert Wiethoff and Wolfgang Juchhoff. *Stahl und Eisen*, v. 79, May 14, 1959, p. 711-718.
Effect of the strength of current on flaw detection; influence of surface temperature variations on crack determination. 6 ref. (S13h; 4-55, ST, 9-72)

332-S.* (Polish.) Application of Ultrasonic Method for Detection of Laminates in Sheet Metal. M. Kurek, K. Kucia and St. Kwiatkowski. *Hutnik*, v. 26, Feb. 1959, p. 72-76.

No relation was found between ingot and sheet parameters and lamination. (S13g; 9-71, 4-53)

333-S. (English.) Recommendations for the Choice and Classification of Steels for Use in Welded Structures. *Lastechniek*, v. 25, May 1959, p. 108-110.

Classification of steels under four groups, with reference to service conditions; required properties to be tested. (S22; ST, 7-51, SGB-s)

334-S. (Czech.) Immediate Control Achieved by Samples Taken From the Melt. A. Fiala. *Hutnicke Listy*, v. 14, May 1959, p. 454-456.

7 ref. (S12h, 14-60)

335-S. (Czech.) Determination of Boron in Steels With 1-5% Boron. Ivan Janousek and Karel Studlar. *Hutnicke Listy*, v. 14, May 1959, p. 458-462.

40 ref. (S11b; ST, *B*)

336-S. (Czech.) Determination of Sulphur in Steel. A. Fiala and V. Stadler. *Hutnicke Listy*, v. 14, May 1959, p. 462-464.

(S11b; ST, *S*)

337-S. (Dutch.) Nondestructive Testing of Materials for Nuclear Reactors in U.S.A. and Canada. A. de Sterke. *Metalen*, v. 14, Apr. 30, 1959, p. 119-123.

Use of eddy currents in testing the wall thickness of fuel element sheaths. (S14c, T11g)

338-S. (Dutch.) Testing of Materials for Nuclear Reactors in U.S.A. and Canada. A. de Sterke. *Metalen*, v. 14, May 15, 1959, p. 132-136.

Ultrasonic testing of fuel elements; penetration tests with fluorescent oil; X-ray tests; helium leak test. (S13g, S13k, T11g)

339-S. (German.) German Standards for S. G. Cast Iron. Horst Muhlberger. *Industrie-Anzeiger*, v. 81, May 12, 1959, p. 585-586.

Standardization with reference to mechanical properties. Some foreign standards are also shown. (S22, Q27; CI-r)

340-S. A Spot Test Procedure for Iron and Copper Inclusions in Aluminum Cans. W. E. Stavig. Hanford Atomic Products Corp. *U. S. Atomic Energy Commission*, HW-57485, Nov. 17, 1958, 10 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Al cans, used to clad uranium fuel elements, are coated with a solution consisting of a film former, an electrolyte, an opacifier to form a cover over the metal surface, a wetting agent and an indicator to complex the ions. The coating is sprayed on the Al surface, dried at room temperature and electrolyzed. Metallic impurities are changed into ions which react with the indicator to form colored compounds. The colored spots are measured by microscopy to determine the size of the inclusion. (S13a; Al, *Fe, Cu*, 9-69)

341-S.* A Look at Russian Steels. Arthur B. Tesmen. *Metal Progress*, v. 75, June 1959, p. 101-105.

Russian carbon, alloy, stainless and tool-steel grades are surveyed. Russian steel nomenclature is explained to permit easy identification of composition, properties and type. (S22; ST)

342-S. Determination of Iron, Chromium, and Nickel by Fluorescent X-Ray Analysis. William W. Houk and Louis Silverman. *Analytical Chemistry*, v. 31, June 1959, p. 1069-1072.

Aqueous solution method. (S11p; Fe, Cr, Ni)

343-S. Radiochemical Evaluation of Fire Assay Method for Determination of Silver. F. H. Faye and W. R. Inman. *Analytical Chemistry*, v. 31, June 1959, p. 1072-1076.

Radiochemical techniques using Ag-110 as means for measuring the loss of Ag in its determination by fire assay. 10 ref. (S11q, S11s; Ag)

344-S. How to Apply the ASTM Specifications Selecting Copper Alloy Pipe, Tube, Wire. Pt. 4. G. S. Mallett. *Canadian Machinery*, May 1959, p. 86.

(Conclusion.) (S22; Cu-b, 4-60, 4-61)

345-S. Nondestructive Testing Symbols. Digest of "Nondestructive Testing Symbols" Prepared by Committee on Nomenclature, Definitions and Symbols, American Welding Society, 1958, 10 p. $1.00. *Metal Progress*, v. 75, June 1959, p. 184, 188, 192.

Basic symbols, general provisions, methods of specifying extent of nondestructive tests. (S-general, S22)

346-S. The Immersed Ultrasonic Inspection of Metal Plate. R. W. McClung. Oak

Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2650, Apr. 6, 1959, 23 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Techniques for the ultrasonic inspection of plate in thicknesses down to ¼ in. (S13g; 4-53)

347-S. (Pamphlet.) Standard Materials, National Bureau of Standards Circular 522. 3rd Ed. 27 p. Apr. 1959. U. S. Government Printing Office, Washington 25, D. C. $.35.

Descriptive listing of standard materials, schedule of fees and weights, ordering instructions and summarized tables of analyses. (S22)

348-S. (Book.) ASTM Specifications for Steel Piping Materials. 507 p. Apr. 1959. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $6.

Compilation covers pipe used to convey liquids, vapors and gases, tubes for refinery service, heat exchangers, condensers, boilers and superheaters. (S22; 4-60)

349-S.* (English.) Spectrometric Determination of Carbon in Metals Under Controlled Atmosphere. B. Breckpot, J. Morris and K. De Clippeleir. *Revue Universelle des Mines, de la Metallurgie, de la Mecanique,* v. 15, May 1959, p. 266-270.

The carbon line was recorded in Co and steel in gaseous atmospheres of oxygen, nitrogen, argon and hydrogen and compared with recordings made in air and under reduced pressure. Increased concentrational sensitivity for carbon leads to an appreciable improvement in reproducibility while it is still considerably lower than for other elements such as Si or Mn. 10 ref. (S11k; ST, Co, CI, C)

350-S.* (French.) Cast Carbon Steels. *Journal d'Informations Techniques des Industries de la Fonderie,* Supplement to no. 104, Mar-Apr. 1959, 5 p.

Tabular summary of principal French, British, German, Austrian standard specifications. (S22; CN, 5)

351-S.* (French.) Magnetoscopic Inspection of Ferrous Alloy Parts. Pt. 4. *Machine Moderne,* v. 53, May 1959, p. 31-39.

Demagnetization of parts inspected by magnetoscopy. Applications of magnetic inspection. Magnetoscopes for flaw detection and for sorting according to hardness, heat treat condition, composition, structure or thickness of case-hardened layer. (S13h, X6n)

352-S. Eddy Currents Track Non-Ferrous Tube Faults. *Metalworking Production,* v. 103, June 5, 1959, p. 996-998.

(S13h, 4-60; EG-a38)

353-S. (Russian.) Photo-Electric Apparatus to Control Geometric Dimensions of Rolled Steel. T. Kh. Zarezankov and P. V. Lyamkov. *Metallurg,* May 1959, p. 30-34.

Of the four types of photo-electric instruments, photo-compensating, photo-light emission and photo-impulsating and time-impulsating, the latter was most effective in measuring rod diameters of 4.5-8.5 mm. within 1 to 1.5% accuracy and strip width of 700-1500 mm. within ± 50 mm. accuracy. (S14c; 4-53, 4-55, ST)

354-S. (Russian.) Determination and Regulation of the Optimum Air-Fuel Ratio. A. L. Malyi. *Metallurg,* May 1959, p. 34-38.

A new method to regulate combustion in metallurgical furnaces by finding automatically the air consumption at which the fuel flame reaches its maximum efficiency. (S18s)

355-S. (Russian.) Automatic Regulation of Heating Process of Continuous and Recuperative Furnaces. M. D. Klimovitskii and B. I. Sinchuk. *Metallurg,* May 1959, p. 38-42.

A one-line diagram illustrating the control of heating process in continuous and recuperative furnaces. This control reduced the fuel consumption by 7-10%. (S18s, W20h)

356-S.* Cermet Body Nondestructive Test Data Evaluated by Spin Tests of Blades and Bend Tests of Bars. A. G. Holms and A. J. Repko. *Nondestructive Testing,* v. 17, May-June 1959, p. 156-164.

Correlation of cermet turbine blade strength with results of penetrant oil inspection, X-ray radiography, sonic inspection and physical property measurements. 12 ref. (S13, Q5g, Q27a, T24b; Ti, C, Ni, 6-70)

357-S.* Radiography With a Large Cobalt 60 Source. Victor G. Behal. *Nondestructive Testing,* v. 17, May-June 1959, p. 172-176.

Sensitivity of radiographic method for detecting grooves and drill holes in steel plates 2 to 12 in. in thickness. (S13e; ST, 4-53)

358-S.* (German.) Ultrasonic Testing of Products in the Iron and Steel Industry. Herman-Josef Kopineck, Hans Kraechter and Werner Rauterkus. *Stahl und Eisen,* v. 79, May 28, 1959, p. 786-797.

Application of ultrasonic testing to sheets, heavy plates, forgings and welded and seamless tubes. (S13g, S14g; 4-51, 4-53, 4-60, ST)

359-S.* (German.) Statistical Comparison of the Chemical Composition of Steel Determined by Spectrographic and Chemical Methods. Hans Buehler, Walter Schreiber and Fritz Thorn. *Industrieblatt*, v. 59, May 1959, p. 179-181.

Chemical composition of 26 steels determined for their Si, Mg, Cr and Ni contents. (S11k; ST, *Si, Mg, Cr, Ni*)

360-S.* (Italian.) Neutron Activation Analysis of Aluminum Alloys. *Alluminio*, v. 38, Apr. 1959, p. 192.

Radiochemical and spectrometrical process for analysis of very small samples. (S11q; Al-b)

361-S. (Russian.) X-Ray Method to Control Decarburization Depth of High Speed Steels. P. L. Beldstotskaya, V. S. Dmitrieva and M. F. Longinov. *Zavodskaya Laboratoriya*, v. 25, May 1959, p. 558-559.

X-ray method applied to high speed R9 and R18 boron steels utilizing intensity lines (111) as used in carbon steels is inadequate in itself because the change in the width of intensity bands shows no relationship between the martensite and carbon contents of the steels. 4 ref. (S11p; TS-m, *B*)

362-S. A Rotary Sampling Machine for the Sampling of Cast Iron. H. Green. *B.C.I.R.A. Journal*, v. 7, Apr. 1959, p. 644-650.

Machine for sampling white, gray and nodular graphite iron for determination of C, S, Si, Mn or P. (S11, 1-53, S12h; Ci)

363-S. Analytical Techniques for Vacuum Processed Metals and Alloys. Frank C. Benner. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 407-432.

Vacuum fusion and vacuum extraction techniques. 33 ref. (S11r)

364-S. (Swedish.) Alkalimetric Determination of Phosphorus. Goran Alfelt. *Jernkontorets Annaler*, v. 143, no. 3, 1959, p. 167-174.

Determination of P in steel. 5 ref. (S11j; ST, *P*)

365-S. (German.) Instruments for Optical Inspection. H. Kluge. *Giesserei-Praxis*, no. 11, June 1959, p. 201-204.

(S13d, E-general, 1-53)

366-S. (Czech.) Nephelometric Determination of Oxygen in Low-Alloy Steels. Miroslav Sicha. *Hutnicke Listy*, v. 15, June 1959, p. 513-515.

4 ref. (S11a; AY, *O*)

367-S. (Rumanian.) Rapid Determination of Types of Steel. M. Suliteanu. *Revista Transporturilor*, Feb. 1959, p. 64-69.

Rapid determination of elements by chemical methods, spark and magnetic testing. (S11a, S10n, S10r; ST)

368-S.* Investment Casting Institute Standards. Pt. 2. Visual, Penetrant and Magnetic Particle Inspection. Precision *Metal Molding*, v. 17, July 1959, p. 40-41.

Types of inspection used for classifying and evaluation of irregularities and defects. (S13k, S13j, S22; 5-62)

369-S.* Instantaneous Inspection of Ship Welds With Scattered Gamma Radiation. J. I. Bujes. *Welding Journal*, v. 38, July 1959, p. 301s-304s.

Present status of filmless technique and procedure evolved for utilizing only one side of the ship's hull during testing. The filmless method was applied with a Co-60 isotope of about 300 mc. as a source and a Geiger counter as a detector of the transmitted gamma radiation through the various points in the steel plate. (S13e, T22g; ST, 4-53)

370-S. (German.) Standards. *Neue Hutte*, v. 4, June 1959, p. 370.

Standards for material sampling sheet metal, profiles, nonferrous metals and alloys. (S22, S12h)

371-S. (Slovenian.) Chemical Determination of Arsenic, Antimony and Copper in Steel and Iron Ores. Sergej Gomiscek. *Rudarsko-Metalurski Zbornik*, no. 1, 1959, p. 51-62.

29 ref. (S11j; ST, Fe, RM-n, *As, Sb, Cu*)

372-S. Determination of Cladding Thicknesses of Nuclear Fuel Elements by X-Rays. Paul Lublin. *Norelco Reporter*, v. 6, May-June 1959, p. 57-59.

Cladding thicknesses of Zr on fuel pins approximately 30 in. long and 0.125 in. in diameter. X-rays impinging on the fuel pin penetrate the cladding and secondary X-rays of uranium are produced. (S14e, T11g; Zr, 8-66)

373-S. (Chinese.) Determination of Boron in Steel and Iron by the Aluminum

Spark Method. Wan Hong-Jang. *Acta Metallurgia Sinica*, v. 4, Mar. 1959, p. 75-80.
Samples are dissolved in perchloric acid, containing an amount of NaOH. A drop is placed on an Al electrode. Determination of boron by testing a spark spectrum. 12 ref. (S11k; ST, Fe, *B*)

374-S. (Chinese.) Spectrographic Analysis of Small Amounts of Rare Earths in Alloy Steel. Li Shuh-cho and Wang Yu-me. *Acta Metallurgia Sinica*, v. 4, Mar. 1959, p. 81-86.
Chemico-spectrochemical method. (S11k; AY, EG-g)

375-S. (Chinese.) Effect of Carbon on the Spectrochemical Analysis of Chromium Steels. Chang Kung-soo and Ho I-djen. *Acta Metallurgia Sinica*, v. 4, Mar. 1959, p. 87-91.
Effect is considerable only when carbon was present in the solid solution and its content higher than 1%. 8 ref. (S11k, 2-60; AY, *Cr*, *C*)

376-S. (French.) Use of the Filter Colorimeter. G. Blet. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, June 1959, p. 35-40.
In the analysis of metals. (S11a, 1-53)

377-S. (French.) Ultrasonic Inspection of Light Metal Semi-Products. Yves Bresson and Jean-Pierre Pouget. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, June 1959, p. 81-90.
(S13g; EG-a39)

378-S. (German.) Photometric Determination of Silicon in Brass. H. Mohl and H. Schlager. *Metall*, v. 13, July 1959, p. 658-659.
(S11a; Cu-n, *Si*)

379-S.* (French.) Testing for Gas Content of Copper-Aluminum Melts. *Fonderie*, no. 161, June 1959, p. 272-275.
Testing by allowing a sample to solidify in a vacuum. (S11r, 1-73; Cu-b, *Al*)

380-S. Separation of Vanadium, Molybdenum and Tungsten by Means of Paper Chromatography. Pt. 1. Tzou Shih-Fu and Liang Shu-Chuan. *Scientia Sinica*, v. 8, Feb. 1959, p. 196-200.
V, Mo and W are separated by paper chromotography in the form of their soluble and stable per-acids. These are then detected using tannin solution. (S11f; Mo, V, W)

381-S.* (Hungarian.) Use of Isotopes in the Detection of Flaws. Pal Reti. *Kohaszati Lapok*, v. 14, June 1959, p. 267-273.
Nondestructive tests of steel in crankshafts, industrial retorts, castings and weld seams. (S13, 1-59)

382-S. Checking and Measuring Methods in Surface Finishing. Vaclav Bruna and Miroslav Firman. *Czechoslovak Heavy Industry*, no. 7, 1959, p. 43-47.
Magnetic, electro-inductive and radiometric techniques. (S15)

383-S. (Italian.) Nondestructive Testing of Combustion Elements by Autoradiography. G. Lancellotti and M. Robba. *Alluminio*, v. 28, no. 6, 1959, p. 269-277.
Testing for defects such as inhomogeneous distribution of uranium in Al-U alloys, position of core in the sheath and cracks. 11 ref. (S13e, T11g; Al-b, *U*)

384-S. (Ukrainian.) Studies of X-Ray Adsorbtion Characteristics in Binary Alloys of Iron-Nickel and Cobalt-Chromium. L. G. Nicolaeva and S. M. Karal'nik. *Ukrainskii Fizicheskii Zhurnal*, v. 4, Feb. 1959, p. 260-266.
10 ref. (S11c; Fe-b, *Ni*, Co-b, *Cr*)

385-S. (Czech.) Isolation of Nonmetallic Inclusions by Direct Chlorination. Miroslav Mandl, Miloslav Kase, Rudolf Friewillig and Jan Dostal. *Hutnicke Listy*, v. 14, July 1959, p. 617-620.
The method described is applied to the analysis of alloy steels and killed carbon steels. 8 ref. (S11b; AY, ST-c, 9-69)

386-S. (Dutch.) A Calibration Block for Ultrasonic Testing. *Lastechniek*, v. 25, July 1959, p. 149-151.
(S13g, 1-53)

387-S. (German.) Experience With Direct-Recording Spectrographs. Albert Pack and Bruno Zischka. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 407-410.
7 ref. (S11k, 1-53)

388-S. (German.) Vacuum Hot Extraction Methods at the Institute for Ferrous Metallurgy in Aachen. Klaus-Dieter Unger, Klaus-Gunther Schmitz, Karl Heinz Gerdom and Hermann Schenck. *Archiv fur das Eisenhuttenwesen*, v. 30, July 1959, p. 411-414.
17 ref. (S11g, 1-73; Fe)

389-S. (Russian.) Determination of the Susceptibility of Aluminum-Magnesium Alloys to Corrosion Under Tension. V. I.

Elagin and E. V. Ekhina. *Zavodskaya Laboratoriya*, v. 25, June 1959, p. 703-704.

Microanalysis is an effective means of evaluating the corrosion resistance of Al-Mg products undergoing various forms of heat treating and when it is difficult to predict the degree of decomposition of solid solutions of Mg in Al. (S11e, R-general, Al-b, *Mg*)

390-S. (Pamphlet.) Zamak Zinc-Base Alloys for Die Casting. 24 p. 1959. Henning Bros. & Smith, Inc., 91-113 Scott Ave. at Randolph St., Brooklyn, N. Y.

Data and specifications on Zamak and other Zn-base alloys. (S22, E13; Zn-b)

391-S.* Investment Casting Institute Standards. Pt. 3. Airfoil Section Standards. *Precision Metal Molding*, v. 17, Aug. 1959, p. 36-37.

Standards by classes are established for investment and ceramic shell cast vanes and blades. Radiographic and acceptance standards and tolerances by specimen areas. (S22; 5-62)

392-S. Aluminum Alloys. M. W. Tayler. *Australasian Engineer*, v. 51, June 1959, p. 85-87.

Standardization and application. (S22; Al-b, 17-57)

393-S. Quantitative Determination of Uranium Loading of Aluminum-Clad Fuel Plates by X-Ray Densitometry. S. Priceman. Sylvania-Corning Nuclear Corp. *U. S. Atomic Energy Commission*, SCNC-277, Oct. 1958, 23 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Nondestructive method for determining uranium distribution is based upon the measurement of density variations in radiographic films. (S11p, T11g; U)

394-S. (Czech.) Determination of Aluminum Oxide in Aluminum Bronze. Rudolf Dufek and Lubos Kopa. *Hutnicke Listy*, v. 14, July 1959, p. 620-622.

Colorimetric and vacuum melting methods. (S11a; Cu-b, *Al, O*)

395-S. (Italian.) Testing the Thickness of Oxide Layers on Aluminum by the Perforation Voltage. *Alluminio*, v. 28, no. 7-8, 1959, p. 375.

Thickness determination by measuring the voltage required for perforation. (S14c; Al)

396-S. (Italian.) Standardization of Cylindrical Coil Springs of Circular Wire Cross Section. Renato d'Agostino. *Macchine*, v. 14, July 1959, p. 665-674.

(S22, T7c)

397-S. (Italian.) Surface Roughness of Castings. *Fonderia*, v. 8, July 1959, p. 287-288.

Standards for roughness designations. (S22, S15; 5)

398-S. (Italian.) Measurement, Regulation and Recording of Temperatures. Pt. 5. *Trattamenti Termici*, v. 2, May-June 1959, p. 22-24.

To be continued. (S16)

399-S.* (English.) Temperature: Steel Forging and Temper Colors. *Aciers Fins et Speciaux*, no. 32, July 1959, p. 111-113.

Methods of assessing temperature by observation of quenching and tempering colors; evaluations for ordinary and stainless steels; use of Seger or Guerineau cones; color craysons for temperatures from room temperature to 2010° F. (S16b, F22, J29; SS, ST)

400-S. (English.) Studies on the Microdetermination of Metals by Extracting the Inorganic Compounds With Organic Solvents. Pt. 2. Microdetermination of Mercury. Hidehiro Goto and Shigero Ikeda. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, June 1959, p. 183-189.

(S11b; Hg)

401-S. (French.) Analysis by X-Ray Fluorescence. H. Bizouard and G. Pomey. *Metaux Corrosion-Industries*, no. 407-408, July-Aug. 1959, p. 302-315.

30 ref. (S11p)

402-S.* (Czech.) Nondestructive Tests for Measuring Case Depth. F. Jandos and J. Koutsky. *Strojirenstvi*, v. 9, May 1959, p. 319-382.

New method is based on changes in permeability and coercive force which vary according to carbon content. 7 ref. (S14h, J28, P16; SS)

403-S. The Measurement of Liquid Iron Temperatures. *Castings*, v. 5, June 1959, p. 25, 27-28.

Continuous measurement of metals with new photo-type pyrometer improves quality and control. (S16a, X9r; Fe)

404-S.* (French.) Use of Radioisotopes in the Foundry. Lucien Soustre. *Memoires*

Scientifiques de la Revue de Metallurgie, v. 56, July 1959, p. 124-130.

Factors in determining choice of sources, films, screens and density of darkening for inspection of castings. Importance of control of quality of negatives for proper interpretation of films. Further development of technique requires additional isotopes, more rapid films and possibly counters instead of films. 6 ref. (S13e, 1-59; 5)

405-S.* (French.) Role of Thermal Conductivity in Metallurgical Research. R. W. Powell. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 181-186.

Thermal comparator based on heat conduction in metals provides new nondestructive testing technique. Applications include sorting of materials, comparative measurement of thermal conductivity and determination of thickness of foils and deposited films and of depth of case hardening. 15 ref. (S14, P11h, 1-53)

406-S.* (French.) Application of Ultrasonics to Inspection of Steel Mill Products. Possibilities and Limitations. L. Beaujard and V. Husarek. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 221-223.

Methods being developed to put ultrasonic inspection on an automated basis for inspection of ingots, billets and heavy plate and to overcome problems of slowness of testing and operator fatigue. 4 ref. (S13g; Fe, ST, 4-52, 4-53, 5-59)

407-S.* (French.) Ultrasonic Flaw Detection. A Review of Factors Affecting the Significance of Results Obtained by Echo Sounding. B. R. Ryrne. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 231-256.

Most bothersome parasite effects occurring in inspection by echo sounding; methods of overcoming these difficulties to permit correct interpretation of results. 52 ref. (S13g)

408-S. (German.) Comparative Photometric Determination of Cobalt in Aluminum and Its Alloys. H. Pohl. *Aluminum*, v. 35, May 1959, p. 260-261.

7 ref. (S11a; Al, Co)

409-S. (Spanish.) Optimum Conditions for the Ultrasonic Testing of Steel. Jose Ors Martinez. *Instituto del Hierro y del Acero*, v. 12, Apr-June 1959, p. 163-172.

6 ref. (S13g; ST)

410-S.* Further Information on Sampling Liquid Steel for Dissolved Oxygen. F. C. Langeberg and J. M. Snook. *Metallurgical Society of AIME, Transactions*, v. 215, Aug. 1959, p. 706-707.

Modifications of the bomb sampling technique. 14 ref. (S11g, S12h; ST, 14-60)

411-S.* (Spanish.) Defects in Large Hammer Forged Crankshafts for Piston Engines. Hermann Schumann. *Neue Hutte*, v. 4, Apr. 1959, p. 218-231.

Revelation of flake structure, nonmetallic inclusions, inclusions of foreign bodies and segregation cracks by macrographs, magnaflux tests and ultrasonic methods. 24 ref. (S13, T21c, F22; AY, CN, 9-70, 9-69, 9-72)

412-S. Statistical Methods in Steel Technology. John W. Sullivan. *Standards Engineers Society, 5th Annual National Meeting, Proceedings*, 1956, p. 38-55.

Use of statistical methods in studying variability in some of the processes and products of the steel industry. (S12, D-general)

413-S.* Application of a Portable Spectroscope to the Rapid Identification of Alloy Steels. D. R. Stoss and P. E. Sherman. *American Society of Mechanical Engineers*, Paper no. 59-A-56, 1959, 7 p. $.80.

Hand spectroscope for identification of alloys in high-temperature high-pressured steam turbines. (S10a, S11k; AY, SS)

414-S.* (Czech.) Determination of Carbon and Sulphur in Steel and Cast Iron by the Method of High-Frequency Combustion. Boleslav Bieber, Bohus Vejmelek and Zdenek Vecera. *Hutnicke Listy*, v. 14, Aug. 1959, p. 700-706.

Chips are heated by high frequency and exposed to a current of oxygen. Combustion time is measured and combustion gases analyzed. 18 ref. (S11g; ST, CI, *C*)

415-S. (Czech.) Photometric Determination of Small Boron Amounts in Low and Medium Alloyed Steels. Lubomir Brhacek and Kvetuse Kurzova. *Hutnicke Listy*, v. 14, Aug. 1959, p. 710-714.

6 ref. (S11a; AY, *B*)

416-S. (Dutch.) X-Ray Diffraction Testing. P. J. G. Gelling. *Metalen*, v. 14, Aug. 15, 1959, p. 229-231.

Methods applied by the Werkspoor N. V., Amsterdam, in testing bearings for residues of molding sand and the analysis of corrosion products. (S11p)

417-S. (Italian.) Radiographic Inspection of Castings. Renzo Parigi. *Fonderia Italiana*, v. 8, May 1959, p. 169-173.
(S13e; 5)

418-S. (Translation—BISI no. 1110.) Highly Sensitive Determination of Sulphur and Simultaneous Determination of Carbon and Sulphur With a Conductivity Recorder. W. Koch. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 543-546.
See item 32-S, 1959. (S11g; C, S)

419-S. (Translation—BISI no. 1111.) Rapid Examination of Ores and Similar Materials. Alfred Neuberger. *Archiv fur das Eisenhuttenwesen*, v. 29, Sept. 1958, p. 547-552.
See item 33-S, 1959. (S11a; RM-n)

420-S. (Translation—BISI no. 1146.) Spectrometric Analysis of Bessemer Pig Iron and Steel by the Scanning Slit Method. M. D. E. Jonckers and A. Daniels. *Revue de Metallurgie*, v. 55, July 1958, p. 601-612.
See item 41-S, 1959. (S11k; CI-a, ST-g, Mn, P, Ni)

421-S. (Translation—BISI no. 1168.) Measuring Openhearth Furnace Roof Temperature by Means of a Photoelectric Pyrometer. A. K. Adabaschjan. *Neue Hutte*, v. 3, Oct. 1958, p. 615-619.
See item 213-S, 1959. (S16, W18r, X9r)

422-S. (Translation—Brutcher no. 4558.) Spectrochemical Rapid Determination of Gases in Steels. W. Koch, S. Eckhard and F. Stricker. *Archiv fur das Eisenhuttenwesen*, v. 30, no. 3, 1959, p. 137-144.
See item 283-S, 1959, (S11k; ST)

423-S.* (Spanish.) X-Ray Inspection in Naval Construction. F. Sanchez and C. Garcia. *Ciencia y Tecnica de la Soldadura*, v. 9, May-June 1959, 10 p.
Practice, equipment and standards of acceptance at Seville Yards of Empresa Nacional Elcano, Spanish shipbuilders. 15 ref. (S13e, T22g; 7-51)

424-S.* (German.) Gases in Cast Iron. B. Marincek and W. Buchen. *Giesserei*, v. 46, Aug. 1959, p. 489-497.
Composition, total amount and different fractions of gases were analyzed from samples taken from cast iron melts. Since a high gas affinity exists in cast iron careful sample taking is essential. (S11r, N15d; CI)

425-S. (Russian.) Effect of Iron in the Colorimetric Determination of Manganese. R. K. Korabel'nik. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 250-253.
Measurement of errors caused by chemical processes occurring between Mn and Fe. Inhibiting effect of H_3PO_4 on this reaction. 9 ref. (S11a, 2-60; Fe, *Mn*)

426-S. (Russian.) Determination of the Aluminum Present in Aluminum-Magnesium Alloys by a Chipless Method. N. A. Tananaev and V. N. Tikhonov. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya*, no. 1, 1959, p. 259-264.
(S11a; A10b, *Mg*)

427-S.* Non-Destructive Testing of Fuel Elements. W. J. McGonnagle. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 380-397.
Visual, pressure and leak, penetrant, thermal, radiography, acoustic, electrical and electromagnetic methods. Relative advantages, sensitivity and limitations. 17 ref. (S13, T11g)

428-S.* Quality Control With Eddy Current Techniques. C. E. Quinn. *Metal Progress*, v. 76, Sept. 1959, p. 70-73.
Inspection instrument, the Laminagage, measures the thickness of thin gages and plates. Useful for locating fine cracks, this tester employs plug-in coils and several types of probes. (S13h, S14h, 1-53)

429-S.* New Tool for Case Carbon Evaluation. Alan Goldblatt. *Metal Progress*, v. 76, Sept. 1959, p. 87-88.
A direct-reading, vacuum spectrograph determines the carbon gradient in steel. Method compared with analyses of carbon by combustion. (S11k, 1-53; ST, C)

430-S.* New Aluminum Hard Coating Quality Control Standards Devised. Ellis P. Owen. *Western Metalworking*, v. 17, Aug. 1959, p. 36-38.
Comparison of microscopic, abrasion, adhesion, indentation, dielectric strength, corrosion and density tests for evaluating quality of anodized coatings. (S-general, Q9; Al-b, 8-73)

431-S. Modern Methods of Analysis for Cast Iron. *Foundry Trade Journal*, v. 107, Sept. 10, 1959, p. 139-142.

Review of papers presented at a recent *BICRA* conference held in London, England, covering sampling of pig and cast iron for carbon determination; application of rotary sampling machined to cast iron; solvent extraction techniques in ferrous analysis and analyses of cupola slags and trace elements in cast iron. (S11; CI)

432-S. (Russian.) Comparative Exactness of Methods for Determination of Cerium, Manganese, Chromium and Vanadium in Ferrous Melts. S. A. Gusinskaya. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya*, no. 2, 1959, p. 256-263.

12 ref. (S11; Fe, *Ce, Mn, Cr, V*, 14-60)

433-S.* Analyzing Gases in Steel. E. Mang. *Foundry*, v. 87, Oct. 1959, p. 178, 180-181.

Method and equipment for determining amounts of H, C and N, evolved from steel during vacuum melting. Equipment employs vacuum extraction technique to obtain rapid and accurate analyses. (S11r, D8m, 1-53; ST, *H, C, N*)

434-S. (German.) Experiences With Directly Recording Spectrographic Instruments. Pt. 2. Gerhard Hartleif and Heinz Kornfeld. *Archiv fur das Eisenhuttenwesen*, v. 30, Aug. 1959, p. 485-488.

Instruments used in process control during production of bessemer steel. (S11k, S18, D3, 1-53)

435-S. (German.) Experiences With Directly Recording Spectrographic Instruments. Pt. 3. Peter Dickens and Asko Bahr. *Archiv fur das Eisenhuttenwesen*, v. 30, Aug. 1959, p. 489-491.

Tests with pig iron, basic bessemer, openhearth and electric steels. (S11k, 1-53; CI-a, ST-g, ST-e, ST-f)

436-S. (German.) Experiences With Directly Recording Spectrographic Instruments. Pt. 4. V. Mathien, M. Lacomble and L. Charlet. *Archiv fur das Eisenhuttenwesen*, v. 30, Aug. 1959, p. 493-496.

Tests with pig iron, basic bessemer, openhearth and electric steels. (S11k, 1-53; CI-a, ST-g, ST-e, ST-f)

437-S.* Immersed Ultrasonic Inspection of Metal Plate. R. W. McClung. *Nondestructive Testing*, v. 17, Sept-Oct. 1959, p. 270-275.

Ultrasonic investigation of laminar discontinuities. (S13g; 4-53, 9-71)

438-S. Spectrophotometric and Photometric Microdetermination of Vanadium. F. Bermejo and M. Paz Castro. *Chemist-Analyst*, v. 48, Mar. 1959, p. 2-3.

Method based on intense coloration of acidic solutions of the vanadyl ion on addition of ethylene glycol. (S11d; V)

439-S.* Isotope Techniques for Inspection and Evaluation of Ship Welds. E. L. Criscuolo. *Welding Journal*, v. 38, Aug. 1959, p. 324-s-328-s.

Radiographic techniques utilizing Tm^{170}, Ir^{192}, Cs^{137} and Co^{60} for the inspection of welds in 1/2 to 2-in. steel plate. 12 ref. (S13e, T22g; 4-53, 7-51, ST, *Tm, Ir, Cr, Co*, 14-63)

440-S. Polarography of Mixtures. Determination of Iron and Nickel. Sidney L. Phillips and Evan Morgan. *Analytical Chemistry*, v. 31, Sept. 1959, p. 1467-1469.

Rapid method of analyzing mixtures of Fe and Ni without the necessity of separation. (S11m; Fe, Ni)

441-S. Application of X-Ray Fluorescence Method to the Analysis of Zircaloy. R. W. Ashley and R. W. Jones. *Analytical Chemistry*, v. 31, Oct. 1959, p. 1632-1635.

Determination of Sn, Fe, Cr and Ni in Zircaloy-2. (S11p; Zr-b, *Sn, Fe, Cr, Ni*)

442-S. Spectrographic Analysis of Molybdenum Metal Powder. Rudolph Dyck and Thomas J. Veleker. *Analytical Chemistry*, v. 31, Oct. 1959, p. 1640-1643.

(S11k, 6-68; Mo)

443-S. (Book.) Selected Methods of Analysis of Foundry Materials. Pt. 1. Pig Iron and Cast Iron. 97 p. July 1959. British Cast Iron Research Assoc., Alvechurch, Birmingham, England. $2.50.

Sampling and analysis of pig and cast irons for C, Si, Mn, S, P, Ni, Cr, Mo, Cu, Ti and V. (S11; CI, CI-a, *C, Si, Mn, S, P, Ni, Cr, Mo, Cu, Ti, V*)

444-S.* Fluorescent Penetrant Method for Casting Inspection. Arthur Lindgren. *Modern Castings*, v. 36, Oct. 1959, p. 105-110.

Use of fluorescent penetrant for magnetic inspection of castings. (S13k)

445-S.* (French.) Analysis of Nonmetallic Inclusions in Steel. H. Bizouard and J.

Philibert. *Revue de Metallurgie*, v. 51, July 1959, p. 123-124.

Analysis by means of spectrometer and microscope. The set of instruments allows quantitative determination of elements such as Na, Mg, Al and Si present in oxide inclusions. (S11k, S11e; ST, 9-69)

446-S.* (Russian.) Quality Control of Weldments With Ultrasound. Yu. M. Gofman. *Svarochnoe Proizvodstvo*, Sept. 1959, p. 39.

Weldments performed on pressure vessels were tested by means of gamma rays and, for comparison, by the ultrasonic method. The latter proved to be more dependable in the detection of pores, inclusions, cracks and incompletely filled joints. (S13, T26q; ST, 7-51)

447-S. Radiographic Inspection Assures Flawless Steel Castings. *Western Metalworking*, v. 17, Sept. 1959, p. 43.

Brief description of mobile cobalt-60 unit for large parts. (S13e, X8g; ST, 5-60)

448-S. (Swedish.) Standards for Aluminum Semi-Products. Gosta Lindblom. *Metallen*, v. 15, no. 2, 1959, p. 68-71.

(S22; Al, 4-55, 4-53, 4-61, 4-60)

449-S. (Russian.) Standardization of Steels Used in Welded Constructions. *Svarochnoe Proizvodstvo*, Sept. 1959, p. 40-43.

(S22; ST)

450-S* Porosity of Plated Coatings. *U. S. Dept. of Commerce, National Bureau of Standards, Technical News*, no. 2389, 1959, 6 p.

Physical and chemical methods of detecting pores; influence of gas on pore formation. (S13a; 9-68, 8-62)

451-S.* (Dutch.) Radiographic and Ultrasonic Testing of Weldments Performed on Gas Pipes. G. J. Janssen. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 248-250.

Comparison of the two methods. The ultrasonic method offers the advantages of more sensitivity in the discovery of cracks and better economy. (S13e, S13g, T26r, 7-51)

452-S. (Dutch.) Automatic Testing of Weldments by Ultrasonics. A. de Sterke. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 240-241.

Description of methods. (S13g, 7-51)

453-S. The Spectrographic Determination of Residual Elements in Steel. *Iron and Steel Institute, Journal*, v. 192, July 1959, p. 253-256.

Experimental procedures for spectrographic analysis of steel to determine residual elements present in amounts as low as 0.01% give good results for Co, Ni, Ti, Sn, Mo, Cb, V, Al and Cr, but less definitive accuracy for Zr and Cu. (S11k; *ST, Co, Ni, Ti, Sn, Mo, Cb, Al, Cr, Zr, Cu*)

454-S.* (English.) Determination of Oxygen in Cast Iron. Hidehiro Goto, Shin Suzuki, Jin Kimura and Akira Onuma. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 271-275.

Method for determining oxygen in oxides in cast iron. Technique is a fractional vacuum method using a tin bath. FeO can be extracted at 1050° C., MnO at 1150° C., Al_2O_3 at 1750° C. (S11g; CI, *O*)

455-S.* (English.) Microdetermination of Metals by Extracting the Inorganic Compounds With Organic Solvents. Pt. 3. Microdetermination of Molybdenum. Hidehiro Goto and Shigero Ikeda. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 276-284.

Use of stannous chloride or hydrazine sulphate as reducing agents and extraction of the compound of Mo by proper organic solvent. The microdetermination is made by light absorbency of the compound within certain regions where absorbence is a function of the amount of Mo. (S11d; Mo)

456-S.* (English.) Radioactive Tracer Study for the Determination of Trace Elements in Metals. Pt. 1. Determination of Zirconium in Steel. Hiroshi Amano. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 296-303.

Use of Zr^{95} as a tracer; the phosphate arsenate, basic selenite and mandelate methods. (S11q, 1-59; ST, Zr)

457-S.* (English.) Radioactive Tracer Study for the Determination of Trace Elements in Metals. Pt. 2. Determination of Niobium and Tantalum in Steel. Hiroshi Amano. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 304-311.

Use of Cb^{95} and Ta^{182} as tracers. Hydrolysis with perchloric acid and

treatment with saturated solution of sulphur dioxide is found to be the best method. (S11q, 1-59; ST, *Cb, Ta*)

458-S.* (English.) Variable Depth Echelette Gratings. Takemaro Sakurai. *Tohoku University, Science Reports of the Research Institutes*, Series A, v. 11, Aug. 1959, p. 352-354.

Various types of echelette gratings are necessary for the measurement of a wide spectral region, since the spread of wave length for a single grating is quite limited. This difficulty can be avoided by making the depth of the echelette grating variable. (S11k, 1-53)

459-S.* (French.) Shop and Site Inspection of Forced Piping Installations. R. Bouchayer, G. Rambaud and J. Picard. *Soudage et Techniques Connexes*, v. 13, July-Aug. 1959, p. 249-259.

Techniques and equipment for inspecting welded joints in steel lines installed in mountainous sites where slope of lines may be as high as 380°. Method adopted for gamma-ray inspection of circumferential joints which have difficult access. (S13e, S13g, T26r; ST, 7-51)

460-S.* (German.) Sand Casting, Chill Casting and Die Casting of Aluminum Alloys. *Giesserei Praxis*, no. 17, Sept. 10, 1959, p. 307-309.

In latest edition of DIN-1725 Standard degree of purity of alloys was increased by decreasing the allowable deviations. Composition, strength, hardness and elongation properties. (S22, E11, E13, 2-60; Al-b)

461-S. (French.) Contribution to the Spectrographic Deformation of Tantalum and Niobium in Stainless Steels of the 18/8 Type. M. Neuilly. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, Oct. 1959, p. 484-490.

7 ref. (S11c; SS, *Cb, Ta*)

462-S. (Polish.) Methods of Determining Smoothness of Casting Surfaces. Zdzislaw Samsonowicz. *Przeglad Odlewnictwa*, v. 9, July 1959, p. 214-218.

(S15; 5-60)

463-S. (Russian.) Ultrasonic Detection of Cavities in Stock From Which Tubing Is Drawn. I. A. Krym. *Tsvetnye Metally*, no. 12, 1958, p. 67-69.

(S13g; 4-55)

464-S. (Japanese.) Determination of Oxygen in Chromium Metal. Hitoshi Kimura, Shigeyoshi Ikeda and Toshio Watanabe. *Japan Institute of Metals, Journal*, v. 23, May 1959, p. 277-280.

Vacuum fusion and bromine methods. (S11f; Cr, *O*)

465-S. (French.) Ultrasonic Flaw Detection. P. Wiskin. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 531-532.

(S13g)

466-S. (Italian.) Rapid Spectrometric and Photometric Analysis of Metals. C. Mielenz. *Macchine*, v. 14, Oct. 1959, p. 959-967.

(S11a)

467-S. Ultrasonic Measurement of Tank Ship Corrosion Losses. Dwight J. Evans. *Corrosion*, v. 15, Nov. 1959, p. 561t-565t.

Method of making nondestructive thickness measurements from one side on steel, especially in tank ships, using an ultrasonic gage. 4 ref. (S14g, R-general)

468-S. Problems Associated With Blast Moisture Measurement and Control. H. Kirk Fallin. *ISA Proceedings, 1959 Conference*, v. 9, 1959, p. 47-50.

Sampling difficulties and installation of equipment. (S18, D1)

469-S. (Hungarian.) Determination of Retained Austenite by a Magnetic Method. Arpad Szombatfalvy. *Kohaszati Lapok*, v. 92, Oct. 1959, p. 445-447.

6 ref. (S11g, N8n)

470-S. (Russian.) Electrolytic Separation of the Sigma-Phase of Filler Metal. N. Ya. Katasik and N. E. Shlepyanov. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, 1198-1199.

(S11f; SS, 7-51)

471-S. (Russian.) Detection of Flux Inclusions in Semi-Products and Parts From Magnesium Alloys. M. A. Timonova, L. N. Sidelnikova and L. A. Sazhina. *Zavodskaya Laboratoriya*, v. 25, no. 10, 1959, p. 1203-1204.

(S13a, R6k; Mg-b, 9-69)

472-S.* Testing Methods. Glenn E. Fulmer. Paper from "Metals for Nuclear Reactors". American Society for Metals, Metals Park, Novelty, Ohio, 1959, p. 94-110.

Metallographic, thermal shock, thermal cycling, mechanical, visual, radiographic, electrical resistance, leak, penetrant inspection, ultrasonic and eddy current

technique for detecting flaws in fuel elements and control rods. In-pile testing. (S13, T11g)

473-S. (Book.) ASTM Specifications for Coated and Uncoated Iron and Steel Sheet and Strip. 140 p. Sept. 1959. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $3.
(S22; 15-68, 4-53, Fe, ST)

474-S. (Book-French.) Nondestructive Testing of Materials by Gamma-Rays. Albert Blondel. 199 p. 1959. Editions Techniques des Industries de la Fonderie, 12, Ave. Raphael, Paris (16^{e}), France.
Detailed description of testing methods. Safety measures to be observed when working with gamma-rays. (S13e)

475-S. (Translation—Brutcher no. 4501.) Rapid Analysis of Ores and Similar Materials. A. Neuberger. *Archiv fur das Eisenhuttenwesen*, v. 29, no. 9, 1958, p. 547-552.
See item 33-S, 1959. (S11a; RM-n)

476-S. (Translation—Brutcher no. 4752.) Magnetic Properties of Sintered Ore as a Function of FeO Content. N. A. Gladkov, Z. I. Nekrasov and V. V. Chekin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*, no. 2, 1959, p. 86-89.
6 ref. (S11g, P16; RM-n)

477-S. (Translation—Brutcher no. 4639.) Mineralogical Composition of Sintered Krivoi Rog Iron Ores With Flux and Coke Additions. E. F. Vegman. Paper from "Production and Further Processing of Steel and Alloys. Collection of Paper no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 45-63.
14 ref. (S11s; RM-n)

478-S. (Translation—Brutcher no. 4631.) Effect of the Physical Structure of Sintered Ores on Their Metallurgical Properties. G. A. Chilingarov and A. N. Pokhvisnev. Paper from "Production and Further Processing of Steel and Alloys. Collection of Papers no. 38, Moscow Steel Institute". Metallurgizdat, Moscow, 1958, p. 5-44.
16 ref. (S11s; RM-n)

479-S. (Translation—Brutcher no. 4618.) Testing As-Rolled Rounds for Cracks by a Magneto-Inductive Eddy-Current Method. H. Knuppel, G. Wiethoff and J. Juchhoff. *Stahl und Eisen*, v. 79, May 14, 1959, p. 711-718.
See item 331-S 1959. (S13h; 4-55, ST, 9-72)

SECTION T

APPLICATIONS of METALS in EQUIPMENT and INDUSTRY

1-T.* Low-Carbon Manganese-Chromium-Molybdenum-Vanadium Steel for Pressure Vessels. I. M. MacKenzie. *Alloy Metals Review*, v. 9, Sept. 1958, p. 2-8.

Use of Ducol "W.30" steel allows fabrication of pressure vessels with thinner walls, satisfactory weldability, high strength, good high-temperature properties. (T26q, 17-57; SS, *Cr, V, Mo*)

2-T.* Preview of Space Metals. *Metal Progress*, Oct. 1958, v. 74, p. 96-113.

Parelleling the need for new materials for aircraft, missiles and satellites is the need to develop improved capabilities in common metal systems. Present and future prospects are reported for Al, Mg, steels, Ti, Be, superalloys, refractory metals, ceramics and cermets, graphite, composite materials, sandwich construction, surface treatment and coatings. (T24, 17-57; SGA-h).

3-T.* Selecting Sleeve Bearing Materials. Richard Booser. *Materials in Design Engineering*, v. 48, Oct. 1958, p. 119-130.

Relative compatibility and other performance characteristics of common bearing alloys. Sn babbitt has less tendency to pickup on a shaft than Pb babbitt; Al, because of its short dwell period and high wear rate needs a good oil supply; leaded Sn bronze does not cause any shaft scoring; Zn bronze has an exceptionally low wear rate; Cd-Ni has a long dwell period which makes it useful where oil supply is limited. 17 ref. (T7d; SGA-c, Sn, Cd, Ni, Pb, Al)

4-T. Engineering Experience at Brookhaven National Laboratory in Handling Uranium-Bismuth Reactor Fuels. R. J. Insler, C. J. Raseman, H. Susskind and C H. Waide. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/459, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

A molten solution of U, Zr, and Mg in Bi can now be circulated in piping systems at 500° C. for thousands of hours at velocities up to 10 ft. per sec. Piping design, repair proceedures and safety. 4 ref. (T11p; 14-60, U, Zr, Mg, Bi, 17-57)

5-T. Manufacture of the Seed Fuel Elements for PWR. H. F. Turnbull, W. J. Hurford, L. B. Prus and A. W. Klein. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/787, 1958, 11 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Seed region of the Pressurized Water Reactor core contains 32 enriched U fuel units, termed clusters. Each fuel plate is a metallurgically bonded assembly of a fuel alloy clad with Zircaloy-2. The fuel alloy consists of 6.7% enriched U alloyed with Zircaloy-2. (T11g; U, Zr)

6-T. Manufacture of EBR-1, Mark III Fuel and Blanket Elements. R. A. Noland, N. J. Carson and C. C. Stone. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF. 15/P791, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Fuel rods were made of lengths of 2% U-Zr alloy clad with a 20-mil. jacket of Zircaloy-2 by co-extruding alloy billets sealed in Zircaloy-2 cans. Rods were cut into shorter lengths appropriate for

assembly into either fuel or blanket rods, which were then assembled with Zircaloy-2 end caps and fuel sections. Sections were joined at the jackets by tungsten inert gas welding. 10 ref. (T11g; Zr, U)

7-T. Metallurgical Problems in Molten Fluoride Systems. W. D. Manly, J. H. Coobs, J. H. DeVan, D. A. Douglas, H. Inouye, P. Patriarca, T. K. Roche and J. L. Scott. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/Conf.15/P/1990, 1958, 30p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Ni-base alloys and austenitic stainless steels are the most promising of available construction materials for containing molten fluorides. An Inconel alloy composed of 15% Cr, 7% Fe, balance Ni, afforded most promising corrosion properties together with excellent mechanical properties. 7 ref. (T11; R6j; Ni-b, SS-e, 17-57)

8-T. Plutonium Fuels for Fast Reactors. D. B. Hall. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/2286, 1958, 19p. (Available from U. S. Office of Technical Services. Washington 25, D. C.) $.50.

Metallurgical and physical properties of possible alloys with the neutron economy and operating potential of reactors fueled with Pu. Pure Pu is diluted to improve its thermal properties and to permit operation at practical levels of power density. Inert, or nonfertile, diluents may be added to Pu to improve its basic properties. Solid alloy forms with melting points above 800° C. and Pu contents in the range of 10-30% (atomic ratio) discussed. (T11g; 17-57, Pu)

9-T. Liquid Metal Fuel Reactor and LMFRE. Clarke Williams and Robert T. Schomer. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/2355, 1958, 17 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Reactor uses U-Bi circulating fuel. 2 1/4% Cr, 1% Mo has been tested in thermally convected and pumped loops and appears to be a possible container material. Graphite exposed to Bi-U solution appears to be a satisfactory container material. (T11p, T11g, R6m; U, Bi, AY, NM-k36)

10-T. Recent Structural Aluminium Developments in Belgium. H. R. Craggs. *Light Metals*, v. 21, Aug. 1958, p. 248-250.

(T26n; Al, 17-57)

11-T. The Spring-Back of Coil Springs. Harold C. R. Carlson and Frank J. Gardiner. *Wire Industry*, v. 25, Sept. 1958, p. 847, 850-851.

How to calculate the exact arbor diameter required to produce a specified outside diameter of spring for any material; comprehensive set of tables based upon the formulas. (T7c, 17-51)

12-T. (French.) Beryllium and Nuclear Reactors. *Metallurgie et la Construction Mecanique*, v. 90, Oct. 1958, p. 739-741.

Be ores and principle producing countries; world reserves. Use of Be as hardening agent, uses in the nuclear industry, (T11, A11a; Be, 17-57)

13-T. (German.) Sandwich Structures in Aircraft and Other Industries. Pt. 1. B. R. Noton. *Aluminium*, v. 34, Aug. 1958, p. 446-457.

Historical development, definition, cover materials, adhesives, Al honeycomb cores. Comparison of compressive longitudinal shear and transverse shear strengths of core materials now available. (T24a, K12; Al, SS, NM-d34, 7-59)

14-T. (German.) Prefabricated Aluminum Exhibition Hall. R. Brechtel and J. Schickling. *Aluminium*, v. 34, Aug. 1958, p. 466-469.

(T26n; Al-b, 17-57)

15-T. (German.) Aluminum House Which Can Be Dismantled and Reshaped. A Reischl. *Aluminium*, v. 34, Aug. 1958, p. 470-473.

(T26n; 17-57, Al-b)

16-T. (German.) New Unit for Street Lighting. *Aluminium*, v. 34, Aug. 1958, p. 474-479.

(T1; 17-57, Al-b)

17-T. Utility of Cutting Tools Expanded by New Materials. *Automotive Industries*, v. 119, July 1, 1958, p. 52-53, 83.

New grades of cemented carbides, ceramics and special high-speed carbides. (T6n; SGA-j, 6-69, 6-70)

18-T. Automotive and Aircraft Uses of Tin. Andrew W. Shearer. *Automotive Industries*, v. 119, July 15, 1958, p. 54-58.

Poundage figures used per unit are slight but total tonnage consumed runs to sizable amount in plating, solders, alloys and chemicals. (T21, T24; Sn, 17-57)

19-T. Lead as a Material of Construction for Chemical Plant. J. G. Openshaw. *Chemical and Process Engineering*, v. 39, Oct. 1958, p. 350-352.

Fabrication problems; corrosion behavior. (T29, G-general, R-general; Pb, 17-57)

20-T. Comparative Economics of Plutonium Fuel Utilization and U-235 Fuel Utilization in Thermal Power Reactors. E. A. Eschbach, D. P. Granquist and Milton Lewis. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1068, 1958, 19 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Minimum costs in a wide range of reactor types and sizes are compared for each of the two fuel systems. Pu may be recycled economically with natural or depleted U feed materials in high efficency reactors typified by those with low neutron leakage rates and high thermal utilization factors. (T11g, 17-53; Pu, U)

21-T. Resources of Nuclear Fuel for Atomic Power. J. C. Johnson. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.-15/P/1921, 1958, 7 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .50.

Uranium ore reserves and production costs. (T11g, A11a, B-general; U)

22-T. (German-French.) Light Metal Facade of Swiss Pavillion at the Brussels World Exhibition. R. Siebold. *Aluminium Suisse*, v. 8, May 1958, p. 75-83.

(T26n, 17-57; Al-b)

23-T. (German-French.) Atomium at the Brussels World Exhibition. Henri Froidevauz. *Aluminium Suisse*, v. 8, May 1958, p. 84-90.

Represents an elementary crystal of the cubic-centric system made up of nine atoms, magnified 150 times. (T26, 17-57; Al-b)

24-T. (German-French.) Role of Aluminum in the Architecture of the World Fair. H. Froidevaux. *Aluminium Suisse*, v. 8, May 1958, p. 91-101.

(T26n, 17-57; Al-b)

25-T. (German-French.) Light Metal Funicular Sleighs. M. Spescha. *Aluminium Suisse*, v. 8, May 1958, p. 102-105.

Light-metal sleighs prove more economic in the long run because of greater passenger-carrying capacity, due to lower weight, far larger size, and minimum of maintenance. (T-general, 17-57; Al-b, Mg, Si)

26-T. (German-French.) Balustrades Made of Light Metal. Emil Baumli. *Aluminium Suisse*, v. 8, July, 1958. p. 117-133.

(T26n, 17-57; Al-b)

27-T. (German-French.) Construction of Motor Boats of Aluminum and Wood Using Synthetic Resins and Aluminum Powder for Filling and Glueing. H. Greutert. *Aluminium Suisse*, v. 8, July 1958, p. 134-138.

(T22g; Al-b, 6-72)

28-T.* Electronic Tubes of Forged Molybdenum. *Design Engineering*, v. 4, Nov. 1958, p. 53.

Uses for clad Mo in magnetron tubes. Tensile strength, elongation, reduction in area of unannealed Mo rod. (T1j, 17-57, Q27, Mo, 8-66)

29-T. Manufacture and Chief Uses of Aluminium Foil. L. W. Swann. *Light Metals*, v. 21, Aug. 1958, p. 255-257.

Consumer goods manufacturers, especially food manufacturers, are finding coated Al foil or laminated foil lined with paper provide attractive, moisture-proof wrappers and packages. Laminated foil lined with paper gives mechanical strength and thickness needed. (T10g, 17-57; Al-b, 4-56)

30-T. Ceramic-Oxide Cutting Tools. *Australasian Manufacturer*, v. 43, Oct. 4, 1958, p. 62-65, 70-73.

(T6n; SGA-j, 6-70)

31-T. For Nuclear Reactors: Zr Is More Popular Than Ever. R. B. Norden. *Chemical Engineering*, v. 65, Nov. 17, 1958, 174, 176.

High strength, resistance to irradiation and corrosion boosts use of Zr. (T11; Zr, 17-57)

32-T. Magnesium Extrusions Make Ideal Airfield Landing Mats. *Modern Metals*, v. 14, Nov. 1958, p. 31-32.

(T24d; Mg-b, 4-58)

33-T. Sinter Alumina for Cutting Tools. Felix Singer and Sonja S. Singer. *Refractories Journal*, v. 34, Oct. 1958, p. 456-462.

11 ref. (T6n; SGA-j, 6-70)

34-T. High Strength Castings for High Speed Rotating Parts. J. C. Buck and D. V. Lippenberger. *Space Aeronautics*, v. 30, Nov. 1958, p. 78-84.

High-strength Al castings for turbines, fans, inducers, impellers. Properties. (T7h; Al-b, SGB-a, 5-60)

35-T. Fuel Enrichment and Reactor Performance. C. Starr. Second United Nations International Conference on the Peaceful Uses of Atomic Energy. A/CONF.15/P/1078, 1958, 18 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Reactor performance as a function of fuel enrichment over a wide range of natural U to about 4% U 235 and the use of Pu recycle for enriched reactors. Proper scope of natural U fuel cycles and of enriched U fuel cycles. (T11g; U, Pu)

36-T. (French.) Design and Calculation of Pressure Vessels. W. B. Carlson. *Revue de la Soudure*, v. 14, no. 3, 1958, p. 125-133.

(T26q, 17-51)

37-T. (French.) Testing of Pressure Vessels. W. Soete and R. Dechaene. *Revue de la Soudure*, v. 14, no. 3, 1958, p. 134-140.

(T26q, 1-54)

38-T. (German-French.) Modern Aluminum Roofing. Carl E. Scherrer. *Aluminium Suisse*, v. 8, Sept. 1958, p. 143-147.

(T26n, 17-57; Al-b)

39-T. (German-French.) Light Metal Ladders. W. Schramme. *Aluminium Suisse*, v. 8, Sept. 1958, p. 161-166.

(T26, 17-57; Al-b)

40-T.* Steels for the Petroleum Industry. A Comparison of British and American Qualities. Pt. 2. F. A. Kirk and J. Williams. *Corrosion Technology*, v. 5, Nov. 1958, p. 357-360.

Physical and mechanical properties of typical British heat and corrosion resistant steels. (T29n, Q-general, P-general; SGA-g, SGA-h, SS)

41-T.* (German.) Metallurgical Studies on the Capacity of Cast and Hot Worked Tools of High-Speed Steel. Karl-August Krekeler. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1575-1585.

Red hardness tests and working experiments with turning and milling tools. When no excessive heating of the edge was caused by the working conditions, cast tools from steels ABC III and EV 4 (both with about 0.10% C) and EV4Co (with about 0.20%C) showed better properties and longer life than forged tools from the same materials. 63 ref. (T6n, Q-general; TS-m)

42-T.* (English.) One-Piece Wheels in Special Steel for Railway Equipment. *Aciers Fins & Speciaux Francais*, no. 29, July 1958, p. 44-46.

Operations in hot working of wheels in one piece include forging, rolling, heat treating, machining. (T23p, F-general; SS, 1-66)

43-T.* (English.) High Nickel-Chrome Alloys for Electrical Resistances. *Aciers Fins & Speciaux Francais*, no. 29, July 1958, p. 67-73.

Certain additives affect resistance to oxidation remarkably. Other factors which shorten the life of these elements are rapid heating and cooling, selected oxidation from a weakly oxidizing atmosphere, attack of sulphur which is catalyzed by the presence of dust or lime, carburization from strongly carburizing gases, sulphur and greases, rupture from flying particles or molten alloys and overheating. 16 ref. (T1p, 17-57; Ni-b, Cr-b, SGA-q)

44-T.* Metallic Heating Element Materials for High-Temperature Furnaces. R. Kieffer and F. Benesovsky. *Metallurgia,* v. 58, Sept. 1958, p. 119-124.

Physical properties and behavior of Mo, W and Ta toward various atmospheres and ceramic structural parts of furnaces. Examples of practical layouts in high-temperature furnaces. 14 ref. (T1p, P11, P12; Mo, Ta, W, SGA-h)

45-T. Fuel Elements for Natural Uranium Reactors. B. W. Dunnington. *Nuclear Technology Briefs Reactor Materials,* no. T1-6, Sept. 9, 1958, 8 p.

Problems of radiation-induced expansion, neutron absorption, and corrosion in developing safe and economical U metal fuel elements. Possibilities for using alloy elements, high-strength cladding and special element designs. Characteristics of oxide and carbide elements. 12 ref. (T11g, P10d, R2g, 2-67; U-b)

46-T.* (French.) Production of Plutonium-Aluminum Fuel Elements for Atomic Reactors. W. B. H. Lord and R. J. Wakelin. *Revue de Metallurgie,* v. 55, July 1958, p. 620-626.

Spikes for experimental reactors; plant and procedures for making cores and their Al sheaths; problems of Pu metallurgy. (T11g, 17-57; Pu, Al)

47-T.* (German.) Water Pipes From Copper. G. Wiedemann. *Metall,* v. 12, Nov. 1958, p. 1001-1003.

Chemical behavior of Cu in water of different composition. Development of protective film. (T26r, R4a; Cu-b)

48-T.* (German.) Hardenable Cemented Carbides. *Werkstatt und Betrieb,* v. 91, Nov. 1958, p. 688.

Titanium carbide grains are enclosed in a steel matrix, the hardness of which can be altered by heat treatment following the sintering process and working of the sintered product. Cemented carbides can thus be machined by conventional methods and after being worked to final shape and dimensions, heat treated to the required operating hardness. (T6n, 2-64; ST, 6-69)

49-T.* (French-German.) Copper as Roofing Material. K. Eichhorn. *Pro-Metal,* no. 65, Oct. 1958, p. 35-39.

Mechanical, physical and chemical properties which make Cu an economical material for roof coverings, especially if longevity is taken into consideration. (T26n; Cu-b, 17-57)

50-T.* (French-German.) Copper Construction Plumbing. O. H. C. Messner. *Pro-Metal,* no. 65, Oct. 1958, p. 43-53.

Roofs, gutters, rain pipes and fittings. (T26n; Cu-b, 17-57)

51-T. Titanium and Zirconium in Chemical Plant Applications. Leo J. Barron. *Chemical Engineering Progress,* v. 54, Nov. 1958, p. 51-54.

(T29, 17-57; Ti, Zr)

52-T. An Automobile Manufacturer Looks at Aluminum Casting Use. Darl F. Caris and Robert F. Thomson. *Foundry,* v. 86, Nov. 1958, p. 92-95.

(T21; 17-57, Al-b, 5-60)

53-T. Something New in Aluminum Furniture. M. J. Schmidt. *Modern Metals,* v. 14, Aug. 1958, p. 46-48.

(T10b; Al, 17-51)

54-T. Beer in Aluminum Cans. *Modern Metals,* v. 14, Aug. 1958, p. 50-52.

(T10g; Al, 17-57, 18-74)

55-T. (German.) Aluminium in Fireships. *Aluminium,* v. 34, Nov. 1958, p. 654.

(T22, 17-57; Al-b)

56-T. (German.) All-Welded Aluminium Working Boats and Tugs. *Aluminium,* v. 34, Nov. 1958, p. 657-658.

(T22, 17-57; Al-b, 7-51)

57-T. (German.) Performance of Newly Developed Cutting Materials. C. Agte and R. Kohlermann. *Fertigungstechnik,* v. 8, Aug. 1958, p. 349-352.

Recommends use of ceramics and multipurpose hard metals. 12 ref. (T6n, 17-52, SGA-j)

58-T.* (Russian.) Aluminum Bimetal Shells With ACM Alloy Instead of Lead Bronze Shells for Tractor Engine Bearings. Yu.Ya. Zil'berg. *Vestnik Mashinostroeniya,* v. 38, Oct. 1958, p. 34-36.

Use of lead bronze shells, while effective antifriction material, is very costly and difficult to produce. The ACM Al antifriction alloy recommended as substitute includes 4% Sb, 0.3% Mg. 3 ref. (T7d; Al-b, *Mg, Sb,* 17-57)

59-T. (Book.) The Contemporary Curtain Wall. William Dudley Hunt, Jr. 454 p. 1958. F W. Dodge Corp., 119 W. 40th St., New York 18, N. Y. $12.75.

Function of the wall, design considerations, physical and mechanical properties of construction materials, recommended practices for erection, resistance to weathering, corrosion, damage. (T26n, 17-57; Al, SS)

60-T. Development of Ferritic Stainless Steel-UO_2 Dispersion Fuel Elements. W. K. Barney, W. E. Ray and H. G. Sowman. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-1908, Aug. 26, 1958, 22 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $ .75.

Fabrication process consists of the cold binder extrusion of a plastic powder dispersion which is fired in dry hydrogen, fitted with welded end caps and electroplated with Ni. This core is inserted into a length of 430 stainless steel cladding and the assembly is bonded by hot swaging at 800° C. (T11g, F21g; SS-d, U, 8-66)

61-T. Materials for Guided Missiles. Paper from "Materials Evaluation in Relation to Component Behavior". *U. S. Office of Technical Services,* PB 131783, p. 601-609.

Applications and limitations of Al, Mg, and Ti alloys, alloy steels. Rich alloys of Co or Ni, because of their high cost and critical supply, are difficult to justify. The outlook for cermets is most promising. (T24e; AY, SS, Al-b, Mg-b, Ti-b, 6-70, 17-57)

62-T. A Low Cost Porous Bushing. *Precision Metal Molding,* v. 16, Dec. 1958, p. 32.

Fe-base bushings have advantage of being about one-fourth the cost of comparable bronze bushings and can operate at higher temperatures. Mechanical properties and corrosion resistance are inferior. (T7d; Fe, Cu-s, 6-71)

63-T. Extrusions Lower Model Costs. *Precision Metal Molding,* v. 16, Dec. 1958, p. 49.

Extruded crankcase of model airplane gasoline engine gives precise shape and superior strength over comparable castings. (T24b; 4-58, 17-53)

64-T. Rolling Mill for Nuclear Fuel Elements. *Sheet Metal Industries,* v. 35, Dec. 1958, p. 928-930.

Remote control of roll changing. (T11g, W23)

65-T. Material Solves Problems in Forging Reactor Parts. *Steel,* v. 143, Dec. 22, 1958, p. 72-76.

Composition for heavy forged sections is equal in tensile, impact strength and weldability to ASME Boiler Code analysis SA 302 but does not flake. (T26q; ST, Cr, *Mn, Mo, Ni,* 9-70, 17-57)

66-T. (French.) Production, Fabrication and Canning of Thorium. M. D. Jepson and L. M. Wyatt. *Revue de Metallurgie,* v. 55, Sept. 1958, p. 847-852.

Processes developed for United Kingdom Atomic Energy Authority: reduction of thorium oxide by calcium, cold compaction, sintering, swaging and/or machining to size and canning in Al containers. Methods of sealing cans and testing finished cartridges. (T11g, H-general; Al-b, Th)

67-T.* Low-Speed Cascade Study of a Simply Generated Compressor Blade Shape. D. Banerjee and P. Pal. *Journal of Technology (Calcutta),* v. 3, June 1958, p. 43-52.

Method of manufacture without use of special purpose machine tools. Effect of deviation in the blade shape from the true aerodynamic profile. 10 ref. (T7h, 17-51)

68-T. Development of Fabrication Techniques and Manufacturing Specifications for APPR Fuel Plates. W. Weinberger. Sylvania-Corning Nuclear Corp. *U. S. Atomic Energy Commission,* SCNC-262, Apr. 1958, 49 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Fuel plates contained U^{235} in the form of highly enriched UO_2 and B_{10} in the form of normal elemental B powder. Samples were prepared for evaluation of core material, picture framing techniques, fuel plate fabrication, and subassembly fabrication employing both brazing and welding methods. (T11g, K-general; U, B)

69-T.* (French.) All-Aluminum Conductors for Electrical Equipment at Edea. J. Touze, *Revue de l'Aluminium,* no. 257, Sept. 1958, p. 881-884.

For connection of Enelcam hydroelectric plant to Alucam reduction works over a distance of 660 yd., a 10.2-kv. line has been constructed consisting of 42 cables in seven circuits. Cable conductors are pure Al 708 sq. mm. in section. (T1b, 17-57; Al-a)

70-T.* (French.) Detection and Prevention of Defects in Electric Heating Elements Used Under Unfavorable Conditions. *Revue du Nickel*, v. 24, Sept-Oct. 1958, p. 90-92.

Tests conducted in special apparatus to study wear of heating elements; influence of furnace atmosphere, heat radiation, breakages of wires, oxidation, overheating and corrosion. (T1p, R1; ST, Ni-b, *Cr*, 9-72, 9-74)

71-T. The Step Bearing—a New Concept in Air Lubrication. Clarence R. Adams. *Product Engineering*, v. 29, Dec. 8, 1958, p. 96-99.

Bearings which can be operated with air, gas, water or mercury at high or low temperatures and speeds. (T7d, 18-73)

72-T.* (French.) Modern Submarine Cables—Miracles of Precision. M. Bourdier *Cuivre, Laitions, Alliages*, no. 45, Sept-Oct. 1958, p. 3-17.

Structure and function of cables; use of Cu and Cu alloys for core and surrounding strips; operations in a wire-producing plant. (T1b; Cu-b, 17-57)

73-T.* (French.) Automobile Radiators. *Cuivre, Laitons, Alliages*, no. 45, Sept-Oct. 1958, p. 19-25.

Historical review, use of nonferrous metals, importance of extreme purity for thermal conductivity, metallurgical problems encountered. (T21c, EG-a38; 17-57)

74-T.* Some Applications of High Nickel Alloys in the Petroleum Industry. Pt. 2. G. L. Swales. *Petroleum*, v. 21, Dec. 1958, p. 439-443.

Behavior of Inconel, Incoloy, Monel, S Monel and Hastelloy C in an alkylation plant utilizing hydrofluoric acid as a catalyst. 11 ref. (T29n, 17-57, R7; Ni-b)

75-T.* Ceramic Fuel Materials for Nuclear Reactors. J. R. Johnson. Paper from "Powder Metallurgy in Nuclear Engineering" American Society for Metals, 1958, p. 193-206.

Radiation damage, engineering and fabrication of ceramics. Properties and behavior of some 20 ceramic materials. Cermet-type fuel elements include SiC-Si and Cr-Al_2O_3. 6 ref. (T11g, 17-57; NM-f40, Si, *C*, Cr, *Al*, *O*, 6-70)

76-T.* Dispersion-Type Fuel Elements. C. E. Weber and H. H. Hirsch. Paper from "Powder Metallurgy and Nuclear Engineering". American Society for Metals, 1958, p. 224-241.

Dispersion-type fuel systems offer increased endurance life in high specific-power reactors, decreasing the refueling frequency. High U concentrations can be attained and fuel-diluent metal combinations used that are unattainable by conventional alloying techniques. The major damage in the fuel system is due to fission products. By proper choice of particle size this damage can be confined to the fissile particles and a small adjacent region, leaving a continuous network of undamaged matrix metal to maintain the integrity of the element. 10 ref. (T11g, 17-57; U, 6)

77-T. Rubber and Ebonite-Lined Storage Tanks. T. H. Brooke. *Corrosion Technology*, v. 5, Dec. 1958, p. 377, 378, 397.

(T26q, L26r; ST)

78-T. Heavy-Duty Tank Linings. W. G. Martin. *Corrosion Technology*, v. 5, Dec. 1958, p. 379-380.

Constructed in acid-resisting bricks or tiles. (T26q, L27)

79-T. Aluminium and Copper Busbars in the Plating Shop. D. W. Taylor. *Electroplating and Metal Finishing*, v. 11, Nov. 1958, p. 383-387, 411.

(T1b, L17; Cu-a, Al-a, 17-57)

80-T. Metallic Constructional Materials for the Chemical and Allied Industries. S. Rowden. *Engineers' Digest*, v. 19, Nov. 1958, p. 473-476.

Applications of mild steel, Ni alloys, Al alloys, Cu alloys, Pb alloys. (T29; 17-57; CN, Cu-b, Ni-b, Al-b, Pb-b)

81-T. Production of Ball and Roller Bearings. *Machinery (London)*, v. 93, Dec. 24, 1958, p. 1448-1456.

Methods employed by the Hoffman Manufacturing Co., Ltd. (T7d)

82-T. Manganese Steel in Industry. *Mechanical World and Engineering Record*, v. 138, Dec. 1958, p. 543-544.

Applications include dipper teeth, shovel wearing posts, gear pinions,

flanges of crane and truck wheels and pulverizing hammers. (T28, T21e, 17-57; ST, *Mn*)

83-T. Aluminum Will Replace Cast Iron in Auto Engines. Darl F. Caris and Robert F. Thomson. *Modern Metals*, v. 14, Dec. 1958, p. 56, 58, 60.
(T21b, 17-57; Al-b)

84-T. Bavaria's Tin Sarcophagi. *Tin and Its Uses*, no. 44, Autumn 1958, p. 12.
(T10; Sn, 17-57)

85-T. (French.) Use of Ceramic Tools in Soviet Union. A. U. Margouless and N. G. Neuweiller. *Machine Moderne*, v. 12, Dec. 1958, p. 51-52.
Cutting tools as used in a Russian locomotive factory. Feed, cutting depth and speed for different tools. (T6n; G17; 6-70)

86-T. (French.) Aluminum Construction in Civil Engineering. Jacques Ernst. *Revue de l'Aluminium*, no. 257, Sept. 1958, p. 885-894.
Use of Al in large metallic frames. Use of extruded shapes with bulbs affords great stability and makes possible use of sections with high slenderness factor. Lattices should be extremely dense, structures hyperstatic. Combination of Al and steel advantageous in reducing sag. Economy in making high purlins by welding. 11 ref. (T26, 17-57; Al-b)

87-T. (French.) Production and Use of Large Extruded Profiles of Aluminum and Light Alloys. Pt. 2. Michel Costeraste and Pierre Bandet. *Revue de l'Aluminium*, nc. 257, Sept. 1958, p. 897-905.
Large homogeneous sections can be used without need of assembly on the job. Increased height is particularly advantageous for single section beams under flexure. In transmission of electricity increased section profiles permit greater intensity. Cost of construction reduced. (T26, 17-57; Al-b, 4-58)

88-T. (French.) Aluminum Welded Yachts. Maurice Victor. *Revue de l'Aluminium*, no. 257, Sept. 1958, p. 907-910.
(T22g; Al-b, 7-51)

89-T. (French.) A Road Bridge of Welded Aluminum. Andre Chevrier. *Revue de l'Aluminium*, no. 258, Oct. 1958, p. 1012-1017.
(T26p; Al-b, 7-51)

90-T. (Italian.) Preparation and Control of Carbon Electrodes for Use in Spectroscopy. Nidia Meng-Chierego. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 337-339, 346.
Heating to 1200° C. in stream of chlorine gas resulted in only partial purification; better results were obtained by heating 10 to 30 sec. with 250-300 amp. by means of a modified Gatterer apparatus. (T1f, S11k)

91-T.* Metal Powders in Missile and Rocket Fuels. Loring R. Frazier. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 65-70.
Application of B, Al, Zr, Mg, Ti, Be, Li powders. Powder properties affecting flammability are particle size distribution, particle shape, surface condition, availability of oxidant, dispersion, temperature. (T24e, T2p, H11; B, Al, Zr, Mg, Ti, Be, Li, RM-j, 17-57)

92-T.* Falcon Airframe Uses Die Casting, Magnesium Structure. Irwin Stambler. *Space Aeronautics*, v. 30, Dec. 1958, p. 18-19, 80, 82, 84, 86, 87.
Outside tolerances of 0.005 to 0.01 in. for Mg sheet; production problems for air-to-air missile. (T24a; Mg, 4-53, 5-61)

93-T.* (Japanese.) Materials for Slide Contacts. T. Matsumae. *Metals*, v. 28, Dec. 1958, p. 887-889.
Brass, bronze, phosphor bronze, Be-Cu, Ag-plated spring steel, Cu, C, Ag, Rh, Ag-Cu, Pd-Cu used. Ag, Ag-In, Ag-Pd clad on phosphor bronze, brass are newer materials. (T1, 17-57; Cu-b, Ag-b, 8-66)

94-T.* (Japanese.) Stainless Spring Steel for Meters. K. Matsumoto. *Metals*, v. 28, Dec. 1958, p. 883-886.
Structure, corrosion and mechanical properties of spring steels. (T7c, 17-57; SS-e)

95-T.* (Japanese.) Ferromagnetic Materials for Meters. M. Yamamoto. *Metals*, v. 28, Dec. 1958, p. 890-894.
Ni-Fe alloy is most frequently used. B and C class Permalloy used for transistor-transformers, cores of gages and Selsyns. (T1, 17-57, P16; Ni-b, Fe, SGA-n)

96-T.* (Japanese.) Free Cutting Steel for Meters. C. Asada and T. Fujiwara. *Metals*, v. 28, Dec. 1958, p. 899-902.
Machinability of steels and stainless steels. (T1, 17-57; G17k; ST, SS, 17-57)

97-T.* (Japanese.) Oil Treated Sintered Bearings for Controllers. I.Naitoh. *Metals*, v. 28, Dec. 1958, p. 903-906.

Do not become oil-stained and produce less noises, but friction coefficient is too high. Fe and Cu alloys are used. Fe alloy is sintered at 1100 to about 1200° C. and Cu-alloy at 750 to about 800° C. (T7d, H15; Cu, Fe, 17-57)

98-T.* (Japanese.) Printed Circuits. H. Nagatsu. *Metals*, v. 28, Dec. 1958, p. 912-916.

Cu foil on plastic plate; photo-etching process. (T1c; Cu, SS, 17-57)

99-T.* Materials of Construction for Head-End Processes. Aqueous Processing of Nuclear Fuels. Charles L. Peterson, Paul D. Miller, Earl L. White and Walter E. Clark. *Industrial and Engineering Chemistry*, v. 51, Jan. 1959, p. 37

Materials for the Zircex and Darex processes. Ta, Ti, Mo, Ni, the Hastelloys, Inconel, Haynes 25, Type S-816 and Illium R are promising. Ni, the Hastelloys, and Mo perform well in the alternate liquid-phase Zircex process, while unalloyed Ti serves the requisites of the Darex process. (T11g, C19n; Ta, Ti, Mo, Ni-b, 17-57, U)

100-T. Wanted: 20,000° Metals. Norman L. Baker. *Missiles and Rockets*, v. 4, Dec. 29, 1958, p. 18, 20.

Properties and missile applications of high melting oxides, graphite and Be. (T24e, SGA-h, 17-57, 2-62, Be, NMk36, 6-70)

101-T. (German.) Stresses in Cutters in Woodworking Machines. H. Flemming and L. Knospe. *Fertigungstechnik*, v. 8, no. 11, 1958, p. 525-527.

Influence of cutter shape on stresses and resulting economics of mass production in woodworking. (T6n, Q25)

102-T. (Japanese.) Materials for Microswitches. A. Naitoh. *Metals*, v. 28, Dec. 1958, p. 895-898.

(T1, 17-57)

103-T. Plastic Design of Steel Frames. Lynn S. Beedle. 406 p. 1959. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $13.

Plastic design in solving practical building frame design problems. (T26n, 17-51; ST)

104-T. (Polish.) Durability of Winding Rope in Polish Collieries. Jerzy Kowalczyk. *Hutnik*, v. 25, Sept. 1958, p. 335-346.

(T7g)

105-T. (Polish.) Sawing Needles Made of New Kind of Wire. Jozef Pechanski. *Hutnik*, v. 25, Sept. 1958, p. 351-354.

(T10; 4-61, 17-57)

106-T. (Polish.) Diamond-Metal Carbides for Tools for Cutting Optical Glass. W. Cegielski. *Prace Instytutow Ministerstwa Hutnictwa*, v. 9, no. 2, 1957, p. 71-80.

Methods, equipment and tests applied in production of saws and polishers for optical glass. Comparison of properties of imported tools and tools manufactured in Poland. 4 ref. (T6n; SGA-j)

107-T. Metallurgical Developments in Brake Drums. V. A. Crosby. *Society of Automotive Engineers*, Preprint 14S, Jan. 1959, 14 p.

Properties required of brake drum materials. Effect of carbon content and alloy additions on tensile strength at elevated temperatures on thermal conductivity and wear resistance of gray cast irons. Relation of graphite content and matrix structure to properties. 9 ref. (T21c, Q9n, Q27a; CI-n, SGA-m, 17-57)

108-T.* How Can Aluminum Best Be Used to Improve Today's Brakes. R. L. Atkin and F. J. Weber. *Society of Automotive Engineers*, Preprint 14R, Jan. 1959, 9 p.

Braking performance of high Si-Al alloy drums and Al drums with cast iron or sprayed steel liners. (T21c; Al-b, 17-57)

109-T. Information Bibliography—Materials for Use in Nuclear Reactors. B. Yates. *United Kingdom Atomic Energy Authority*, IGRL-IB/R-15, Aug. 28, 1958, 55 p.

References to 366 books, unclassified reports, and journals relating to Al, Be, B, ceramics and refractories, Cu, Mg, Mo, Ni, Cb, steel, Ta, Sn, Ti, W, V and Zr in reactor applications. (T11; Al, Be, B, Cu, Mg, Mo, Ni, Cb, ST, Ta, Sn, Ti, W, V, Zr, 17-57)

110-T.* (German.) Stainless Spring Wire and Spring Strip. Karlheinz Kayser. *Draht*, v. 9, Dec. 1958, p. 491-496.

Properties for an age hardening austenitic steel with 17% Cr and 7% Ni. Influence of heat treatment on the elasticity modulus

and elastic limit; influence of aging; properties at elevated temperature; magnetic properties. (T7c, P16, Q-general, 2-62, 2-64; SS, SGA-b, 4-61, 4-53)

111-T.* Development of Beryllium for Nuclear Reactor Applications. G. C. Ellis. *Metallurgia*, v. 58, Dec. 1958, p. 265-269.

Development of maximum properties in commercial grade Be by improved purity and fabrication control of structure and orientation; application of grain orientation control to tube fabrication processes; determination of effects of improved metal purity on single-crystal deformation characteristics. 25 ref. (T11; Be, 17-57)

112-T.* (German.) Effect of Heat on Strength Properties of Overhead Cables. G. Dassetto. *Aluminium*, v. 34, Dec. 1958, p. 716-718.

Experiments with conductors of Al, Aldrey, Cu and steel; strength tested at 180, 200, 250, 400 and 500° C. Tensile strength at these temperatures for 5 min. decreased for Al from 100 to 45.7%, for Aldrey to 56.1%, for Cu to 52.8%, for steel to 91.5%. 8 ref. (T1b, Q27a, 2-61, 2-62; Al, Al-b, Cu, ST)

113-T. Costume Jewellery. R. King. *Birmingham Metallurgical Society, Journal*, v. 38, Dec. 1958, p. 107-115.

Applications of Cu, brass, bronze, gilding metals, Sn, nickel silver and Al. Casting, fabrication and finishing techniques. (T9s, E-general, G-general, L-general; Cu-n, Sn, Ni, Al)

114-T. Aluminium Crown Closure for Bottles. *Light Metals*, v. 22, Jan. 1959, p. 9-10.

Methods of constructing bottle caps. (T10g, 17-57; Al-b)

115-T. Architectural Metal at the Brussels Fair. F. Charles Thum. *Metal Progress*, v. 75, Jan. 1959, p. 71-74.

Steel cables were widely used as main tension members from which roofs are hung, clearing the exhibit space of all supporting columns. Light and strong supporting members enabled the architect to use colored plastics effectively. Brilliant metal more than held its own in the aesthetic balance. (T26n, 17-57)

116-T. Aluminium Pressure Vessels. *Metallurgia*, v. 58, Dec. 1958, p. 295-296.

Summaries of papers presented at a symposium on pressure vessel design, manufacture and use held by the British Institution of Mechanical Engineers, Oct. 28, 1958. (T26q; Al, 17-57)

117-T. We Need Better Materials for Rockets. *Steel*, v. 144, Feb. 2, 1959, p. 96-97.

Plastics, graphites, ceramics, refractory metals suggested. (T24e, T2p; NM-k36, NM-f, NM-d31, SGA-h)

118-T. (German.) Aluminum Used in the Merlin-Nuclear Reactor. H. Croscha. *Aluminium*, v. 34, Dec. 1958, p. 714-716.

Pressure vessel inside the protective concerte block is made from Al approximately 10 mm. thick. Reactor core is suspended in an Al cage. Each heating element consists of nine plates composed of U^{235} and an Al sheath. (T11; Al, U, 17-57)

119-T. (German.) Sandwich Construction in Aircraft and Related Industries. B. R. Noton. *Aluminium*, v. 34, Dec. 1958, p. 719-727.

Behavior of sandwich panels made from various cores and the adhesives under shear stress. (T24a, K12, Q2, 7-59; Al-b, NM-d34)

120-T. (German.) Unhardened Gears. H. Rettig. *Industrieblatt*, v. 58, Dec. 1958, p. 513-519.

Tabular survey on the strength and hardness of gears from gray cast iron, nodular cast iron, cast steel, unalloyed and unhardened engineering steel and heat treated steel. (T7a, Q27a, Q29n; CI-n, CI-r)

121-T. (German.) Technical Considerations on Gear Defects. Heinz Glaubitz. *Industrieblatt*, v. 58, Dec. 1958, p. 524-528.

Effects of heat treatment. 11 ref. (T7a, J-general; ST, 9)

122-T. (German.) Reaming With Hard Metal Tools. Herman Haidt. *Industrieblatt*, v. 58, Dec. 1958, p. 557,563.

Technology, considering the mechanical properties of materials dealt with in reaming operations. (T6, G17e; 6-69)

123-T. (German-French.) Use of Aluminum in New Buildings. A. Gilliand and J. Rejhon. *Aluminium Suisse*, v. 8, Nov. 1958, p. 175-186.

Roofing, chimneys, facades, interior doors, partitions, framework, air-conditioning and heating system, parking areas and fencework. (T26n; Al-b, 17-57)

124-T. (German-French.) Freight Car With Retractable Roof. *Aluminium Suisse*, v. 8, Nov. 1958, p. 187-192.
(T23p; Al-b, 17-57)

125-T. (German-French.) Light Metal Silo Wagon for Bulk Cargo Loads. H. Zysset. *Aluminium Suisse*, v. 8, Nov. 1958, p. 192-200.
(T23p; Al-b, 17-57)

126-T. (German-French.) Modern Shelter in Swiss Alps. A. Gilliand. *Aluminium Suisse*, v. 8, Nov. 1958, p. 201-203.
(T26n; Al-b, 17-57)

127-T.* (German.) Sandwich Structures in Airplane and Other Industries. Pt. 5. B. R. Noton. *Aluminium*, v. 35, Jan. 1959, p. 36-44.
(T24a; 7-51, 17-51)

128-T. Application of Aluminium to Pressure Vessels. *Light Metals*, v. 21, Dec. 1958, p. 375-376.
Summaries of four papers presented at a symposium on Al pressure vessels held by the Institute of Mechanical Engineers, London, covering materials, codes of practice for construction, fabrication and user experience. (T26q; Al, 17-57)

129-T. Magnesium Wheels for Road Vehicles. *Light Metals*, v. 21, Dec. 1958, p. 380.
Main obstacle, apart from cost, is that heating of both the part and the tooling is at present required for forming Mg. (T21c, Mg, 17-57)

130-T. Hand-Operated Pump in Cast Aluminum. *Light Metals*, v. 21, Dec. 1958, p. 395.
New marine bilge pump gravity die cast in LM6 alloy. (T22m, Al-b, 5-61)

131-T. Aluminium Bridge Construction. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 14-16.
Design, fabrication and welding techniques, structural properties. (T26p, K-general; Al, 17-57, 17-51)

132-T. Anodized Aluminium Windings. *Metal Industry*, v. 94, Jan. 16, 1959, p. 48.
Building-up of an oxide film to enable Al foil or strip to be used as a conductor "sheathed" with its own insulation. (T1g, T1m, L19; Al-b, 4-53, 4-56)

133-T. A Guide to Nuclear Power. W. D. Biggs. *Welding Engineer*, v. 44, Feb. 1959, p. 34-36.
(T11; SS, Al-b, Ti-b, Zr-b, 17-57)

134-T. (English.) Design Against Excessive Deformation. W. P. Kerkhof. *Lastechniek*, v. 25, Jan. 1959, p. 1-7.
Design of pressure vessels. (T26q, 17-51)

135-T. (French.) Service Behavior and Economic Efficiency of Ceramic Cutting Tools. Walther Dawihl and Emil Klingler. *Machine Moderne*, v. 53, Jan. 1959, p. 41-46.
25 ref. (T6n; 6-70)

136-T. (French and German.) Uses of Nonferrous Metals in the Decoration of Buildings. P. Suter. *Pro-Metal*, v. 11, Dec. 1958, p. 74-80.
(T26n, 17-57; EG-a38)

137-T. (Italian.) Applications of Aluminum at the Brussels Fair. *Alluminio*, v. 27, Oct. 1958, p. 442-448.
(T-general, T26n, 17-57; Al)

138-T. (Slovenian.) Mechanized Transportation of Tailings. Samo Cermelj. *Rudarsko-Metalurski Zbornik*, no. 3, 1958, p. 311-316.
(T28q, W12)

139-T.* (French.) Uranium Alloys of Low or Medium Alloying Element Content. M. Englander. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1177-1187.
Alloys offering higher resistance to thermal and nuclear fatigue than pure U when used as nuclear fuel. Medium content alloys developed a single isotropic crystalline phase and low content alloys develop through solid state transformation an anisotropic matrix strengthened either by a fine homogeneous precipitate or by a eutectoidal decomposition. (T11g, Q7h; U-b)

140-T.* (French.) Welded Hollow Bodies for High Pressures and Temperatures. Design and Calculation. F. Maier. *Soudage et Techniques Connexes*, v. 12, Nov-Dec. 1958, p. 404-412.
Stresses in hollow cylindrical bodies under internal pressure. Designs of pressure vessels; tensile strength of notched cylindrical specimens of steel. 12 ref. (T26q, K-general, 17-51)

141-T.* (German.) Light Metal Piston With Ferrous Ring Carrier Inserts. W. Kohler. *Metall*, v. 13, Jan. 1959, p. 36-41.

Review of various applications both by mechanical means and by bonding, description of designs, materials selected for piston and carrier, results expressed in reduced piston wear. Evaluation of technical advantages and economic aspects. 4 ref. (T7, Q9; Al-b, 17-51, 17-57)

142-T. Need Low-Cobalt Stainless for Nuclear Applications. W. L. Fleischmann. Iron Age, v. 183, Feb. 12, 1959, p. 106-107. (T11, 17-57; SS, *Co*)

143-T. Reactor Element Processing Goes Automatic. *Metalworking Production*, v. 103, Jan. 30, 1959, p. 199-203.

At the UKAEA's Springfields (Preston) plant, recently greatly enlarged and re-equipped to produce canned U reactor fuel elements, high output and minimum handling requirements have led to installation of new semi-automatic transfer lines for machining and fabrication. (T11g, A5a, 18-74; U)

144-T. (French.) Design of Pressure Vessels. *Soudage et Techniques Connexes*, v. 12, Nov-Dec. 1958, p. 461-462. (T26q, 17-51)

145-T.* Better Aircraft Engines. W. Paul Eddy. Digest from "The Aircraft Engine—Proving Ground for New Materials". 16th Annual William Park Woodside Lecture Presented before the Detroit Chapter A.S.M., Oct. 13, 1958. *Metal Progress*, v. 75, Feb. 1959, p. 124, 126, 128, 130.

High temperatures involved impose rigid demands on materials of construction. Relative advantages and properties for low-alloy steels, Ni and Co-base alloys, and dispersion hardened Al and Ti. (T24b; Ni-b, Co-b, Al, Ti, 17-57, 2-62)

146-T.* Aluminum and Its Alloys. W. A. Gardner and D. H. G. Abel. *Nuclear Energy Engineer*, Jan. 1959, p. 45-49.

Properties of Al alloys, such as neutron absorption cross section, weight, thermal and electrical conductivity, corrosion resistance and ease of fabrication make them highly desirable as reactor construction materials. (T11; Al-b, 17-57)

147-T.* A Guide to Nuclear Power. Pt. 2, Nuclear Reactors. W. D. Biggs. *Welding Engineer*, v. 44, Jan. 1959, p. 31-34.

Main types of heterogeneous reactors include water moderated and cooled reactors, graphite-moderated gas-cooled reactors, graphite-moderated, liquid-metal cooled reactors. Materials currently available for sheaths, cans and fuels. (T11; 17-57)

148-T. Stainless Steel in Automobiles. Digest from "Paper presented at A.I.M.E. Electric Furnace Conference", Dec. 1958. *Metal Progress*, v. 75, Feb. 1959, p. 132-134, 136, 138.

Cr coating techniques; applications of stainless in engine exhaust valves, trim and fittings. (T21, 17-57, L17; SS, *Cr*)

149-T. Automatic Manufacture of Bearings: Timken Roller Bearing's Bucyrus Plant. *Metallurgia*, v. 59, Jan. 1959, p. 13-16.

(T7d; W-general)

150-T.* Reactor Fuel Elements. James F. Schumar. *Scientific American*, v. 200, Feb. 1959, p. 37-43.

Design of fuel element, composition of fuel, life of fuel. (T11g, 2-60, 2-67; U, Al, Pu, Th, Zr, 17-51)

151-T. Metallurgy and Fuels. Fissile and Fertile Materials. *Engineering*, v. 187, Jan. 23, 1959, p. 106-109.

Report on the 1958 Geneva Atomic Energy Conference. (T11g; U, Pu, Th)

152-T. Metallurgy and Fuels. Canning Materials. L. M. Wyatt. *Engineering*, v. 187, Jan. 30, 1959, p. 136-141.

Report on the 1958 Geneva Atomic Energy Conference. 45 ref. (T11; Al, Mg, ST, Be, 17-57)

153-T. Has Chromium Plating Deteriorated? R. Silman. *Product Finishing*, v. 12, Feb. 1959, p. 65-72.

Quality and service life of today's auto trim compared to that of before 1940. (T21a; *Cr, Ni*, 8-62, 17-57)

154-T. What's New in Brake Linings. Newell H. McCuen. *Society of Automotive Engineers*, Preprint no. 14T, Jan. 1959, 8 p.

Sintered metallic linings are composed of powdered Fe or Cu, graphite, inorganic fillers and friction modifier. (T21c, 17-57; Cu, Fe, 6-68)

155-T.* (French.) Solid Nuclear Elements Used as Reactor Fuels. Jean A. Ternisien. *Metaux Corrosion-Industries*, v. 33, Nov. 1958, p. 441-456.

Properties of nuclear metals, alloys, metalloids and cermets suitable for this application. (T11g, 2-67; 6-70, Th, U, Pu, Ni-b)

156-T.* (German.) Behavior of Metal Electrodes in a Vacuum. R. Balzer. *Schweiz. Technische Zeitschrift.*, v. 55, Dec. 11, 1958, p. 976-977.

Properties of Ni, Cu, Ta, Mo, W, Pt and graphite electrodes, such as stability of shape at high temperatures, vapor pressure, separation of gases, electron emission. (T1f, Q-general, P-general, 2-62, 1-73; Ni, Cu, Ta, Mo, W, Pt, NM-k36)

157-T.* (Rumanian.) Heat Resistant Alloys in the Construction of Aircraft Turbines. P. Popescu and C. Mincu. *Revista Transporitulor*, v. 5, Nov. 1958, p. 513-520.

(T24b, 2-62; 17-57, SGA-h)

158-T. Nuclear Power Through Metallurgy on France. *Journal of Metals*, v. 11, Feb. 1959, p. 106-111.

Role of uranium, thorium, plutonium, aluminum-plutonium alloys and cermets in French reactor technology. (T11g; 17-57, U, Pu-a, Pu-b, Al, 6-70)

159-T. Electroplated Magnesium for Electronics Applications. *Magnesium*, Feb. 1959, p. 2-3.

(T1, 17-57; Mg, 8-62)

160-T.* Titanium Carbides Wear Better. E. J. Egan, Jr. *Iron Age*, v. 183, Mar. 19, 1959, p. 101.

Lab and shop tests of new Ti carbide cutting tools, developed by Ford Motor Co. (T6n; 6-69, Ti)

161-T.* Fuel Containers for Rockets. Donald E. Nulk. *Metal Progress*, v. 75, Mar. 1959, p. 66-72.

Weight restrictions, high pressures and wide operating temperature ranges must be considered in producing missile fuel vessels. Material choice is limited and optimum joining methods are still to be developed. Careful testing is needed to determine the quality of both factors. (T2p)

162-T.* Metals Used in the Vanguard. Charles Hirst. *Metal Progress*, v. 75, Mar. 1959, p. 73-76.

Stainless steel, Al and Mg alloys and Ti are employed in various areas of the vehicle. Future missiles will benefit from the evaluation of materials for this application. (T24e, 17-57; SS, Al, Mg, Ti)

163-T.* Hot Work Toolsteel for Aircraft. P. E. Ruff. *Metal Progress*, v. 75, Mar. 1959, p. 103-107.

Used for many years in special dies, the 5% Cr toolsteels (H-11) are being accepted as a structural material in supersonic aircraft and missiles. Heat treatable to 280,000 to 300,000 psi. tensile strength, the steel resists softening up to 925° F. Impact and fatigue strengths are also adequate. (To be continued.) (T24, 17-57, Q-general; TS, *Cr*)

164-T.* Designed to Fly High. Tom Bishop. *Metal Progress*, v. 75, Mar. 1959, p. 108-111.

New Comets use metal of higher endurance and slow crack propagation and the design is based on thousands of fatigue tests on material, joints, members, subassemblies and completed structure. (T24, Q7; Al-b)

165-T. (Translation—BISI no. 1059.) Carbide Tools for Shaping and Cutting. J. Witthof. *Draht*, Nov. 1957, p. 465-470.

See item 134-T, 1958. (T6n, Q-general, G17; W, Co, 6-69)

166-T.* How to Increase High Temperature Reliability of A-286 Fasteners. Robert L. Sproat. *Steel*, v. 144, Mar. 16, 1959, p. 114-117.

Six design and fabrication techniques greatly extend life. (T7f; SS, 17-57)

167-T.* Special Steels for Nuclear Power. J. A. Stafford. *Iron & Steel*, v. 32, Mar. 1959, p. 106.

Effect of neutron irradiation on notch ductility and creep. (T11, Q23p, Q3, 2-67; ST, 17-57)

168-T.* (French.) Use of Nickel Alloys in Aircraft Construction. P. Egre. *Revue du Nickel*, v. 24, Nov-Dec. 1958, p. 116-124.

Compositions, mechanical properties, heat treatment and specific applications in French and American aircraft components of high-strength alloy steels and stainless steels. (To be continued.) 13 ref. (T24; AY, SS, 17-57)

169-T. Use of Stainless Steel in the Oil Industry. *Iron and Steel*, v. 32, Feb. 1959, p. 75-76.

Compositions of some 12 standard wrought stainless steels correlated with specific applications in oil refining and distillation. (T28; SS, 17-57)

170-T. Progress of Aluminum as a Building Material. E. H. Laithwaite. *Metallurgia*, v. 59, Feb. 1959, p. 74-78.

Application to curtain walling, domestic construction, flashings and weatherings. (T26n; Al-b, 17-57)

171-T. New Look on Bridges. *Precision Metal Molding*, v. 17, Mar. 1959, p. 40-42.

Application of Al castings and tubing in bridge railings. (T26p; 4-60, 5-60, Al-b, 17-57)

172-T. Plutonium System Study With an Application to the MTR. W. B. Lewis and G. D. Marshall. Phillips Petroleum Co., Atomic Energy Div. *U. S. Atomic Energy Commission, IDO-16455*, Nov. 20, 1958, 27 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Effects of concentrations of Pu^{239}, Pu^{240} and Pu^{241} on Pu fuel mixtures. (T11g; Pu, 17-57)

173-T.* Workpiece Compatibility of Ceramic Cutting Tools. M. C. Shaw and P. A. Smith. Paper from "Lubrication Science and Technology". v. 1, no. 2. Pergamon Press, Inc., New York, 1958, p. 336-344.

Performance characteristics, cutting force and chip formation, of ceramic and cemented carbide tools and various speeds are compared when machining wide variety of ferrous and nonferrous metals. 5 ref. (T6n, G17; 6-69, NM-f)

174-T.* These Chips Were Produced by High Speed Steel. John F. McAuliffe. *Carbide Engineering*, Mar. 1959, p. 11-14.

High-speed steel is suitable for taps, form tools, milling cutters, hobs, broaches, thread dies, cut-off tools and reamers. (T6n, 17-57; TS-m)

175-T.* High Strength-to-Weight Magnesium Sheet Alloy Meets Ramjet Needs. C. P. King. *Western Metalworking*, v. 17, Mar. 1959, p. 55-56.

Mechanical properties, corrosion, welding, forging and forming of the new Mg sheet alloy HM21A-T8. (T24b, A-general; Mg-b, 4-53, 17-57)

176-T.* Problems in Rocket Engine Materials. Donald E. Rhoda. *Western Metalworking*, v. 17, Mar. 1959, p. 58-59.

Mechanical and corrosion properties of steel, stainless steel and Al alloys. (T2p, Q-general, R-general; ST, SS, Al-b, 17-57)

177-T.* (German.) Welded Hollow Bodies for High Pressures and Temperatures. Design and Calculation. F. Maier. *Soudage et Techniques Connexes*, v. 12, Nov-Dec. 1958, p. 404-412.

12 ref. (T26q, K-general, 17-51)

178-T. What Makes a Good Asphalt Pipe Enamel? Lloyd Bramble. *Petroleum Engineer*, v. 31, Mar. 1959, p. D34-D35. (T26r; NM-g)

179-T.* Airite Products Fabricates Titanium Pressure Vessels for the Atlas Missile. *Crucible Titanium Review*, v. 7, Mar. 1959, p. 1-3.

Deep drawing, machining, welding and heat treatment of Ti alloy. (T26q, 17-57, G-general; Ti)

180-T. Applications of Ductile Cast Iron in the Field of Pipelines. Maurice C. M. Grandpierre. *British Foundryman*, v. 52, Feb. 1959, p. 61-65. (T26r, 17-57; CI-r)

181-T.* Alloys for the Aircraft Industry. F. R. Morral. *Cobalt*, no. 2, Mar. 1959, p. 23-36.

Review of the industry's requirements together with corresponding data on Co-containing alloys of particular interest. 13 ref. (T24, Q-general, 2-62; Co-b, 17-57)

182-T.* Steels for Use in Steam Power Plant Operating Above 950° F.: Creep, Stress-Relaxation and Metallurgical Properties. *British Electrical and Allied Industries Research Assoc., Technical Report J/T170*, 1957, p. 7-15.

High-temperature properties of three steels intended for turbine casing bolts, and other, smaller bolts in steam power plant. The steels consist of an oil quenched and tempered $\frac{1}{2}$% Mo, $\frac{1}{4}$ %V steel, a 1% Cr, $\frac{1}{4}$% Mo, $\frac{3}{4}$% V steel in a tempered condition following either oil quenching or water quenching, and an oil quenched and tempered 1% Cr, $\frac{1}{2}$% Mo steel. (T7f, W11g, Q-general, 2-62; AY, *Mo, V, Cr*, 17-57)

183-T. Structural Materials. G. Matz. *Organisation for European Economic Co-Operation, Information Conference on Nuclear Energy for Management*, June 1957, p. 195-199.

Al, Be, Mg and Zr as nuclear reactor core materials. (T11; Al, Be, Mg, Zr, 17-57)

184-T. (French.) Steel Framework of the French Pavilion at the Brussels Exposition. J. Corpelet. *Soudage et Techniques Connexes*, v. 13, Jan-Feb. 1958, p. 61-67. (T26n, 7-51; ST)

185-T.* Fuel for the Atomic Engine. B. Lustman. *Metal Progress*, v. 75, Apr. 1959, p. 72-78.

The fuel in the Shippingport atomic power plant consists of long metallic elements of highly enriched U, arranged in a hollow square which encloses and is surrounded by a "blanket" of natural uranium oxide. The reactive metal is U highly enriched in the fissionable isotope U^{235} alloyed with 99.3% by weight of Zr, and bonded by hot rolling to Zircaloy-2 by the well known "picture-frame" method. (T11g, 17-57, R4; U)

186-T.* (German.) Core Meterials for Magnetic Amplifiers. *VDI Zeitschrift*, v. 101, Mar. 21, 1959, p. 341-342.

The magnetic properties of cold rolled 50% ferronickel sheet are improved by a special heat treatment. The magnetic properties along preferred directions must be taken into account in core design. (T1g, P16, 2-64; Fe-b, *Ni*)

187-T. How Lightweight Materials Will Be Used in the Convair 880 Jet. T. L. Heid. *Materials in Design Engineering*, v. 49, Apr. 1959, p. 100-104.

Use of Al alloys and Al honeycomb in the airframe. (T24a; Al-b, 7-59, 17-57)

188-T. Aluminum Winning Out in Wheel-Drum Drive. R. L. Atkin and F. J. Weber. *Modern Metals*, v. 15, Mar. 1959, p. 50-54.

Performance of high-silicon Al alloy drums and Al drums with sprayed steel liner shrunk-fit or metallurgical bonded cast iron liner. (T21c, K13r, K5k; Al-b, *Si*)

189-T. Titanium Vs. Stainless in Chemical Processing Equipment. R. W. Wirta. *Modern Metals*, v. 15, Mar. 1959, p. 78-82.

(T29; Ti-b, SS, 17-57)

190-T. Magnesium in Airborne Photo Gear. M. J. Mraz and C. Ellman. *Modern Metals*, v. 15, Mar. 1959, p. 86-88.

(T9p; Mg, 5-60, 17-57)

191-T.* Reactor Materials Pace Nuclear Progress. R. F. Dickerson. *Battelle Technical Review*, v. 8, Apr. 1959, p. 3-6.

U, Al-U alloys, uranium oxide in stainless steel, and Zr. (T11; U, Al, SS, Zr, 17-57)

192-T.* (Russian.) Use of Cermets for Pressure Vessels. Yu. N. Ryabinin. *Fizika Metallov i Metallovedenie*, v. 6, no. 5, 1958, p. 893-899.

Use of cobalt-tungsten carbide cermets in manufacture of pressure vessels. Correlations between hardness and pressure strength; pressure strength, Young's modulus, thermal expansion and conductivity as functions of the Co content. Effect of temperature on hardness and on Young's modulus. (T26q, Q-general, 2-60, 2-61; W, Co, 6-69, 6-70, 17-57)

193-T.* Neutron Bombardment of Reactor Metals. *Australasian Manufacturer*, v. 43, Mar. 7, 1959, p. 80-85.

Effect of radiation on uranium and boron. (T11, 2-67; B, ST, U, 17-57)

194-T.* Steels for Nuclear Reactors. C. V. Mills. *Iron & Steel*, v. 32, Apr. 1959, p. 149-153.

Boron steels, low-cobalt steels, low-manganese steels, pressure vessel steels. (T11, T26q; ST, *B*, 17-57)

195-T. More Sinterings in '59 Cars. *Precision Metal Molding*, v. 17, Apr. 1959, p. 34-35, 106.

(T21c, 6-72, 17-57)

196-T. (German.) Fuel Metals and Construction Metals for Nuclear Reactors. H. O. Nicolaus. *Werkstoffe und Korrosion*, v. 10, Mar. 1959, p. 152-158.

Materials used in construction of nuclear reactors, such as carbon steel, Ti alloys, Cr-Fe alloys, stainless steel, Ni and its alloys. 27 ref. (T11, 17-57; CN, Cr-b, *Fe*, Ti-b, SS, Ni-a, Ni-b)

197-T.* What Materials Beat High Nuclear Heat. *Chemical Engineering*, v. 66, Apr. 20, 1959, p. 202, 204, 206.

Advantages and disadvantages of metals capable of operating at over 1470° F. (T11, 2-62; SGA-h)

198-T.* Big Obstacles Beset Aluminum Food Cans. L. P. Gotsch, E. F. Bike and K. W. Brighton. *Modern Metals*, v. 15, Apr. 1959, p. 60, 64, 66, 68.

Manufacture of containers, strength, corrosion resistance, effect on color and flavor. (T10g, R7n; Al, 17-57)

199-T.* NASA Research Bearing on Jet Engine Reliability. S. S. Manson, G. M. Ault and B. Pinkel. *Society of Automotive Engineers*, Preprint no. 49 T, 1959, 34 p.

Prediction of service performance; principal failure mechanisms under design, creep, stress-rupture, mechanical fatigue, thermal fatigue, stress-corrosion and

foreign object damage. Inspection and maintenance. 23 ref. (T24b, Q3m, Q7k; SGB-s, 17-57)

200-T.* (French.) Cupro-Aluminums and Their Applications in Naval Construction. Pierre Weill-Couly. *Fonderie,* Feb. 1959, p. 63-74.

Properties of binary and complex cupro-aluminums. Selection of alloy for specific parts of vessels in terms of service requirements. (T22, Q-general; Cu-b, *Al*)

201-T.* (French.) High-Uranium Alloys. G. Cabane. *Metaux Corrosion-Industries,* v. 34, Feb. 1959, p. 49-57.

U-Mo alloys with varying Mo content and U-Cb-Zr systems in relation to reactor applications at elevated temperatures. (T11g, 2-62; U-b, *Mo, Cb, Zr*)

202-T. (French.) Aluminum Radiator Grills. Charles Guinard. *Revue de l'Aluminium,* v. 36, Feb. 1959, p. 213-217.

Renault and Simca adopt light-alloy grills. Finishing procedures. (T21c; L-general; Al-b)

203-T.* (English.) NRU—Some of Its Special Testing Problems. A. J. Mooradian. *Metalen,* v. 14, Apr. 1959, p. 98-102.

Tests of nuclear reactor fuel units for leakage between the Al sheath and the uranium core and for displacements of the core within the sheath. (T11g, 1-54; U, Al)

204-T.* Metals for the Atomic Boiler. B. Lustman. *Metal Progress,* v. 75, May 1959, p. 97-102.

Water at 530° F. and 200 psi. is highly corrosive, even when alkalinized and carrying hydrogen in solution. The Shippingport reactor vessel is lined with Type-304 stainless steel, and all piping and heat exchanger tubing are made of the same alloy. (T11, 17-57; SS, Zr-b)

205-T.* Iron Castings in the Chemical Industry. G. A. J. Begg. *British Foundryman,* v. 52, Apr. 1959, p. 183-193.

Strength soundness, corrosion resistance and heat resistance necessary for use in chemical industry. (T29; CI)

206-T.* Low-Carbon Mn-Cr-Mo-V Steel for Pressure Vessels. I. M. Mackenzie. *Chemical & Process Engineering,* v. 40, Apr. 1959, p. 132-136. (From *Alloy Metals Review.*)

As the size of welded pressure vessels increases, the use of mild steel plates becomes less satisfactory and material of higher strength becomes essential. The only satisfactory solution is to introduce alloying elements while maintaining the carbon content at a relatively low level. (T26q, Q-general, K9s; AY, Cr, Mn, Mo, V, 17-57)

207-T.* Rotor Forgings for Power Equipment Manufacturers. T. G. Foulkes. Paper from "Symposium on Brittle Failure of Rotor Forgings". American Society for Testing Materials, STP no. 231, 1958, p. 10-11.

Melting and casting of steel; ingot forging; heat treatment; machining and inspection. (T7h; ST, 4-51)

208-T.* Requirements for Turbine and Generator Rotor Forgings. A. W. Rankin. Paper from "Symposium on Brittle Failure of Rotor Forgings" American Society for Testing Materials, STP no. 231, 1958, p. 16-27.

Temperature, pressure and stress additions encountered in operation of steam turbines. (T7h, 17-52; ST, 4-51)

209-T. (Italian.) Copper-Lead Alloys in Journal Bearings. Vittorio Rizzardini. *Macchine,* v. 14, Apr. 1959, p. 319-322.

Properties and service behavior. (T7d; Cu-b, *Pb*)

210-T. (English.) Stainless Steel and the French Dairy Industry. *Aciers Fins & Speciaux,* no. 31, Mar. 1959, p. 46-49. (T3s; SS)

211-T.* Wear and Life of Single-Point Carbide Tools. H. W. Babel and F. W. Boulger. Paper from "An Evaluation of the Present Understanding of Metal Cutting". American Society of Tool Engineers, Detroit, 1959, p. 89-134.

Types of failure encountered with carbide cutting tools: Flank wear; crater wear; combination of crater and flank wear; spalling or crumbling of the cutting edge; fracturing or major chipping of the cutting edge. 53 ref. (T6n, Q9n)

212-T. Sodium and Bismuth Liquid Metal Fuel Systems. Richard C. Vogel and Walton A. Rodger. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5933, Nov. 1958, 54 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.

Criteria for the selection of liquid metal fuel carriers for U and Pu fuels. Corrosion behavior of each fuel carrier is

summarized together with data on the fabricability of components from possible materials of construction. 142 ref. (T11g, R-general; U, Pu, 14-60, Na, Bi)

213-T. (Japanese.) Metals for Space Applications. *Metals*, v. 29, Jan. 1959, p. 1-7.

Properties needed correlated with currently available materials. (T24e, T24f, 17-57)

214-T.* (French.) Liquid Metal Slurry Fuels and Breeder Blankets. B. R. T. Frost. *Revue de Metallurgie*, v. 56, Mar. 1959, p. 272-278.

Specifications for fuel and blanket compositions and possible solid-liquid combinations. Experiments on the circulation of "soluble" slurries through temperature gradients. Soluble slurries are not found appropriate for these applications and suitable insoluble slurries are being developed. 14 ref. (T11g)

215-T.* Testing in the Hot Rod Engine. R. C. Downey. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 174-185.

Design and manufacture of Mo alloy turbine buckets. Engine tests at 200° F. (T24b, F22, 2-62, 17-51; Mo-b)

216-T.* Fabrication of Electronic Tube Components. R. W. Yancey. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 205-213.

Forging, rolling, extrusion, drawing, wire drawing, cladding, spinning, annealing and joining techniques used in the manufacture of tube components. (T1j, F22, F24, F28, G-general; Mo)

217-T. Development of Silicon-Modified 48 Wt.% U-Al Alloys for Aluminum Plate-Type Fuel Elements. W. C. Thurber and R. J. Beaver. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission*, ORNL-2602, Mar. 23, 1959, 52 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

Casting procedures, mechanical working characteristics, composite fuel plate fabrication and fuel element assembly methods; resultant mechanical properties. (T11g, E-general, Q-general; U-b, *Al*, Si)

218-T. Ceramic Tooling: Progress, Problems and Predictions. W. B. Kennedy. *Metalworking*, v. 15, June 1959, p. 6-7.

(T6n, G17; 6-70)

219-T. Missile Structures and Powerplants. John M. Siergiej. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 215-216.

(T24b, T24e, 17-57; Mo)

220-T. Molybdenum Requirements in the Petrochemical Industry. Eugene H. Edwards. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, p. 217-219.

(T29m, T29n, 17-57; Mo)

221-T. Molybdenum Requirements in the Nuclear Energy Field. C. C. Woolsey. Paper from "Fabrication of Molybdenum". American Society for Metals, Cleveland, 1959, p. 220-221.

(T11, 17-57; Mo)

222-T. (German.) Cast Iron Equipment for Chemical Plants. Peter von der Forst. *Werkstoffe und Korrosion*, v. 10, Apr. 1959, p. 213-218.

Composition and properties of various types of cast iron used in chemical equipment with special reference to laminar and nodular cast irons, enamelled gray cast iron, low and high alloyed cast irons. (T29; CI, 17-57)

223-T.* (Czech.) Forged Rotors of Vanadium-Steel for Turbo-Generators. Jiri Novak. *Hutnicke Listy*, v. 14, May 1959, p. 436-442.

A Ni-V openhearth steel (2.0% Ni, 0.20% V) used in Czechoslovakia is compared with foreign steels with regard to mechanical properties and structure. With vanadium additions a favorable ratio ductility/strength can be achieved. 18 ref. (T7h, Q-general, F22g; AY, *Ni, V*)

224-T. Welding and the Nuclear Power Programme. Leonard Owen. *British Welding Journal*, v. 6, May 1959, p. 197-204.

(T11, K-general)

225-T. Engineers Discuss Space Flight. *Metal Progress*, v. 75, June 1959, p. 113-116.

Rocket research as reviewed at meeting of American Society of Mechanical Engineers. (T24e, T24f)

226-T.* Ceramic-Coated Copper Wire. Burnham W. King, George D. Kelly, Winston H. Duckworth and Jack H. Terry. *American Ceramic Society Bulletin*, v. 38, May 1959, p. 251-255.

Development of a ceramic coating for Cu wire. Decreasing the diameter of the mandrel to 0.1 in. decreased the dielectric

strength to 180 v. When the coated wire was wound hot (near upper enameling temperatures of the coating) no decrease in dielectric strength was observed. 7 ref. (T1b, L27; Cu, NM-34g)

227-T. (Book.) Symposium on Brittle Failure of Rotor Forgings. 43 p. 1958. American Society for Testing Materials, STP no. 231, 1916 Race St., Philadelphia 3, Pa. $2.

Requirements for turbine and generator rotor forgings. Ultrasonic and other inspection techniques; brittle fracture. Papers abstracted separately. (T7h, S13, Q27s; ST, 4-51)

228-T. Use of Lead in Chemical and Metallurgical Plant Construction. A. Turner, J. R. Wellington and L. Williams. *Canadian Journal of Chemical Engineering*, Apr. 1959, p. 55-64.

17 ref. (T29, R-general; Pb, 17-57)

229-T. Ceramics for Supersonic Missiles. James Castelfranco. *Ceramics*, v. 10, May 1959, p. 13-18, 20.

To provide resistance to severe thermal shock, sustain elevated temperatures and induce stress by differential thermal expansion. (T24e; 17-57, NM-f)

230-T. Stainless for Condenser Tubing. *Iron Age*, v. 183, June 11, 1959, p. 144.

Heat transfer rates for light-wall stainless ranged from 91.6 to 96.1% of admiralty. (T1j, P11k; SS)

231-T. Controlled Contact Cutting Tools. B. T. Chao and K. J. Trigger. *Journal of Engineering for Industry*, v. 81, May 1959, p. 139-151.

Substantial reduction in power consumption, increase in tool life, more effective ultilization of cutting fluids and improved surface finish on machined workpiece. 6 ref. (T6n, G17)

232-T. (Russian.) Cast Iron Automobile Crankshafts. A. A. Dudnik and G. A. Ukhabin. *Liteinoe Proizvodstvo*, May 1959, p. 8-12.

Hollow automobile crankshaft of Mg cast iron successfully replaced crankshafts forged from low-carbon steel. (T7j, E-general; CI-q, *Mg*)

233-T.* (French.) Application of Nickel Alloys in Aircraft Construction. Pt. 3. P. Egre. *Revue du Nickel*, no. 2, Mar-Apr. 1959, p. 35-41.

Mechanical properties and applications of Inconel, Monel and Monel K. (T24, Q-general; Ni-b, 17-57)

234-T.* Nuclear Power Plant Materials. Arthur P. Beard. Paper from "Vaccum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 350-359.

Vacuum techniques in the preparation, purification, and fabrication of Zr, U, Hf, Be, V and Th. Behavior of various amounts of hydrogen in these metals. 30 ref. (T11; Zr, U, Hf, Be, V, Th, 17-57)

235-T.* Electronic Materials. C. W. Horsting. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 360-369.

Applications of vacuum techniques include processing of metals at high temperatures in a vacuum to drive out adsorbed and dissolved gases; vacuum annealing processes designed to remove metalworking stresses without oxidation or other gas-metal reactions; jointing of metals-to-metals and of metals-to-ceramics by vacuum brazing; vacuum evaporation of metals to create a metallic deposit; preparation of alloys by melting in a vacuum. 4 ref. (T1, C5, K8, J23, 1-73)

236-T. Advances in Nuclear Fuel Elements. J. J. Burke. *Journal of Metals*, v. 11, May 1959, p. 323-324.

(T11g; U-b)

237-T.* (German.) Crankshafts from S. G. Cast Iron. Horst Muhlberger. *VDI Zeitschrift*, v. 101, June 1959, p. 713-718.

Mechanical properties and costs. The elongation is influenced by the phosphorus content. Structural improvements are achieved by reduced wall thicknesses and heat treatments. 23 ref. (T21c, Q-general, 2-60, 3-74; CI-r, *P*)

238-T.* Fuel Elements. *Power Reactor Technology*, v. 2, June 1959, p. 40-50.

Irradiation history, thermal stress, fuel loss and impact strength of uranium-magnesium and graphite-uranium fuel elements. 13 ref. (T11g; U-b)

239-T. (German.) Applications for S.G.-Cast Iron. *VDI Zeitschrift*, v. 101, June 1959, p. 707-708.

(T26r, W24n; CI-r, 17-57)

240-T. (Swedish.) Use of Hard Metals. Chr. Kjaergaard Nissen. *Industriell Teknik*, v. 87, Jan. 21, 1959, p. 33-38; Feb. 4, 1959, p. 57-60.

Use and properties of hard metal cutting tools. (T6n; EG-d, 17-57)

241-T.* Metal Powders for Missile Fuels. L. R. Frazier. Digest of "Metal Powders in Missile and Rocket Fuels". Paper presented at Indiana ASM Chapters 11th Annual Symposium, Purdue University, Apr. 1959. *Metal Progress*, v. 76, July 1959, p. 134, 136, 138, 140.

Requirements of metals for missile and rocket fuels include high energy, light weight, physical control, physical stability, chemical stability, abundance, generation of gas and minimum residue. Data for a number of metals. (T11g, P-general, 17-57; 6)

242-T.* Silver-Indium-Cadmium Alloys for PWR Control Rods. I. Cohen, E. F. Losco and J. D. Eichenberg. Digest of "Metallurgical Design and Properties of Silver-Indium-Cadmium Alloys for PWR Control Rods" Paper presented at Third Nuclear Engineering and Science Conference, Chicago, Mar. 1958, 27 p. *Metal Progress*, v. 76, July 1959, p. 140, 142.

Indium was found to be particularly effective in imparting prolonged corrosion resistance in high-temperature water. The concentration of In required for adequate neutron absorption was too high to insure metallurgical and radiation stability. Replacement of some In with Cd gave a single-phase f.c.c. alloy (15% In, 5% Cd) which met all requirements for PWR control rods. (T11j, R-general, P18; Ag-b, In, Cd)

243-T. (Book.) Materials for Nuclear Reactors. Bernard Kopelman, ed. 411 p. 1959, McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. $12.00

Advantages and limitations of materials as fuel elements, moderators, coolants, shields and structure formers. Fabrication, testing and evaluation of fuel elements; the stability or instability of the fuel to irradiation; and the chemical processing of the spent fuel to recover the unburned portion. (T11)

244-T. (Book.) Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, v. 8, Nuclear Power Plants, Pt. 1. Geneva, Sept. 1-13. 1958, 584 p. United Nations, Geneva. $14.00

Relevant papers abstracted separately. (T11, W11p)

245-T.* Titanium in Aircraft Power Plants. W. H. Sharp. *Crucible Titanium Review*, v. 7, June 1959, p. 1-4.

Use of commercially pure Ti, 2.8 Cr, 1.5 Fe alloy, 2 Cr, 2 Fe, 2 Mo alloy, 4 Al, 4 Mn alloy, 6 Al, 4 V alloy and 5 Al, 2.5 Sn alloy for compresser parts. (T24b; Ti, 17-57)

246-T. Reactor at Shippingport Uses Stainless Steel to Resist Corrosion, High Temperatures and Pressures. *Inco*, v. 27, Apr. 1959, p. 10-11.

(T11; SS, 17-57)

247-T. 24-Foot Diameter Propellers to Drive Largest Tankers Ever Built in U. S. A. *Inco*, v. 27, Apr. 1959, p. 22-23.

Ni-Al bronze propeller. (T22h; Cu-s, *Ni, Al*)

248-T. Argonne Opens Plutonium Facility. *Journal of Metals*, v. 11, July 1959, p. 456-457.

Equipment and layout at the new fuel fabrication facility. (T11g, A9h; Pu)

249-T. (French.) Special Steels Used in Reactor Construction. J. A. Stafford. *Revue de la Soudure Lastijdschrift*, v. 15, no. 2, 1959, p. 110-113.

(T11; ST, 17-57)

250-T.* An Improved Tianium Alloy for Chemical Plant. *Platinum Metals Review*, v. 3, July 1959, p. 88-89.

Effects of Pt and Pd additions on corrosion rate. (T29m, R-general, 2-60; Ti-b, *Pt, Pd*)

251-T.* The Use of Cermets as Gas-Turbine Blading. G. C. Deutsch. Paper from "High Temperature Materials". John Wiley & Sons, Inc., New York 16, 1959, 190-204.

Tests in J33 and J47 jet engines of blades made of TiC cermet composition containing 30% Ni and 8% of a solid solution of Co, Ta and Ti carbifes. In one group 5% of Ni was replaced by 5% of Mo, with great improvement of stress-rupture properties. 5 ref. (T7h, Q3q, 2-60; Ti, Ni, Cb, Ta, Ti, 6-69, 6-70, SGA-h)

252-T. (German.) Iron Figurines as Religious Offerings. J. M. Ritz. *Stahl und Eisen*, v. 79, June 25, 1959, p. 934-940.

Fe offerings of various historical age and style have been preserved. The religious role of Fe; its value as a means to symbolize subject of prayer; historical and geographical studies. (T9q, A2; Fe)

253-T.* (Czech.) Cast Diamond Core Bits for Rock Drills. Miroslav Pirner. *Hutnicke Listy*, v. 14, July 1959, p. 588-593.

Methods for casting and insertion of diamonds. Influence of casting temperature and cooling velocity on hardness of Cu-Ni-Mn and Cu-Ni-Si alloys. 5 ref. (T28j, E13; Cu-b, *Ni, Mn, Si,* NM-k37)

254-T. A Split Point for Drilling Super-Strength Alloys. *Metal Cuttings,* v. 7, July 1959, p. 2-3.
(T6n, G17e; SGB-a)

255-T. Effect of Irradiation on Fuel Materials. J. H. Kittel and S. H. Paine. *Nuclear Energy Engineer,* v. 13, June 1959, p. 301-305.
Determination of the effects of relatively high burn-up on natural unalloyed uranium. About 2 at.% burn-up was obtained on some specimens as a result of conversion of appreciable amounts of U^{238} into Pu^{239}. (T11g, 2-67)

256-T.* (German.) Welded Steel Used in Construction Materials and Cranes in Nuclear Engineering and Isotope Production. O. Jungbluth. *Schweissen und Schneiden,* v. 11, June 1959, p. 209-216.
Welding is best suited for the construction of reactor shells and reactor cranes. Complex loading requires the use of steel. Welding methods, testing of seams and gas tightness and safety measures. 5 ref. (T11, W12q, K-general; ST, SGB-s)

257-T.* (German.) Materials and Welding in Reactor Construction. W. Liebig. *Schweissen und Schneiden,* v. 11, June 1959, p. 217-218.
Welding of reactor parts requires special considerations due to the close tolerances demanded. Ferritic parts must be accessible for metal spraying. Steels of high Al content are mostly used. Parts exposed to electron bombardment should be free of Co. Argon-arc welding is recommended for austenitic materials. (T11, K-general; SS)

258-T.* (Sloviakian.) Cracks in Ships' Hulls. Oskar Izdinsky. *Zvaracsky Sbornik,* v. 8, no. 1, 1959, p. 108-130.
Chemical and structure tests, mechanical tests and investigation of internal stress and fatigue strength performed on materials and weldments used in the construction of boats for river traffic. Cracks are ascribed to stress accumulation avoidable by a modified design of welded assemblies. 6 ref. (T22g, K-general, 9-72)

259-T.* (French.) Scythes, Sickles and Forks in Special Steels. *Aciers Fins et Speciaux,* no. 32, July 1959, p. 62-65.
High-quality steel with high wear and shock resistance demands hard and extra hard special carbon steel. The hardness is Rockwell C-40 to 45. The production process involves six successive heatings from the first forging operation through the flattening and heel forming process. Oxidation and decarburization are avoided by careful furnace temperature control. (T3, 17-57, J-general, F22; CN)

260-T. Future Application Trends for Titanium and Steel in Military Aircraft. W. Stuart Lyman and Fred L. Bagby. *Defense Metals Information Center,* DMIC Memo. 17, May 8, 1959, 6 p.
Role of Ti alloys in airframe parts and power plants. Ti usage in missiles will not be great until it is shown that it possesses a marked superiority over steel for Ti alloys in welded high-performance solid-propellant rocket motor cases, accompanied by a large reduction in the price of reasonably weldable high-strength Ti alloy sheet. (T24; Ti-b, 17-57)

261-T.* (Czech.) Heat Resistant Bolts for High-Pressure Installations. A. Chitkov. *Strojirenstvi,* v. 9, May 1959, p. 353-364.
Steel selection and composition; stress relaxation and fatigue studies; creep tests; stress concentrations, impact ductility; cyclic load conditions. New methods for tightening heavy bolts. (T7f, Q3, Q6n, Q7a; ST)

262-T.* Missiles and Metals. Pt. 1. *Corrosion Reporter,* v. 6, July 1959, 16 p.
History of rockets and missiles with comparative graphs showing falling point and effects of subzero temperatures on tensile, impact strengths of light, super and refractory alloys. (T24e, T2p, Q-general)

263-T.* Materials for Springs. John T. Milek. *Materials in Design Engineering,* v. 50, Aug. 1959, p. 115-126.
Tabular comparison and survey of six major groups of materials—carbon steels, alloy steels, stainless steels, Ni, Co and Cu alloys. (T7c, Q21; CN, AY, SS, SGA-b, Ni-b, Co-b, Cu-b, 17-57)

264-T. Railroad Car Journal Bearings. *Lubrication,* v. 45, Aug. 1959, p. 101-116.
Good performance of worn-in railway car journal bearings when lubricated with

straight mineral oil of the proper viscosity. 7 ref. (T7d, T23p, NM-h)

265-T.* Aluminum Engines—Design for Modern Fabrication. James M. Smith and Richard M. Smith. *Society of Automotive Engineers*, Preprint no. 68A, June 1958, 25 p.
Design considerations for Al cylinder blocks, cylinder heads, crankcases, intake manifolds, pistons, bearings and other parts. Corrosion and production problems. (T21b, T21f, 17-51; Al-b)

266-T.* (German.) New Wear Resistant Castings Used to Crush Hard Materials. Telfer E. Norman and Gerhard E. Ott. *Giesserei*, v. 46, Aug. 13, 1959, p. 471-478.
Wear behavior of hammers and edges fabricated from pearlitic chilled cast iron as components of mining equipment. 7 ref. (T28, Q9n; CI-p)

267-T.* (German.) Reaction Between Tool and Workpiece in Cutting of Metals. T. N. Loladse. *Industrie Anzeiger*, v. 81, Aug. 4, 1959, p. 21-26.
Principal causes of tool wear; methods of predicting rate of wear in given applications. (T6n, Q9)

268-T.* (German.) Underground Fuel Oil Tanks From Steel Sheet. F. Brixa. *Industrie-Anzeiger*, v. 81, Aug. 14, 1959, p. 1033-1035.
Materials prescribed, dimensions and corrosion protection. (T26q, R10, L26a)

269-T. (English.) Steel-Backed Copper-Lead Bearings. *Copper*, Winter 1958, p. 13-15.
(T7d; Cu, *Pb*, *ST*)

270-T.* (German.) Openhearth Steel and Electric Steel as Materials for Hoist Ropes. Bruno Ansorge. *Neue Hutte*, v. 4, Apr. 1959, p. 210-218.
Tensile, bend, torsion and flexural fatigue tests performed with wires as used in hoist ropes. Openhearth steel is preferable due to the unfavorable aging behavior of electric steel. 5 ref. (T7g, Q27a, Q1a, Q7g, 2-65, 2-60; ST-e, ST-f)

271-T. Mercedes-Benz Experience With Aluminum Parts in Automotive Engines. Eberhard Hundt. *Society of Automotive Engineers*, Preprint no. 68B, June 1958, 8 p.
Al intake manifolds, pistons, connecting rods, cylinder heads, engine blocks and crankcases. Discussion. (T21b; Al-b, 17-57)

272-T.* Cathodic Protection in Storage. W. Lambert and G. Campbell. *Gas Age*, v. 124, July 9, 1959, p. 21-24.
Protection of underground storage facilities including well casings and field gathering lines. Annealing was proved to eliminate stress potentials. Presence of water enhances the formation of galvanic cells. (T26r, 2-64, R10d)

273-T.* (Czech.) Carbon Steels Used for Watch Springs. O. Modracek. *Hutnicke Listy*, v. 14, Aug. 1959, p. 674-679.
Strength as a function of hardening and annealing temperatures. Strength, elastic limit and elongation of spring wire measured for several drawing steps. Effect of cycling on the minimum spring momentum. 11 ref. (T7c, Q27a, Q21, Q23p, F28h, Q7, 2-61, 2-64; CN)

274-T.* Sintered Alumina for Cutting Tools. F. Singer, S. S. Singer and S. Croydon. *Interceram*, no. 6, 1957, p. 22-25.
For successful use as a cutting tool at high speeds and elevated temperatures sintered alumina tools should possess strong resistance to thermal shock and fatigue phenomena. Tensile strength-temperature curves of sintered alumina, thermal properties, modulus of elasticity, tool performance and tool geometry are tabulated. (T6n, Q-general, P11, 2-62; Al, NM-a34)

275-T.* Titanium and Zirconium: Their Future in Plant and Power Services. G. W. Bauer. *Plant Power Service Engineer*, v. 1, July 1959, p. 22-23.
Ti because of its outstanding strength-to-weight ratio and Zr with its low neutron absorption cross section and good corrosion resistance have large applications in fuel elements. Promising applications for Ti include use in rectifiers, resistors and capacitors. (T11g, T1; Ti, Zr, 17-57)

276-T. Next Breakthrough in Autos? Aluminum in Bumpers. E. P. White. *Modern Metals*, v. 15, Aug. 1959, p. 34-38.
(T21a; Al-b, 17-57)

277-T. Redesign in Die Castings Sparks Power Mower Sales. Kim Darby. *Modern Metals*, v. 15, Aug. 1959, p. 54, 56, 58.
(T10k; Al, 5-61, 17-51)

278-T. (Book.) Aluminum Construction Manual. 1st Ed. 389 p. 1959. Aluminum Assoc., 420 Lexington Ave., New York 17, N. Y.

Data on design of Al structures; dimensioning and weight; load data on beam connections for 6061-T6 alloy. Specifications for structures of Al alloys 6061-T6 and 2014-T6. (T26, S22, 17-51; Al, 17-57)

279-T. (Book.) Bearing Design and Application. Donald F. Wilcock and E. Richard Booser. 464 p. 1957. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $12.50.

Analysis of load capacity, speed, temperature, dimension tolerance and lubrication factors in selecting ball and roller bearings. (T7a, 17-51, 17-57)

280-T.* Application of Tubes to Structures. G. B. Godfrey. *West of Scotland Iron and Steel Institute,* v. 66, 1958-1959, p. 104-121.

Basic design formulas; conditions of stress, yield, corrosion, section shapes and prestressing. (T26, Q-general, 4-60; 15-57)

281-T. (Russian.) Factors Influencing the Quality of Automobile Sheet. B. S. Natapov, D. E. Tsivirko and E. S. Fal'kevich. *Nauchnie Doklady Vysshei Shkoly-Metallurgiya,* no. 1, 1959, p. 254-258.

Effects of nitrogen, aluminum and oxygen on the aging process in deep drawn auto body parts. 5 ref. (T21a, G4b, N7e, 2-60; ST, *N, Al, O,* 4-53)

282-T. Bronze Sleeve Bearing. Harry C. Rippel. *Machine Design,* v. 31, Sept. 17, 1959, p. 173-206.

Bearing size; clearances; oil-flow rates; operating temperatures; power required; lubricant film thickness; journal eccentricity ratio; whirl speed; allowable shock load. 6 ref. (T6d; Cu-s, 17-51, NM-h)

283-T.* Design and Materials for Reduced Pump Corrosion. Jack E. Piccardo. *Corrosion,* v. 15, Sept. 1959, p. 41-44.

Critical metal parts in seal-less pumps and pumps with packing gland or mechanical seals used in chemical and allied industries. 6 ref. (T29, R-general, 17-51, 17-57)

284-T.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Grades of Zinc and Fields of Use. C. H. Mathewson and G. H. Turner. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 386-400.

Common grades, principal forms and uses of metallic Zn. Specifications, preparation analysis and properties of super-purity Zn. 25 ref. (T-general, S22; 17-57, Zn)

285-T.* The Processing and Uses of Metallic Zinc and Zinc-Base Alloys. Miscellaneous Processes and Applications. Ernest W. Horvick. Paper from "Zinc. The Science and Technology of the Metal, Its Alloys and Compounds". ACS Monograph no. 142. Reinhold Publishing Corp., New York 22, 1959, p. 551-572.

Use of metallic Zn dust in the chemical industry as a metallurgical precipitant and in paints. Zn alloy for soldering and brazing Al. Hot and impact extrusion of Zn. Composition of Zn-base bearing metals. Use of Zn in wet batteries. Peen plating with Zn. Determination of Zn content in ores and other raw material. 8 ref. (T-general, L17, S11, K7; Al, Zn-b, SGA-f, SGA-c)

286-T. (Russian.) Steel Wire Used for Overhead Lines. S. I. Fuks. *Nauchnye Doklady Vysshei Shkoly—Metallurgiya,* no. 2, 1959, p. 238-244.

Atmospheric corrosion of Zn plated and unplated wire and its effect on tensile and bend strength. Compositions for optimum corrosion resistance. 8 ref. (T1b, R3, Q27a, Q5g, 2-60; ST, 4-61, 8-62, *Zn*)

287-T. Present Status of Nuclear Power. Karl P. Cohen. Digest of "Current Nuclear Power Developments and Their Outlook". Paper Presented to Energy Resources Conference, Denver, Colo., Oct. 16, 1958. *Metal Progress,* v. 76, Sept. 1959, p. 184-, 186, 188.

Nuclear power stations in U. S., Great Britain and Russia; costs and development. (T11)

288-T.* The Foundry Approaches the Space Age. A. H. Langenheim. *Foundry,* v. 87, Oct. 1959, p. 138, 140, 142, 144, 146-148, 151, 154, 156, 158.

Specifications required of castings to be used in space travel. Processing and properties of Mg, Al, low-alloy steel, superalloys and refractory metals. 4 ref. (T24e; 5, Mg, Al, AY, SGB-a, 17-57, EG-d37)

289-T.* (French-German.) Watch Jewels and Copper Alloys. *Pro-Metal,* v. 12, Aug. 1959, p. 182-186.

Use of Be bronze bearings in watches. The bearings are produced from cylindrical rods and then Rh plated. (T7d, L17; Cu-b, *Be*)

290-T.* (German.) New Wire Ropes. Pt. 1. D. van de Moortel. *Draht*, v. 10, Aug. 1959, p. 353-357.

Testing equipment, results of fatigue tests and cross sections of modern wire ropes. (T7g, Q7a)

291-T.* (German.) Heat Treatment of Tools Used in the Manufacture of Screws and Nuts. Pt. 1. Jacques Garnier. *Draht*, v. 10, Aug. 1959, p. 357-358.

Forging provides equal distribution of carbides in a ledeburitic structure. Heat treatment is performed in a protective atmosphere or in enclosed packing. Normalizing temperature depends on carbon content. Choice of hardening temperature and quenching medium is determined by composition. (T6, J24, J26, 2-60; CN-r, AY)

292-T. Application of Light-Gauge Steel Sheet and Strip in Roofing, Flooring and Side-Wall Cladding. R. J. Shaw. *Sheet Metal Industries*, v. 36, July 1959, p. 481-493.

(T26n; ST, 4-53, 17-57)

293-T. Vitreous-Enamelled Steel Sheets for Curtain Walling. T. J. MacArthur. *Sheet Metal Industries*, v. 36, July 1959, p. 494-496.

(T26n; ST, 4-53, 8-71)

294-T.* (German.) Friction Bearings From Gray Cast Iron. *Industrieblatt*, v. 59, Aug. 1959, p. 390-391.

Oxidation of surface graphite by the Kolene-E process, an anodic treatment in a salt bath, followed by dip tinning and lining with white metal by casting. (T7d, L19, L16, E-general; CI-n, Sn, SGA-c)

295-T. Reactor Control Materials. W. Kermit Anderson and Donald N. Dunning. Paper from "Progress in Nuclear Energy. Series 5. Metallurgy and Fuels". v. 2. Pergamon Press, Inc., New York 22, 1959, p. 193-205.

Application of the new boron-containing stainless steels and boron alloys with Ti and Zr; Hf as a control material; applications of rare earths for reactor control. 4 ref. (T11; SS, *B, Ti*, Zr, Hf, EG-d, 17-57)

296-T.* Carbide Grade Selection. Pt. 2. W. E. Montgomery. *Carbide Engineering*, v. 11, Aug. 1959, p. 15-17.

Classification of carbide tool-tip material in terms of use. Criteria of size and shape of chip indicate tool wear and ease of cutting for given work. (T6n; 6-69)

297-T.* (Russian.) Evaluation of Alloys for Electric Heating Elements. N. V. Semenova and L. L. Zhukov. *Stal'*, July 1959, p. 652-655.

Determination of optimum amounts of Cr, Al and rare earth elements to obtain a heat resistant Fe-Cr-Al alloy with best electric and scale resistant properties. 4 ref. (T1p; 17-57, Fe-b, *Cr, Al*, EG-g, SGA-q)

298-T. Curtain Walling With Vitreous Enamelled Steel Sheet. T. J. Macarthur. *Industrial Finishing (London)*, v. 11, Aug. 1959, p. 36-38.

(T26n; ST, 8-71, 4-53)

299-T. (Book.) Progress in Nuclear Energy. Series 5. Metallurgy and Fuels. v. 2. H. M. Finniston and J. P. Howe, Editors. 653 p. 1959. Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y. $21.

Basic materials, solid-state physics and physical metallurgy of U, Th, Mg, Pu, Zr and Be. Papers are abstracted separately. (T11q; U, Th, Mg, Pu, Zr, Be)

300-T. (Book.) Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy. v. 5. Properties of Reactor Materials. Geneva. Sept. 1-13, 1958. 627 p. United Nations, Geneva. $14.

Corrosion resistance properties and radiation effects of reactor materials, structural and sheathing alloys, steels and concrete, at various temperatures; neutron absorbers. Papers abstracted separately. (T11, R-general, 2-67, 2-70; SGB-s)

301-T.* Feasibility of Titanium for Welded Missiles. Carl E. Hartbower, George M. Orner and Daniel M. Daley, Jr. *Welding Journal*, v. 38, Sept. 1959, p. 345s-353s.

Welded Ti alloys are evaluated for missile applications by means of short-time elevated-temperature tensile properties and notch-tensile-impact testing. 4 ref. (T24e, K1d, Q27a; Ti-b, 17-57)

302-T.* (Swedish.) Properties of Metal Bellows. Bengt Hokby. *Metallen*, v. 15, no. 2, 1959, p. 56-62.

Manufacture and tests by exposure to internal or external pressure. Life as a function of length and frequency of longitudinal compressions. 9 ref. (T-general, Q7b; Cu-n)

303-T.* Bellows Joints. C. M. Daniels. *Machine Design*, v. 31, Oct. 15, 1959, p. 147-155.

Factors that influence selection and application in flexible ducting systems with severe operating requirements. 9 ref. (T6m; SS, Ti, Al)

304-T. A Portable Pipe-Welding Machine, H. L. Saunders. *Welding Journal*, v. 38, Sept. 1959, p. 876-884.

For welding Al pipelines. (T26r, K1, 1-52; Al)

305-T.* Hard Metal in Mining. F. Kolbl. *Murex Review*, v. 1, no. 20, 1959, p. 589-594.

Tungsten carbide hard metals; effect of Co content on hardness, compressive and transverse strength, modulus of elasticity. Importance of size and shape of carbide particles. 11 ref. (T28, 2-60; W, *Co*, 6-69)

306-T.* (Dutch.) Poor Welding Practices With Pressure Vessels. P. Bongers. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 253-260.

A collection of examples relating to defective weldments. (T26q, K-general)

307-T. Material Considerations in Superheater Design. Paul M. Brister and George N. Emmanuel. *American Society of Mechanical Engineers*, Paper no. 59-PWR-11, 1959, 13 p. $.80.

Basic requirements for high-temperature superheater design, using carbon steel, C-Mo steel and Croloy with reference to high temperature, strength, surface and structural stability and fabrication requirements. 4 ref. (T26q; 17-57, CN, AY)

308-T.* Applications of Curent Materials to Hot Airframe Design. M. B. Dunn, M. D. Musgrove and O. T. Ritchie. *Society of Automotive Engineers*, Preprint no. 104U, 1959, 27 p.

Hot airframe design problems employing Al, Ni and Mo alloys with emphasis on radiant cooling; advantageous thermal characteristics. (T24a; 17-57, Al-b, Mo-b, Ni-b, 17-51)

309-T. Flat-Rolled Steel. Guenther Frank. *Metal Treatment and Drop Forging*, v. 26, July-Aug. 1959, p. 284-288.

(T26; ST, 4-53)

310-T.* Sleeve-Bearing Bronzes. *Machine Design*, v. 31, Oct. 29, 1959, p. 135-138.

Composition, mechanical and physical properties, characteristics and applications of cast bronze bearing materials. (T7d, Q-general; Cu-s, 17-57)

311-T.* An Approach to Wire Rope Lubrication. Louis A. Stanzione. *Iron and Steel Engineer*, v. 36, Sept. 1959, p. 126-132.

Problems include the choice of lubricant to be applied during fabrication and while in service. Laboratory tests were designed to stimulate the field performance of a lubricant to predict its behavior under high and low temperatures and to check its ability of wetting and adhesion to the wire surface. (T7g; NM-h, 1-54)

312-T.* Strength and Thermal Limitations of Materials for Airframe Components. J. C. Ekvall. *Society of Automotive Engineers, Transactions*, v. 67, 1959, p. 590-595.

Applications at 0-1200° F. of Mg, Al and Ti alloys, low alloy and corrosion resistant steels, and Ni, Co and mixed-base steel. 18 ref. (T24a, 2-62; Mg-b, Ti-b, AY, SS, Ni-b, Co, 17-57)

313-T.* (Japanese.) 9% Chromium-1% Molybdenum Steel Tubes. Jimpei Omori, Katsujiro Takehara, Toyohiko Okamoto, Shoji Terai and Hidetoshi Maruoka. *Sumitomo Metals*, v. 11, Apr. 1959, p. 11-22.

Creep rupture tests over 10,000 hr. at 600° C. and 3400 hr. at 650° C. Creep and creep rupture strengths were compared with the allowable stresses of the ASME Boiler Code. Oxidation test proved that the steel has superior resistance. Sound welded joints might be obtained by arc welding or inert gas arc welding. (T26q, R1h, Q3q, K1; 4-60, AY, *Mo*)

314-T. Magnesium in Aircraft Tooling. Karl F. Melde. *Institution of Production Engineers, Journal*, v. 38, Sept. 1959, p. 480-484.

Properties, processing techniques and applications. (T24; Mg, 17-57)

315-T. The Advancement of Powder Metallurgy Applications in the Automobile. Roy E. Blue. Paper from "General Session on Powder Metallurgy". 15th Annual Meeting.

Metal Powder Industries Federation, New York 17, 1959, p. 94-98.

Current and future applications of powder metal parts. (T21; 6, 17-57)

316-T.* (French.) Steels, Cast Irons and Alloys for Oil Field Equipment. Be. de Borde. *Revue du Nickel*, v. 25, July-Aug. 1959, p. 87-96.

Property requirements, heat treatment and structural characteristics of drilling and extraction equipment. Specific materials suitable for boring tools, pumps, filters power transmission and hoisting equipment in oil field conditions. (To be continued.) (T28; AY, CI, Cu-b, Ni-b, 17-57)

317-T. Metallurgical Developments Outlined at the 1958 Geneva Conference on Peaceful Uses of Atomic Energy. H. M. Finniston. *Institute of Metals, Journal*, v. 87, July 1959, p. 360-375.

Progress in physical metallurgy of U, Pu, Th, Zr, Al, Mg, Be, Cb, and some solid and liquid fuel elements with reference to mechanical and chemical behavior and radiation effects. (T11g; U, Pu, Th, Zr, Al, Mg, Be)

318-T. (Russian.) Use of Two-Metal Bushings in Conical Ore Crushers. K. P. Shmidt. *Tsvetnye Metally*, no. 1, 1959, p. 89-91.

Comparison of the life of one-metal bronze bushings and that of bushings lined with a layer of babbitt. (T7d, W15n, Q9; Cu-s, SGA-c)

319-T.* Nodular-Cast-Iron Piston-Rings With a Ferritic Matrix. Traian Dumitrescu and Pascal Popescu. *Foundry Trade Journal*, v. 107, Oct. 15, 1959, p. 319-323.

Rings have greater elasticity and maintain their physical and mechanical properties at high temperatures to a greater extent than those made from alloyed flake-graphite Fe or pearlitic nodular Fe. The wear resistance is superior and the rings are free from internal stresses. 9 ref. (T7, Q9n; CI-r)

320-T.* The Future of All-Metal Sandwiches. *Machine Design*, v. 31, Nov. 12, 1959, p. 32-34.

Use of honeycomb, corrugated and waffle structures in aircraft and missiles. Applications for all-metal sandwich material. (T24; 7-59, 17-57)

321-T. (Russian.) Correlationship Between the Wear Resistance of Carbon Steel and Its Structure. A. A. Soroko-Novitskaya. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 5-18.

Effect of heat treatment. 5 ref. (T7, Q9n, 3-71, 2-64; CN)

322-T. (Russian.) Position of the Pinion Within the Housing of a 120-Degree Friction Bearing With Liquid Friction Under Constant and Alternated Loads. E. F. Zommer. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 136-188.

12 ref. (T7d)

323-T. (Russian.) Distribution of Pressure in the Oil Film of a Friction Bearing. L. B. Khrisanova. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 189-196.

9 ref. (T7d, 3-74)

324-T.* Titanium Fasteners in Aircraft. R. T. Allsop. *Light Metals*, v. 22, July-Aug-Sept. 1959, p. 201-204.

Advantages of Ti fasteners, problems and recommended procedures for producing them. (T7; Ti, 17-57)

325-T.* Structural Design in High-Temperature Reactors. N. H. Triner. *Nucleonics*, v. 17, Oct. 1959, p. 78-81.

Uniaxial and biaxial creep tests, high-temperature plastic-strain cycling, thermal-shock and relaxation tests. (T11, Q25p, Q3, 1-54, 17-51)

326-T.* The Manufacture and Properties of Basic Oxygen Steel for Wire Products. H. B. Emerick and S. Kreisberg. *Wire and Wire Products*, v. 34, Oct. 1959, p. 1331-1335, 1395.

Characteristics of product properties and applications of rod and wire made from basic oxygen steel. 5 ref. (T7g, Q-general; CN, 4-61)

327-T.* (German.) Steel Wire Used for Steel Ropes. F. Kohlhase. *Draht*, v. 10, Sept. 1959, p. 471-475.

Mechanical properties of steel used in ropes; effect of phosphorus and sulphur on quality. (T7g, Q-general, 2-60; ST, *S*, *P*, 17-57)

328-T.* Process Applications and Construction Materials for a High-Temperature Nuclear Reactor. Leon Davidson and Alfred A. Strasser. *Chemical Engineering Progress Symposium Series (Nuclear Engineering, Pt. 5.)*, v. 55, no. 22, 1959, p. 167-171.

Fuel element design for the 2000 to 3000° F. range; criteria for selection of fuel element materials; materials suitable for fuel element cladding in various atmospheres. (T11g, 17-51)

329-T.* Reprocessing Uranium-Zirconium Alloy Reactor Fuel Elements. C. B. Leek, R. B. Lemon and F. K. Wrigley. *Chemical Engineering Progress Symposium Series (Nuclear Engineering, Pt. 6.)*, v. 55, no. 23, 1959, p. 171-176.

Dissolution of the fuel elements in hydrofluoric acid, adjustment of the dissolver solution and separation of the uranium from fission products in three extraction cycles. (T11g, A11d)

330-T. (Dutch.) Copper and Copper Alloys. W. G. R. de Jager. *Metalen*, v. 14, Sept. 30, 1959, p. 284-286.

Cu alloys as material for springs. Electrical, thermal conductivity, modulus of elasticity, shear modulus. (T7c, P15g, P11h, Q21; Cu, SGA-b)

331-T. (German.) Design of Welded Chemical Equipment From Nonferrous Metals and Austenitic Steels. H. Canzler, *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 529.

(T29, K-general, 17-51; EG-a38, SS-e)

332-T. (German.) Welding of Chemical Apparatus. W. Grien. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 529.

Design and fabrication of weldments. Choice of materials. (T29, K-general, 17-51)

333-T. (German.) Rapid Welding Processes in the Construction of Long Distance Lines. H. Geilenkeuser. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 530.

(T1b, K-general)

334-T. (German.) Design of Weldments on Chemical Equipment From Aluminum. P. T. R. Moller. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 530.

(T29, 17-51; Al-b, 7-51)

335-T. (German.) Design of Weldments on Chemical Equipment. H. Titze. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 530.

(T29, 17-51; 7-51)

336-T. (German.) Automatic Resistance Welding in the Construction of Railroad Cars. Ernst Guder. *Deutsche Eisenbahn Technik*, v. 7, Aug. 1959, p. 395-405.

(T23p, K3)

337-T. The Development of Oscillatory Rolling-Contact Bearings for Airframe Applications in the Temperature Range 300 to 600° F. W. A. Glaeser. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 151909, Mar. 1959, 104 p. $2.50.

Evaluation of more than 1000 commercially available high-temperature aircraft roller bearings. (T24a, T7d; SGA-c)

338-T. (Russian.) Direct Cold Deformation as a Means for Increasing the Corrosion-Fatigue Strength of Pump Rods. R. A. Bagramov and R. M. Raskin. *Vestnik Mashinostroeniya*, v. 39, no. 10, 1959, p. 9-13.

Oil well pump rods are deformed in the direction of main stress to which they will be exposed in service in order to increase strength. 3 ref. (T28, R1e, 3-68, G23q; ST)

339-T. Notch Sensitivity Wall Will Crack. *Missiles & Rockets*, June 22, 1959, p. 15-19.

Progress in production of rocket motor cases with minimum notch sensitivity and 300,000 psi. yield strength. (T24e, Q23b, Q23s)

340-T. Study of the Metallurgical Properties That Are Necessary for Satisfactory Bearing Performance and the Development of Improved Bearing Alloys for Service up to 1000° F. T. V. Philip, A. E. Nehrenberg and G. Steven. Crucible Steel Co. of America. *Wright Air Development Center Technical Report* no. 57-343, Oct. 1958, 56 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.75.

(T7d, Q-general, 2-62; AY, *Co, Cr*, SGA-c)

341-T. Current Status of Knowledge on Design Criteria for Bearings Used in High Temperature Aircraft Electrical Accessories. P. Lewis, S. F. Murray and A. A. Schwartz. General Electric Co. *Wright Air Development Center Technical Report* no. 58-519, Sept. 1958, 58 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $1.50.

40 ref. (T7d, T24, 17-51; SGA-h, SGA-c)

342-T. (Czech.) Steel Tubing Used in Construction. A. Benda and P. Rosendorf. *Hutnicke Listy*, v. 14, no. 10, 1959, 349-353.

(T26; ST, 4-60, 17-57)

343-T. (French.) Electric Cables From Aluflex. Pt. 1. Henri Lemainque. *Revue de l'Aluminium*, v. 36, Sept. 1959, p. 935-940.

Tensile strength, elongation, bend tests, corrosion resistance, conductivity. (T1b, Q27a, Q23p, Q5j, R3, P15g; Al-b, 4-61)

344-T. (Russian.) Strength of Teeth of Circumference Hardened Gears. E. S. Kagan. *Stanki i Instrument*, no. 10, 1959, p. 35-36.

(T7a, J2g, Q7a)

345-T. (Russian.) Properties of Hard Alloys Used in Machining of Stainless Steel. N. P. Golubev. *Stanki i Instrument*, no. 10, 1959, p. 39.

Wear resistance of VK8, VK6, T15K6 and T5K10 alloys. (T6n, Q9n; SGB-q)

346-T. (Book.) Metals for Nuclear Reactors. W. A. Maxwell, Editor. 117 p. American Society for Metals, Metals Park, Novelty, Ohio. $8.

Elementary physical principles of nuclear reaction. Reactor, design and material problems; effects of radiation; corrosion by liquid metals and aqueous solution; fabricating and testing techniques for reactor components. Papers abstracted separately. (T11, 2-67, R-general, K-general, S13)

347-T. (Book-Russian.) Friction and Wear of Machine Parts. M. M. Krushchov. 266 p. 1959. Akademiya Nauk SSSR, Moscow. 11 R.

Collection of articles covering topics connected with friction, wear and lubrication of machinery. (T7, Q9)

348-T. (Translation—ATS.) Use of Aluminum and Its Alloys in Petroleum Refinery and Petrochemical Plant Equipment. S. I. Vol'fson. *Chemistry and Technology of Fuels and Oils*, v. 4, no. 9, 1959, p. 54-58.

5 ref. (T29m; Al-b, 17-57)

SECTION W

PLANT EQUIPMENT

1-W. Wade Furnaces for Brazing Stainless Steel and Heat Treating Jet Pipe Assemblies. *Machinery (London)*, v. 93, Sept. 17, 1958, p. 645-647.

(W27j, J27a, K8; SS, Ni-b)

2-W. Cast-Master Automatic Loading and Unloading Unit for Die Casting Machines. *Machinery (London)*, v. 93, Oct. 8, 1958, p. 839-840.

(W19f, W12s, E13, 18-74; Al-b)

3-W. New Type of Continuous Electric Enamelling Furnace. *Metal Finishing Journal*, v. 4, Oct. 1958, p. 398-399.

Advantage is improved heating distribution, achieved by spreading the loading elements over the furnace walls and floor. (W4k, L26n, 18-74)

4-W. Automatic Hydraulically Operated Electroplating Plant. *Metal Finishing Journal*, v. 4, Oct. 1958, p. 400-402.

(W3d, L17; *Cd*)

5-W. Plating and Anodizing Rack Design. Pt. 2. H. Kraus. *Metal Industry*, v. 93, Oct. 17, 1958, p. 335-336.

Cu, steel, Al and Ti are basic materials used in rack construction. Back construction, maintenance, coatings. (W3g, 17-57; Cu, ST, Al, Ti)

6-W. (German.) Welding Technique in Heavy Machinery Construction. Edgar Gruder. *Elin-Zeitschrift*, v. 10, June 1958, p. 72-78.

Welding equipment of Elin factory. 5 ref. (W29, 18-67)

7-W. (German.) New Pole-Controlled Transverse-Magnetic-Field Welding Machine. Theodor Konigshofer. *Elin-Zeitschrift*, v. 10, June 1958, p. 85-88.

Simple welding generator with a relatively low no-load voltage and very good welding properties. Magnetic regulation of current. Graphs and oscillograms of the electric properties. (W29a)

8-W. (German.) High-Current Generators for Arc Welding. Theodor Konigshofer. *Elin-Zeitschrift*, v. 10, June 1958, p. 109-110.

(W29a, K1)

9-W. (German.) Automation of Ore Dressing Plants. Gunther Gerstenberger. *Neue Hutte*, v. 3, July 1958, p. 389-398.

9 ref. (W15, B13, B14; 18-74)

10-W. (Japanese.) Selection of Blower for Cupola and Its Efficiency. S. Tamagawa and D. Kosugi. *Japan Foundrymen's Society*, v. 30, July 1958, p. 560-570.

(W13e, W18d, 1-72, 17-51)

11-W. (Russian.) New Type Heating Furnace Operating in Vacuum and Controlled Atmosphere. B. A. Borok, V. I. Gavrilin and B. P. Lobashev. *Zavodskaya Laboratoriya*, v. 24, no. 9, 1958, p. 1158-1159.

(W27n)

12-W.* (German.) Laminated Grinding Wheels. H. Leich. *Metallwaren-Industrie und Galvanotechnik*, v. 49, Sept. 1958, p. 385-390.

Development, operation and application of flexible grinding wheels with radial sheets of abrasive, based on experience in

woodworking industry. Application to fine grinding of steel plates and slightly curved surfaces. Since abrasive grain size is limited to from 150 to 320, prior grinding with hard wheels is required where large amounts of material are to be removed. Small grain size increases tool life up to 200% and with generous lubrication 250 hr. service life may be expected. High tip speed of up to 100 ft. per sec. makes the tool particularly suitable for automatic machinery. (W25c, G18; ST, 4-53)

13-W.* Survey of Furnaces for Melting Copper Alloys, With Cost Data Compiled Under Production Conditions in Sand Foundries. J. L. Rice. *Association of Bronze and Brass Founders,* no. 58, June 1957, 71 p.

Crucible, reverberatory, semirotary, rotary, electric furnaces; pro and con on fuels; crucibles, refractories, electrodes, burners; furnace costs. 23 ref. (W18, E10; Cu-b, 17-53, 1-52)

14-W.* Cast and Rammed Sections in Electric-Arc Furnace Roofs. Pt. 2. *Industrial Heating,* v. 25, Nov. 1958, p. 2325-2326, 2328.

Monolithic constructions in center sections of arc-furnace roofs reduced refractory costs; materials installed by ramming, failure frequently results from laminations; use of high-temperature castable refractories offers maximum economies, both when rammed and cast. (W18s; RM-h, 2-62, 18-69)

15-W.* (German.) Testing and Standardizing of Wire Shot Used in Surface Cleaning. Hans Krautmacher. *Stahl and Eisen,* v. 78, Oct. 16, 1958, p. 1433-1440.

Testing apparatus in which wire shot is thrust against plates at an initial velocity of 80 m. per sec. Shot of 160-180 kg. per sq. mm. tensile strength, 1.2 mm. diameter, showed no notable wear after passing the tester 1200 times, 3% wear after 1500 passes; slowly increasing wear up to 1900 passes, and wore out after 2100 passes. 33 ref. (W2a, Q9n; 4-61)

16-W. Universal Heat-Treatment Furnace —Stress-Relieving Large Welded Fabrications. *Iron and Steel.* V. 31, Nov. 1958, p. 549-550.

Furnace designed to meet exacting heat treatment requirements for large nuclear reactor power vessels. Covers full range of treatments of steel vessels from 200 to 900° C. (W27g, J1a, T11; ST)

17-W. Soaking Pits With a High Velocity Combustion System. David C. Haney. *Iron and Steel Engineer,* v. 35, Nov. 1958, p. 82-89.

Soaking pit capacity increased without expanding existing building by replacing two batteries of four small, gas-fired regenerative pits with two batteries of three larger, one-way, top-fired recuperative pits. (W20g, 18-70)

18-W. Grinding Wheel Grades. Makoto Okoshi and Hanju Watanabe. *Japan Science Review,* v. 4, no. 1, Oct. 1958, p. 146-147.

(W25c)

19-W. Automatic Lathe-Loader Conveyor Set-Up Speeds Buffer Cylinder Turning. *Metalworking Production,* v. 102, Nov. 7, 1958, p. 1954-1956.

(W12r, W25n, 18-74, 4-51, 4-60)

20-W. (German.) Sisal Brushes. Werner Mangold. *Metallwaren-Industrie und Galvanotechnik* v. 49, Sept. 1958, p. 391-392.

Experience with abrasive-impregnated sisal brushes. Performance of woven disks, cord brushes and various impregnations. (W2b, L10e)

21-W. (Japanese.) Model Studies Aimed at Improvements in Checker Chambers. Hidefumi Hasimoto. *Sumitomo Metals,* v. 10, Apr. 1958, p. 63-67.

Model was utilized to study flow patterns in the checker chamber and their uptake of openhearth furnace. (W18r, W13b, 17-56)

22-W.* Free-Piston Gas Turbine After-Burning. S. B. Jackson. *Iron & Steel,* v. 31, Sept. 1958, p. 445-448.

Reduces peak load demand by operating in parallel with Grid supply system. Varying load peaks can be compensated by varying the after-burner temperature which regulates the power output. 1 ref. (W11m)

23-W.* (German-French.) Use of Aluminum in Heating Systems. *Aluminium Suisse,* v. 8, Sept. 1958, p. 148-150.

Reasons for using Al in radiator construction; methods employed; joining of parts under high pressure, with additional tightening by synthetic resins, instead of welding. Iron oxide does not attack Al if oxygen is excluded, but rather forms a protective layer on the surface. (W10e; Al-b, 17-57)

24-W. Automation Adds a Brain Cell. R. H. Eshelman. *Iron Age*, v. 182, Nov. 20, 1958, p. 95-97.

Used on weigh-miller which first gages a part, memorizes the data, then sets up controls for precise machining. (W25r, T21b; 18-74, Al-b)

25-W. Magnetrostrictive Transducer Doubles Ultrasonic Efficiency. *Iron Age*, v. 182, Nov. 20, 1958, p. 98-99.

(W2, 1-74)

26-W. Skull Furnace Is Versatile. *Iron Age*, v. 182, Nov. 27, 1958, p. 69.

Used for melting reactive metals and special alloys; eliminates the ceramic crucible: melts quickly under vacuum. (W18a; Ti, Zr)

27-W. Luminous-Wall Firing: Low-Cost Idea in Rapid Heating. P. M. Unterweiser. *Iron Age*, v. 182, Dec. 4, 1958, p. 127-129.

Furnace has rapid heating and cooling cycle. Gas-air mixture, under controlled pressure, is forced through porous brick and burns evenly at wall's surface. (W27n, W27g: SS, 4-60)

28-W. Investigation of Basic Refractory Materials for Cupola Plant. B. Sochor. *Refractories Journal*, v. 34, Oct. 1958, p. 486-487.

Melting procedure in relation to basic refractory materials (bricks and ramming materials). (W18d, E10a; RML-38)

29-W. (French.) Dynamic Behavior of D. C. Arc Welding Generators. Method Suggested for Finding the Welding Capacity. M. A. Carrer. *Revue de la Soudure*, v. 14, no. 3, 1958, p. 146-154.

4 ref. (W29a)

30-W. (Polish.) Calculation of Protection of Rolling Mill Parts by Securing Them With Pot-Shaped Iron Buffers. Wladyslaw Dobrucki. *Hutnik*, v. 25, July-Aug. 1958, p. 284-291.

Effectiveness of vibration absorbers on rolls. (W23p)

31-W.* (German.) Use of Epoxy Resins for Making Drawing Dies. H. Gross, R. Beck and K. H. Schenk. *Fertigungstechnik*, v. 8, no. 10, 1958, p. 436-443.

Preparation, molding, casting and curing methods for both the hot and cold curing epoxy resins, data on compression strength and its influencing by applying various mixing formulas. Service life and wear resistance of drawing dies. (W24n; NM-d)

32-W.* (German.) Heat Treatment of Pressure Casting Dies. H. Kluge. *Giesserei-Praxis*, no. 19, Oct. 10, 1958, p. 387-389.

Heat resistant alloy steels most frequently used in Germany for manufacturing pressure casting dies are listed with specifications regarding composition, properties and fields of application. (W19n, S22; SS, *W*, *Co*, SGA-h)

33-W.* (German.) Experiences With Chromium Plating of Forging Dies. Kortendieck. *Werkstattstechnik und Maschinenbau*, v. 48, Oct. 1958, p. 569.

Better results obtained with Cr plating on plain carbon steels and flat dies; however, improvements of performance and lifetime are noted on alloy steel dies. Diffused Cr also improves performance of dies by reducing specific resistance of the die materials against the material flow of the workpiece. (W22a, 17-57; ST, *Cr*, 8-62)

34-W.* To Cut Nuclear Power Costs: Argonne's Alloy X-8001. *Modern Metals*, v. 14, Aug. 1958, p. 36-37.

Addition of 1% Ni to commercially pure Al greatly retards corrosion in high-temperature water. Major application in boiling water power reactors. (W11p, T11q, R4; Al-b, *Ni*, 17-57)

35-W.* (Czech.) Melting Through of Blast-Furnace Hearths. Vilem Friedrich. *Hutnicke Listy*, v. 13, no. 9, 1958, p. 800-803.

Damages in fire-clay hearth appear in region of tapping hole and depend on furnace maintenance. Damages caused by

melting through of carbon-lined hearth appear mainly as consequence of defects in hearth linings or defects which occur when new furnace starts working. (W17g; RM-h35, RM-h39)

36-W.* (French.) Mechanical Properties of Cast Iron Materials Used for Producing Ingot Molds. Michel Ferry and Jean-Claude Margerie. *Fonderie*, no. 153, Oct. 1958, p. 475-485.

Determination of optimum balance between low modulus of elasticity and high tensile strength. Castings of various composition were tested by measuring physical properties at ambient and at elevated temperatures, including creep tests. 12 ref. (W19c, 17-57; Q-general; CI-n)

37-W. Batch Sand Distribution and Core Processing. Evan J. Ross. *British Foundryman*, v. 51, Sept. 1958, p. 420-427.

Distribution system; automatic loading and unloading of cores. (W19h, W19k, 18-67)

38-W. How to Choose Arc Welding Plant. *Metalworking Production* v. 102, Nov. 21, 1958, p. 2035-2042.

(W29, K1)

39-W. Pneumatic Conveying of Graphite. *Pipes & Pipelines*, v. 3, Nov. 1958, p. 29-30.

System supersedes all manual operations from bulk storage to delivery at produce bunkers in production areas. (W12r; NM-k36; 1-71, 18-74)

40-W. (German.) Application of N-H Shielding Gas in Welding of Refrigeration Installations. K. Boeckhaus. *Die Kalte*, v. 11, Apr. 1958, p. 123-128.

Experience with a mixture of 80% pure N and 20% pure H. (W29j, K1d; N, H)

41-W. (German.) Plans of a Plate Rolling Mill. Wilhelm Hilterhaus. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1525-1536.

(W23b; ST)

42-W. (German.) Economics of a Plate Rolling Train. Paul Diestel. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1536-1546.

(W23b; ST)

43-W. (German.) New Type Continuous Milling Train for Small Sections. Nikolaus Petrovits and Hanns-Heinz Billen. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1546-1556.

(W23; ST)

44-W. (German.) Roll Force and Torque Under Simultaneous Pull Determined by Experiments and Calculation. Hans-Gunter Muller and Paul Funke, Jr. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1564-1574.

(W23, F23)

45-W. (Translation—Brutcher, 4342.) Ingot Molds Chill Cast of Magnesium-Treated Cast Iron. G. A. Pisarenko. *Stal'*, v. 18, no. 7, 1958, p. 668-672.

See item 471-W, 1958. (W19c, 17-57, E23; CI-r)

46-W. (Translation—SLA, ASLIB-GB29.) Methods of Preparing Wiredrawing Dies. I. I. Voronov. *Metallurg*, no. 6, 1956, p. 36.

(W24n, F28)

47-W. (Translation—SLA, ASLIB-GB43.) Development of Electrical Equipment of Modern Single-Stand Reversing Mills. K. Muller-Trimbusch. *Stahl und Eisen*, v. 76, Feb. 23, 1956, p. 201-211.

(W23a, W23n)

48-W.* Steels for Extrusion Tools. F. Rodgers. *Metal Industry*, v. 93, Nov. 28, 1958, p. 449-452.

Steel for liners, linear holders and containers. Temperature and stress conditions in extrusions resulting in embrittlement and creep. (To be continued.) 4 ref. (W24n, F24; AY, 17-57)

49-W.* Plasma Gas Guns Reach 30,000° F. William M. Stocker, Jr. *Metalworking Production*, v. 102, Nov. 28, 1958, p. 2088-2089.

Plasma is ionized gas. Plasma guns, in which gas is forced through an electric arc, are for metal spraying, cutting and melting applications. (W29d, G22h, L23)

50-W.* Steels for Extrusion Tools. F. Rodgers. *Metal Industry*, v. 93, Dec. 5, 1958, p. 469-473.

Required characteristics and suggested composition of liners, mandrels and dies. (W24n; SS)

51-W.* Metal Fibres Reinforce Plastic Dies. A. P. Maszucchelli. *Metalworking Production*, v. 102, Dec. 5, 1958, p. 2129-2130.

Longer wear, better thermal properties and greater accuracy result when cast epoxy dies are filled with metal fibers. New technique wherein short fibers are flocked to outside wear surfaces. (W24n, H17; ST, Al-b, NM-d)

52-W. Performance Tests of a Vertical Steam Generator for Nuclear Power Plants. R. L. Coit and C. C. Peake. *Mechanical Engineering*, v. 80, Dec. 1958, p. 56-60. (W11p; 17-52)

53-W. Welding and Forming Combined. *Metalworking Production*, v. 102, Dec. 5, 1958, p. 2133-2134.

Integrated machine performs a complete manufacturing sequence to produce wire bolsters at the rate of 5000 ft. per hr. (W29, W24, 18-74)

54-W. Survey of General and Specialized Machine Tools for Press-Tool Production. J. A. Waller. *Sheet Metal Industries*, v. 35, Dec. 1958, p. 931-938, 951. (To be continued.) (W25)

55-W. (German.) Problem of Air Control in Foundry Planning. Karl Nilsson and Yngve Bovin. *Giesserei*, v. 23, Nov. 6, 1958, p. 689-698.

Installations for controlling temperature, humidity, air circulation, dust, fumes and gases in foundries. Improved working conditions and lower cost of air control per ton of steel produced are the functions of integrated air control planning at time of plant construction. (W10d, W19; ST)

56-W.* (Japanese.) Introduction to Vacuum Furnaces. S. Ikeuchi. *Metals*, v. 28, Nov. 1958, p. 817-820.

Advantages of vacuum melting are removal of gases and impurities whose vapor pressures are high, protection from adulteration and deoxidation. Description of 500-kg. high-frequency vacuum induction furnace operating under 10^{-3} mm. Hg. (W18a, C5j, D8m, 1-73; Ni-b)

57-W.* (Russian.) Modernization of Slabbing Mill at 'Zaporozhstal' Works. M. E. Krivitskii, G. A. Dubrovin and A. V. Sysoev. *Stal'*, v. 18, Oct. 1958, p. 910-916.

Replacement of top roll positioning and balancing arrangement and of vertical roll drive by more efficient mechanism operated by a 50-atm. hydraulic system has resulted in 25% increased mill productivity, in reduced wear on working parts and in improved reliability of mechanisms. Vertical roll drive with roller bearings was of particular help. (W23a)

58-W.* (Russian.) Dependence of Duration of Openhearth Furnace Campaign on Schedule of Repairs. V. A. Romenets. *Stal'*, v. 18, Nov. 1958, p. 1039-1045.

Frequency of hot repairs depends on annual productivity of furnace. All other factors being the same, the main influence on annual furnace productivity is duration of each melt. Short and long repair schedules worked out. Choice of schedule depends on technological level and indexes of each furnace. (W18r, 18-71)

59-W.* (Russian.) Results of Discussion on Quality of Ingot Molds. N. V. Zinov'ev. *Stal'*, v. 18, Nov. 1958, p. 1046-1055.

Major factor determining the performance of ingot molds is metal structure which depends not only on chemical composition but on casting technique. Pearlite and pearlite-ferrite (with 10-40% ferrite and soft graphite) recommended. Also ferrite-pearlite (with 50-80% ferrite). Charge should contain 40% scrap and 15% pig iron by weight. 24 ref. (W19c, 2-60, 3-71; ST)

60-W. Mechanical Presses: Their Selection, Design and Function. Chpt. XI. *Metal Forming and Fabricating*, v. 20, Nov. 1958, p. 32-35.

Gap frame presses. (W24g)

61-W. (Czech.) Industrial Furnace Foundations. Vladimir Balabanov. *Hutnicke Listy*, v. 13, Nov. 1958, p. 984-987.

Distribution of temperatures in a blast furnace foundation is studied. Where the temperature exceeds 250-300° C., red bricks are suggested instead of concrete. Compositions of cements used in foundations. 6 ref. (W17g, 18-69; RM-h)

62-W. (Russian.) Installation for Assembly and Welding of Crane Bridges. L. A. Zhivotinskii, A. D. Gitlevich and V. Ya. Belov. *Svarochnoe Proizvodstvo*, Oct. 1958, p. 33-35. (W29, W12q)

63-W. (Russian.) Friction Welding Machine From a Lathe. M. I. Kunis and A. I. Korablev. *Svarochnoe Proizvodstvo*, Nov. 1958, p. 37.

Conversion of a lathe into a friction welding machine. (W29)

64-W.* Economic Advantages of Electric Furnaces. Walter H. Holcroft. *Metal Treating*, v. 9, Nov-Dec. 1958, p. 10-11, 29, 34, 36, 40.

Box-type batch furnace, car-type, conveyor-type, pusher-type furnaces, roller-hearth continuous furnace, continuous rotary furnace, shaker-hearth furnace and walking-beam furnace. (W27j, W27k, W29m, 17-52)

65-W.* (French.) Ventilation of Foundries. K. Nilsson and Y. Bovin. *Fonderie Belge*, v. 28, Nov. 1958, p. 317-331.

Gravity and forced-air ventilation systems; provision of fresh air and individual ventilation where fumes, dust, etc., must be exhausted. (W10d, E-general, A8a, 18-67)

66-W.* (French.) Accelerated Process in a Basic Heroult Furnace Used in Steel Casting. Andre Mal. *Fonderie Belge*, v. 28, Nov. 1958, p. 332-334.

Combines advantages of basic furnace method with that of acid furnace by simplifying and shortening operation, using one slag application. (W18s, D5a; ST)

67-W.* (Russian.) Continuous Rolling of Wire Rod. V. S. Makarenko. *Metallurg*, v. 3, Nov. 1958, p. 28-34.

Mill rolls wire of carbon steel 5-10 mm. diameter. Original bar is square, 60 mm. long, and weighs 330 kg. Production indexes from Jan. to Aug. 1958 given as 500,000 tons yearly. (W23d; CN)

68-W.* (Russian.) Continuous Small Section Rolling Mill 350. V. F. Bur'yanov and B. F. Cherkasov. *Vestnik Mashinostroeniya*, v. 38, Nov. 1958, p. 79-84.

Handles round sections 10-30 mm. diameter, squares 10-30 mm. and sheet 200 x 6 mm. of carbon steel, using ingots of 80 x 80 and 106 x 106 mm. 9-9.5 m. long. Ingots heated in trizonal recuperative furnace fueled by mixture of coke and blast furnace gases. (W23, F21b; CN)

69-W.* Metal Powders for Barrel Finishing. G. C. Madigan. Paper from "Proceedings of the 14th Annual Meeting". Metal Powder Assoc., New York, 1958, p. 71-78.

A blend of Cu metal powder and abrasive were formed into pellets by pressing in a suitable die. During tumbling trapped Cu pellets are dislodged by placing the casting in an acid until the pellets merely drop free. Tests indicate that the new media form small radii more rapidly than previously obtained with other madia, such as aluminum oxide stone. (W2a, L10d; Cu)

70-W. How Do Steel Dies Compare With Carbide Dies? Joseph P. Schmidt. *Carbide Engineering*, v. 10, Dec. 1958, p. 9-15.

Although carbide dies have higher initial cost than steel dies they can produce 12 times as many pieces. (W24n; 6-69, ST)

71-W. Testing of Machine Tools. Jiri Tlusty. *Czechoslovak Heavy Industry*, no. 7, 1958, p. 41-48.

10 ref. (W25n, 1-54)

72-W. Spray Booths in Operation. Mark Reeves. *Electroplating and Metal Finishing*, v. 11, Nov. 1958, p. 398-402.

(W4h)

73-W. Automatic Bright Cadmium Plating in a Trade Finishing Shop. *Electroplating and Metal Finishing*, v. 11, Nov. 1958, p. 403-405.

(W3d, W3g, 18-67, L16; *Cd*)

74-W. (French.) Buffing Machine With Rollers. C. R. Morris. *Machine Moderne*, v. 12, Dec. 1958, p. 59-60.

New method for obtaining superfinishes in borings. Machine used consists of a number of runners at inclined axle, placed at even intervals on outside of boring cylinder which is kept in place by outer housing. (W2n, L10a; ST)

75-W. (French.) Aluminum Conductors for Outdoor Transformers. Guy Souriou. *Revue de l'Aluminium*, no. 258, Oct. 1958, p. 1017-1026.

(W11r, 1-57; Al)

76-W. (French.) Calculating the Capacity of Crushers. Pt. 1. Huber Panu and Emil Popa. *Revue de Metallurgie (Bucharest)*, v. 3, no. 2, 1958, p. 59-83.

11 ref. (W15n, B13)

77-W. (Russian.) Overhauling 260-Ton Openhearth in 140 Hours. V. E. Pis'mennikov. *Metallurg*, v. 3, Nov. 1958, p. 26-27.

Work entailed removing 1300 tons of metal and relining furnace with 3000 tons of refractories. Speed made possible by careful planning and use of special cranes and hoisting equipment. (W18r, 18-72; RM-h)

78-W. (Russian.) Mechanization and Automation of Sand Blowing. G. S. Taburinskii and P. I. Kholodenko. *Liteinoe Proizvodstvo,* Oct. 1958, p. 11-16.

Mechanization of sand blowing is first step of elaborate program to modernize foundry industry. Sand blower used to fill mix in core boxes. While former machines could be only used for mixes of high-viscocity green sand of low strength and humidity up to 3.0%, new machine can be used for all types of core and molding mixes. It performs two-fold operation blowing the core and reloading the operating reservoir with a device consisting of reversible disk with two working holders. (W19h, 18-74)

79-W. (Russian.) Tube-Billet Mill at Dzerzhinsky Works. G. E. Tsukanov. *Stal',* v. 18, Nov. 1958, p. 1012-1017.

Installation of automatic seamless tube mill. High productivity impeded by shortages of certain parts due to poor plant layout. (W23h, 18-67; ST)

80-W. (Russian.) Mechanization and Automation of Tube Mills. M. G. Berdyanskii. *Stal',* v. 18, Oct. 1958, p. 928-930.

Automation in moving of billets from the heating furnace to the continuous stands. Various degrees of mechanization in different mills and plans for more complete automation. (W23h, W12r, 18-74; ST)

81-W.* Cupolas. F. Dunn and H. J. Leyshon. *Iron & Steel,* v. 31, Dec. 24, 1958, p. 632-636.

Cupola design and melting practice; cold blast acid-lined furnace, basic-lined, water-cooled and hot blast cupolas. Oxygen enrichment of blast. 37 ref. (W18d, E10a, 1-64, 1-65)

82-W.* Rotary Furnaces. F. Dunn. *Iron & Steel,* v. 31, Dec. 24, 1958, p. 637-638.

Rotary melting practice, pulverized fuel-fired furnaces, oil-fired furnaces. 21 ref. (W18b; CI)

83-W.* Electric Furnaces. F. S. Leigh. *Iron & Steel,* v. 31, Dec. 24, 1958, p. 643-646.

Principal design features and operating characteristics of induction melting furnaces of the core type and coreless types. Resistance furnaces and direct arc and rocking-arc furnaces. (W18a, W18s, E10r, 1-62; ST, CI)

84-W. Factors Effecting Press Tool Design. A. Chapple. *Australasian Engineer,* v. 50, Oct. 7, 1958, p. 60-64.

Pressure, shearing resistance, ductility and strain hardening of materials. (W24N, 17-51, 3-66, 3-74)

85-W. Drive and Control System for High-Speed Rod Mill. *Iron and Steel,* v. 31, Dec. 1958, p. 585-588.

Equipment and layout at the Cuyahoga Works of the United States Steel Corp., Cleveland. (W23n)

86-W. Standardization Increases Flexibility of Automation. *Machinery,* v. 65, Jan. 1959, p. 98-108.

(W12r, 18-74)

87-W. Equipment Requirements for High-Speed Machining. H. J. Siekmann. *Tool Engineer,* 42, Jan. 1959, p. 49-52.

(W25n)

88-W. (German.) Dynamic Loads on Rolling Mill Machinery. S. N. Koschewnikow. *Neue Hutte,* v. 3, Nov. 1958, p. 655-665.

(W23p, F23)

89-W.* (German.) Operation of Oil-Fired Pusher-Type Furnaces. Rudolf Muller and Franz Hollweger. *Stahl und Eisen,* v. 78, Nov. 13, 1958, p. 1676-1678.

Actual plant experience in transport, storage and preheating of fuel, operating characteristics of the preheating furnaces, oil consumption, influence of fuel on product quality and scaling rate. Performance report on low-pressure burners of recent design. (W20h, F23; RM-k, Al-b)

90-W.* (Hungarian.) Determining Flywheel Dimensions for Rolling Mills. Ervin Kiss. *Kohaszati Lapok,* v. 13, Feb-Mar. 1958, p. 131-135.

Methods for designing flywheels on reversible and on nonreversible rolling mill stands based on analysis of actual operational conditions of the rolling process. 4 ref. (W23p)

91-W.* Rolling Mill With Remote Control for Processing Nuclear Fuel Elements. *Process Control and Automation,* v. 5, Dec. 1958, p. 524-526.

Complex electro-hydraulic control system permits interchanging of four separate roll configurations by remote control. Mill has 600,000-lb. rolling load capacity, speed of 100 ft. per min. (W23f, 18-74, T11g)

92-W.* (French.) Efficiency and Costs in Arc Welding. W. Bonhomme and G. Jasmin. *Revue Universelle des Mines*, v. 14, Oct. 1958, p. 372-377.
Intensive research has provided improved electrodes and thereby reduced welding costs. Advantages and limitations of deep-penetration, high-efficiency, coated, basic, acid and rutile electrodes. (W29h, K1)

93-W. Fully Continuous Narrow-Strip and Wire-Rod Mill. Ludwig Wegmann. *Demag News*, no. 148, 1957, p. 16-29.
Mill in Luxembourg of a new design, to roll strip 10-70 mm. thick, 0.8-5 mm. thick and wire from 5-12 mm. diameter. (W23c, W23d)

94-W. Planning Heavy and Medium Plate Mills. W. Mullenbach. *Demag News*, no. 149, 1957, p. 23-31.
Survey of present mills which meet high standards of quality, finish and rolling tolerances and which can roll a variety of stock. (W23b)

95-W. Engineering Aspects of Modern Basic Bessemer Plants. Hans Hofmeister and C. Herrmann. *Demag News*, no. 149, 1957, p. 1-8.
Engineering development work on basic bessemer steelworks, plants being planned or built with bottom-blown converters. (W18p)

96-W. Burn-Off Cleaning and Paint Baking in One Radiant Oven. *Industrial Finishing*, v. 34, Aug. 1958, p. 82-83.
Overhead power-driven monorail conveyer moves material; quartz-lamp radiant oven, having three temperature ranges, degreases and bakes primer and top coating. (W4k, W12r, L26n, L10n; 18-74)

97-W. Mechanical Manipulation in Bar Mills. E. C. Peterson. *Iron and Steel Engineer*, V. 36, Jan. 1959, p. 67-78.
Devices available for handling pieces through guides and passes of bar mills. (W12, A5a, F23)

98-W. Mechanical Inching Devices. H. Kermit Fish, J. R. Shields, E. W. Barth and K. W. FitzSimmons. *Iron and Steel Engineer*, v. 36, Jan. 1959, p. 109-111.
(W23n)

99-W. A Survey of Forging Manipulators and Their Applications. P. L. Lillywhite. *Iron and Steel Institute, Journal*, v. 190, Dec. 1958, p. 394-413.
Use of manipulators in relation to the layout of various forging plants. (W22, W12s)

100-W. Tape Control Guides Welding System. *Tooling & Production*, v. 24, Jan. 1959, p. 54.
(W19, 18-74)

101-W. (English.) New Basic Bessemer Steelworks of the Hadir Company at Differdange (Grand Duchy of Luxembourg). *Acier-Stahl-Steel*, v. 23, Nov. 1958, p. 483-488.
(W18p)

102-W. (French.) Tuyere Peepholes in Cupolas. *Journal d'Informations Techniques des Industries de la Fonderie*, Aug. 1958, p. 4-10.
Types of holes; maneuverability and safety. (W18d, 17-51)

103-W. (German.) Modernization of Foundry Plants. Adolf M. Plesinger. *Giessereitechnik*, v. 4, Nov. 1958, p. 275-282.
11 ref. (W10a, W19, 18-67)

104-W. (German.) Calculations on the Heating of Plating Tanks. Hans Reufels. *Metallwaren-Industrie und Galvanotechnik*, v. 49, no. 12, 1958, p. 512-516.
Electrical, steam and gas heating; automatic temperature control. (W3j)

105-W. (German.) Sleeve Bearings With Fluid Film Friction. Pt. 1. Bearing Assembly for a Conic Roll-Neck. Bertold Sprenger. *Stahl und Eisen*, v. 78, Dec. 25, 1958, p. 1853-1861.
Rolling mill assembly. 15 ref. (W23m)

106-W. (German.) Sleeve Bearings With Fluid Film Friction. Pt. 2. High Oil Flow Bearing. Wilhelm Mullenbach. *Stahl und Eisen*, v. 78, Dec. 25, 1958, p. 1861-1865.
Roll and bearing form a unit (rolling mill). (W23m)

107-W. (German.) Sleeve Bearings With Fluid Film Friction. Pt. 3. Simple Bearings With Oil Circulation. Josef Frohling. *Stahl und Eisen*, v. 78, Dec. 25, 1958, p. 1865-1867.
Rolling mill assembly. (W23m)

108-W. (German.) Pressure and Heat Stresses in Forging Dies. J. Stoter. *Werkstattstechnik und Maschinenbau*, v. 48, Dec. 1958, p. 676-678.
(W22a, 17-57; AY)

109-W. (Russian.) Arc Welding Equipment. I. Ya. Rabinovich. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 6-9.

New welding generators and rectifiers. 5 ref. (W29a, K1, 1-52)

110-W. (Russian.) Universal Welding Equipment. V. P. Kolesnikov and S. M. Shklovskii. *Svarochnoe Proizvodstvo*, Dec. 1958, p. 31.

(W29)

111-W.* (Hungarian.) Production and Consumption of Cast-Iron Ingot Molds. Sandor Hargitay. *Kohaszati Lapok-Ontode*, v. 91, May-June 1958, p. 101-109.

Mold life extended by preheating, proper cleaning after use, avoiding water cooling, control of temperature and pouring rate and removal of molds as soon as possible after pouring. (W19c, D9k; CI)

112-W.* Steels for Extrusion Tools. F. Rodgers. *Birmingham Metallurgical Society, Journal*, v. 38, Dec. 1958, p. 117-138.

Application of 2% Ni-Cr, 2% Ni-Cr-Mo-V, 1-1/2% Cr-Mo-V, 5% Cr-Mo-V, 4% W-Cr, 10% W-Cr steels in extrusion containers, liners, liner holders, rams and stems, mandrels and dies. 4 ref. (W24p, F24, 17-57; TS, *Ni, Cr, Mo, V, W*)

113-W.* Aluminum Cooling Towers and Their Treatment. A. J. Haygood and J. Dean Minford. *Corrosion*, v. 15, Jan. 1959, p. 36-40.

Alloy selection, fabricating practice, surface finish and inhibition treatment. Specific applications and properties for 6061, 6062, 6051, 2024, 5052 and 3004 Al alloys. 8 ref. (W10g, R10b; Al-b, 17-57)

114-W.* Rolling Mill for Processing Nuclear Fuel Element Materials. *Metallurgia*, v. 58, Dec. 1958, p. 286-288.

Provision for operation in an inert atmosphere is provided in a new 2-high/4-high combination mill which is arranged for sealing within a glove box enclosure, the reduction gears, pinion stand and drive motor being outside. (W23, T11g, F23)

115-W. More Atoms for Peace. John P. Howe. *Metal Progress*, v. 75, Jan. 1959, p. 106-110.

Discussions at the Geneva Conference indicated that knowledge of fundamental physics is more advanced than the ability to harness the atomic forces. (W11p, P18)

116-W. Atomic Energy in Canada. David A. Keys. *Metal Progress*, v. 75, Jan. 1959, p. 90-94.

Canadian activities are restricted to peacetime uses of atomic energy. Over 100 "Cobalt-60 Theratrons" have been sold to 20 countries for treatment of malignant diseases. Long and successful experience with heavy water as a moderator for chain reaction in natural U enables them to use this principle in the design of their first power plants. (W11p, 1-52, 16-62)

117-W. New High Frequency Induction Equipment for Heating Billets for Rolling. J. C. Howard. *Metallurgica*, v. 58, Dec. 1958, p. 270-272.

Installation provides the cleanliness and flexibility required in heating a range of special alloys, some with high Ni content, whose rolling temperatures vary from 800 to 1250° C. (W28s, F23; Ni, 4-52)

118-W. Faster Roll Grinding Aided by Automatic Electronic Feed. *Metalworking Production*, v. 102, Dec. 26, 1958, p. 2265-2269.

(W23k, W25s; ST)

119-W. Auto Makers Tool Up With Magnesium Mill Products. Thomas Walker. *Modern Metals*, v. 14, Jan. 1959, p. 58, 60-61.

(W25b, X20, T21a, 17-57; Mg-b)

120-W. (Russian.) Increasing Productivity of Linear Heavy Section Rolling Mills. M. S. Karpyshev. *Stal'*, Dec. 1958, p. 1108-1112.

Alterations in a heavy section rolling mill increased the productivity by 20-25%. (W23e, 17-51)

121-W.* (German.) New Basic Converter and Openhearth Steel Plants. Werner Heischkeil, Karl Becker, Gerhard Leiber and Rudolf von Moos. *Stahl und Eisen*, v. 79, Jan. 8, 1959, p. 8-21

Reconstruction of an integrated iron and steel mill with latest design equipment. Data on types, capacities, controls, charging devices, operation, output, heat consumption and life expectancy of steel melting furnaces. Comparison with similar equipment in other reconstructed plants, economic aspects, quality of steel produced. 15 ref. (W10, W18p, W18r; ST)

122-W.* (Hungarian.) Shaping the Roll Surfaces for Hot Rolling of Sheets and Strips.

Jeno Mercader. *Kohaszati Lapok*, v. 91, July 1958, p. 317-321.

Compensating effects of roll and roll stand deflection, elongation of beams, wear of rolls and flexibility of journal bearing housings. Advisability of using preheated rolls for closer control of rolling accuracy. (W23k, F23, 17-51)

123-W.* (Hungarian.) Application of Suspended Form Panels for Furnaces. Ferenc Hammer and Arisztid Czeke. *Kohaszati Lapok*, v. 91, July 1958, p. 336-338.

Prefabricated steel form panels to rebuild openhearth furnaces. (W18r, 18-72; ST, 17-57)

124-W. Titanium/Platinum Anodes Developed. *Industrial Finishing (London)*, v. 11, Jan. 1959, p. 49.

(W3h; Ti-b, *Pt*, 8-62, 17-57)

125-W. Steelworks Lubrication. *Iron and Steel*, v. 32, Jan. 1959, p. 32-33.

German rolling mill practice. (W23, 18-73)

126-W. Metal-Working Processes and Equipment. Pt. 3. A. G. Thompson. *Welding and Metal Fabrication*, v. 27, Jan. 1959, p. 26-30.

Application of cold sawing machines, reciprocating hacksaws, bandsaws, section and bar croppers, hydraulic saw feed and clamping machines. (To be continued.) (W24m)

127-W. Annealing and Patenting Furnaces for Steel Wire. *Wire Industry*, v. 26, Jan. 1959, p. 73-74.

(W27, J23; ST, 4-61)

128-W. (German.) Replacement of a Cupola Bottom Without Pulling Down the Furnace. Gerhard Bienwald. *Giesserei*, v. 45, Nov. 20, 1958, p. 722-723.

Changing from cold blast to hot blast. (W18d, 18-57)

129-W.* (French.) Construction and Operation of Methane and Fuel-Oil Fired Openhearth Furnaces. Luigi Bruno. *Revue de Metallurgie*, v. 55, Dec. 1958, p. 1113-1125.

Calculations by formulas based on actual findings in plant practice, developed to direct furnace design and to forecast performance characteristics, particularly heat consumption and required composition of the charge. (W18r, 17-51)

130-W.* Composition and Application of Anodes. D. J. Fishlock. *Metal Finishing*, v. 57, Feb. 1959, p. 48-51, 57.

Anodes must have the following characteristics: free and uniform dissolution, high conductivity, high purity. (To be continued.) (W3h, P15g, 2-60; Ni-a, Ni-b, *Sn*, Cu)

131-W. Development of Filler Wire for Welding Army Ordnance Armor by the Inert-Gas Shielded Consumable-Electrode Process. S. M. Silverstein, R. P. Sopher and P. J. Rieppel. Battelle Memorial Institute. *U. S. Office of Technical Services*, PB 131689, Mar. 1956, 30 p. $1.

Mn-Ni-Mo-V and Mn-Mo-V ferritic steel filler wires with improved cracking resistance. Additions of 0.30% misch metal to the experimental filler wires improved the cracking resistance and notch toughness of the weld deposits. Titanium additions, when controlled very closely, had significant effects on notch toughness of the deposited weld metals. (W29h, Q23s; ST, *Mn, Mo, Ni, V*, 9-72)

132-W. (Book.) Hitchcock's Machine and Tool Directory. 926 p. 1959. Hitchcock Publishing Co., 222 E. Willow Ave., Wheaton, Ill. Free.

Products, toolsteel, trade name and association sections. (W25, T6; TS, 11-67)

133-W. (Translation—BISI, no. 1104.) Raw (Unfired) Converter Bottoms at the Seraing Basic Bessemer Steelworks, Cockerill-Ourgree. R. S. Schuermans and J. Van Neste. *Revue Universelle des Mines*, v. 14, Aug. 1958, p. 270-279.

See item 500-W, 1958. (W18p; RM-h)

134-W. (Translation—BISI, no. 1132.) Modern Hot Blast Cupolas for Steel Melting Plants. N. V. Zinov'ev. *Stal'*, Sept. 1958, p. 796-799.

See item 584-W, 1958. (W18d; ST)

135-W. (Translation—BISI, no. 1161.) The Volklingen Cross-Flow Shaft Kiln for Burning Small Lump Limestone. Werner Heiligenstaedt. *Stahl und Eisen*, v. 77, Apr. 4, 1957, p. 421-426.

See item 184-W, 1957. (W13a, NM-e)

136-W.* Three New Low-Hydrogen Iron-Powder Electrodes. D. C. Smith and W. G. Rinehart. *Metal Progress*, v. 75, Feb. 1959, p. 102-107.

Three new electrodes have been developed for high-strength weldments which

will respond to heat treatments such as are used in aircraft. Tests show that the weld metal matches hardness and tensile strength of the base at tempering temperatures between 450 and 1250° C. (W29h, Q-general; AY, SGB-a)

137-W.* Melting Furnaces. T. Bishop and A. G. E. Robiette. Paper from "Modern Foundry Practice". Philosophical Library, Inc., New York, 1959, p. 142-179.

Characteristics of lift-out, bail-out and tilting crucible furnaces. Arc, induction and resistance electric melting furnaces. Rotary furnaces, air furnaces, openhearth furnaces, converters and cupolas. Recent development in cupola operation. (W18, E10a)

138-W.* Heavy Plate Techniques. *Nuclear Energy Engineer*, Jan. 1959, p. 36-39.

Development of new low-hydrogen electrode "Fortex 35A" for welding 3-in. steel plates, giving welds with substantially higher Charpy impact strengths. (W29h)

139-W. Niobium-Uranium Alloys as Container Material for Molten Uranium Eutectic Alloys. G. W. Powell. Nuclear Metals Inc. *U.S. Atomic Energy Commission*, NMI-1183, Aug. 22, 1958, 20 p. (Available for U. S. Office of Technical Services, Washington 25, D. C.) $.75.

For periods up to one month the useful temperature range of oxidized crucibles of 5% Cb uranium alloy containing molten 5% Cr uranium alloy is from 860 to 950° C. If the oxidizing treatment is carried out so that the oxide layer is constituted wholly of UO_2 instead of U_3O_8 the useful temperature range can be extended to higher temperatures and the crucible life within the 860 to 950° C. interval increased. (W18h, R1h; U, Cb, 17-57, 2-61)

140-W. Automatic Equipment Brazes and Tests 7 Joints in 4 Minutes. *Industry & Welding*, v. 32, Feb. 1959, p. 28-29.

A 50-kw. induction heating machine silver brazes 85 joints an hour in automatic transmission cover assemblies. (W29n, T21, K8k)

141-W. Rolling Medium Width Steel Strip: Steel, Peech and Tozer's Brinsworth Mill. *Metallurgia*, v. 59, Jan. 1959, p. 3-9.

(W23, F23; ST)

142-W. Abrasive Sheets and Belts. Lester F. Spencer. *Metal Finishing*, v. 57, Feb. 1959, p. 52-57.

(W2p, W25c)

143-W. Buying Industrial Heating Equipment. C. F. Olmstead. *Metal Progress*, v. 75, Feb. 1959, p. 65-75.

Improvements in induction heating; vacuum as a furnace "atmosphere"; austempering and martempering practices. (W27, W28s, 1-73)

144-W. An Economic Appraisal of Stainless Steel and Zirconium in Nuclear Power Reactors. Manson Benedict. *Metal Progress*, v. 75, Feb. 1959, p. 76-81.

Zirconium (as Zircaloy) instead of stainless steel as structural material, fuel cladding or fuel diluent in nuclear reactors enables savings to be made through the use of uranium of lower enrichment or reduction in the critical mass. This study included five power-producing thermal reactors chosen to span the entire range of fuel enrichment. (W11p, 17-57; SS, Zr-b)

145-W. (Italian.) Water-Cooling Systems for Cupolas. C. Longaretti and C. Pensotti. *Fonderia Italiana*, v. 7, Oct. 1958, p. 367-386. 35 ref.

Construction and operational details of various types of installations. Influence of water cooling on furnace productivity, duration of fusion, refractory and coke consumption, temperature of bath and slag production. Water requirements, heat losses due to cooling. 35 ref. (W19m, W18d)

146-W. (Japanese.) Research on Plaster Molds. Chuyo Hisatsune and Akira Shimizu. *Japan Foundrymen's Society, Journal*, v. 30, Dec. 1958, p. 974-980.

Permeable plaster mold and its additives studied by differential thermal analysis and X-ray diffraction. 4 ref. (W19g; NM-f43)

147-W. (Japanese.) Low Frequency Induction Crucible Furnaces. Shunpei Amitani. *Japan Foundrymen's Society, Journal*, v. 30, Dec. 1958, p. 981-990.

Principle, classification, heating index, skin effect, speed of melting, motion of the molten metal, advantages and disadvantages of the furnace and application to some special metals. (W18c, 1-69)

148-W. Roller Hearth Furnace for Continuous and Batch Annealing of Stainless Steel Tubes. E. A. Hasnip and M. P. Shaw.

Process Control and Automation, v. 6, Jan. 1959, p. 8-14.
(W27g, J23, 1-61, 1-62; 4-60, SS)

149-W. (German.) Foundry Machinery and Equipment. Rudi Hach. *Freiberger Forschungshefte*, no. B31, 1958, p. 259-287.
(W19)

150-W. (German.) Frequency Induction Furnaces for Small Stampings and Bolts. G. Ritzerfeld. *Metall*, v. 12, Dec. 1958, p. 1118-1123.
Equipment used for cylindrical stampings and forgings up to 300 mm.diameter. (W27k, J2g, T7f)

151-W. (German.) Mechanization and Automation in a Steel Mill. Karl Heinz Huser. *Stahl und Eisen*, v. 79, Jan. 22, 1959, p. 65-73.
(W23, 18-74)

152-W. (German.) Air and Gas Preheating in Triple Gas Openhearth Tilting Furnaces as Influenced by Regenerator Design. Heinz Voigt and Gerhard Schmalhaus. *Stahl und Eisen*, v. 79, Jan. 22, 1959, p. 80-88.
7 ref. (W18r, 17-51)

153-W. (Russian.) Conditions Affecting Preparations of Porous Chromium Electrodes. N. N. Voronin and S. V. Trachuk. *Ukrainskii Khimicheskii Journal*, v. 24, no.5, 1958, p. 575-580.
7 ref. (W3h; Cr)

154-W.* (English.) Liquid Hardening Media. *Aciers Fins & Speciaux Francais*, no. 30, Dec. 1958, p. 49-55.
Physical properties and quenching characteristics of water, aqueous solutions, quenching oils, molten salt baths and molten metal baths. Types of oils. (W28p, J26)

155-W.* (Russian.) Recirculation-Type Recuperative Steelmaking Furnace. M. A. Glinkov and G. I. Demin. *Stal'*, Jan. 1959, p. 24-31.
Quality of metal produced in the recirculation-type recuperative steel melting furnace is not inferior than that produced in openhearth furnaces. The use of the recirculation-type recuperative furnace may prove to be particularly effective when melting low-carbon metal, where the sum of C + Mn + S + P is less than 0.075%. 4 ref. (W18r, D2)

156-W.* (Russian.) Roll Pass Designing and Rolling Shapes of Alloy Steels. M. V. Shuralev and S. G. Nekrasov. *Stal'*, Jan. 1959, p. 58-63.
Necessary to take into consideration the higher properties of alloy steels in comparison with ordinary carbon steels. These include higher resistance to deformation, widening and shrinkage. (W23k, F23, 17-51; AY)

157-W.* A New Concept of Weld Metal for High-Strength Fabrication. D. C. Smith. Paper from "New Fabrication Techniques". American Society for Metals, Cleveland, 1958, p. 54-62.
Properties of three commercial, heat treatable electrodes developed for welding of SAE 4130, 4140 and 4340 steels. Low-hydrogen iron powders make it possible to add limited amounts of C to the covering and recover enough in the weld deposit to raise the C content to about 0.25% without impairing the weldability characteristics of the electrodes. Tensile strength of the deposit is raised to that of the base metal of higher C content. (W29h, K1; ST, C)

158-W. Cleaning Iron Oxide Fumes With a Bag Filter. Pilot-Plant Tests by British Oxygen Research Development, Ltd. K. H. Sargent. *Iron and Coal Trades Review*, v. 178, Jan. 9, 1959. p. 79-85.
Experiments provide basis for design when handling oxide fume generated by oxygen lancing. 20 ref. (W13c, A8a; ST)

159-W. (English.) Anzin Works of the Tubes Division of the Lorraine-Escaut Group. *Aciers Fins Speciaux Francais*, no. 30, Dec. 1958, p. 99-107.
Special steels, rolling mills and forging mills for production of tubes; cold drawing and heat treatment; inspection facilities. (W23h, F26)

160-W. (Russian.) Improved Brick Linings for Electric Furnaces. A. N. Glazov and V. I. Mesyats. *Metallurg*, Jan. 1959, p. 14-19.
(W18a; RM-h)

161-W. (Russian.) Rational Design of Blast Furnace Hearth Bottoms. B. N. Zherebin and N. V. Krepyshev. *Stal'* Jan. 1959, p. 10-14.
Air cooling of a blast furnace hearth bottom, applied under conditions of intensified operation, reduces the temperature and eliminates formation of cracks. 6 ref. (W17g; RM-h)

162-W. (Russian.) Rationalization of Conditions for Charging Raw Materials Into a

Blast Furnace. V. A. Sorokin. *Stal'*, Jan. 1959, p. 15.

Modified structure for charging raw materials into a blast furnace. (W17g, D1a, 1-52)

163-W. (Russian.) Mastering the Rolling of Stainless Steel Profiles. S. G. Terent'ev. *Stal'*, Jan. 1959, p. 64-67.

To overcome difficulties in rolling slitted shapes of stainless steel it is necessary to select a suitable material for manufacture of rolls with different pass design and to adjust carefully the guide accessories. (W23k, F23, 17-51; SS)

164-W.* High Volume Molten Metal Holding. *Modern Metals*, v. 15, Feb. 1959, p. 36, 38.

Seventy-five melting and holding furnaces having a total holding capacity of more than 700,000 lb. of hot metal are the key to Ford's volume production of die and permanent mold cast engine and transmission parts. (W19a, T21b, T21c; 5-61, 5-63, Al-b, 17-57)

165-W.* Compact Furnace Anneals Strip. D. L. Somers and C. A. Turner. *Iron Age*, v. 183, Feb. 26, 1959, p. 94-95.

Continuous annealing furnace for stainless steel strip provides controlled atmosphere and temperatures up to 2100° F. (W27n, J23n, 1-61; SS, 4-53)

166-W.* (German.) Aluminum Bronze Drawing Dies and Steel Dies Compared. K. Keller. *Werkstattstechnik*, v. 49, Jan. 1959, p. 55-59.

Deep drawing properties of three stainless steel dies (austenitic and ferritic), several steel dies, and of four copper-base die alloys. Less friction is produced by bronze dies permitting less expensive lubrication to be used. 6 ref. (W24n, 17-57; SS-d, SS-e, SGA-j, Cu-b, *Al, Fe, Mn, Si, Ni*)

167-W. The Expansion Program at Sparrows Point. Engineering and Mechanical Aspects. George C. Little. *Iron and Steel Engineer*, v. 36, Feb. 1959, p. 69-79.

Facilities for steel production and working; erection problems; design of openhearth furnaces, soaking pits and slab mills. (W18r, W20g, W23a, 18-70)

168-W. Jones & Laughlin Cleveland Works. T. J. Ess. *Iron and Steel Engineer*, v. 36, Feb. 1959, p. 85-104.

Characteristics of coke plant, blast furnace, openhearth furnace, blooming mill, strip mill, hot finishing, pickling, cold mill, annealing and temper mill facilities. (W18a, W17g, W18r, W23, 18-67)

169-W. (French.) Melting of Copper Alloys. Rene Liseau. *Fonderie*, no. 156, Jan. 1959, p. 3-13.

Various types of fuel heated and electric melting furnaces. (W18, E10; Cu-b)

170-W. (German.) Design and Service Life of Forming Tools. K. Sieber. *Werkstattstechnik*, v. 49, Jan. 1959, p. 49-55.

Relationship between shape of dies and forming process; wear and cracking of dies; materials for dies. (W24n, G-general, 17-51)

171-W. (Italian.) Graphite Crucibles. *Fonderia*, v. 7, Nov. 1958, p. 497-498.

Maintenance, use, handling; heating. (W18h, NM-k37)

172-W.* Nickel-Base Alloy for High-Temperature Heat Treating Equipment. L. M. Griffore. *Metal Treating*, v. 10, Jan-Feb. 1959, p. 10-14, 40.

Use of Hastelloy X in trays, hearth rollers and radiant heating tubes. Oxidation resistance and tensile strength at elevated temperatures. Welding and machining procedures. (W27p, W28a, 17-57; Ni-b, SGA-h)

173-W.* Van der Horst Evaluates Titanium Tubing for Heating and Cooling Chrome Solutions. *Products Finishing (London)*, v. 23, Feb. 1959, p. 59-60, 62.

Titanium provides good heat exchange and corrosion resistance (W13b, 17-57, R7g; Ti-b, 4-60)

174-W. (Book.) Filler Metals for Joining. Orville T. Barnett. 244 p. 1959. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $7.

Fillers for arc welding, gas welding, thermit welding, brazing and soldering. Emphasis on iron powder electrodes, automatic welding wires and soldering filler wires. (W29h, SGA-f)

175-W. (Translation.) Design and Construction of the Openhearth Furnace. G. Grenier. *Iron and Coal Trades Review*, v. 178, Jan. 16, 1959, p. 149-152. (From *L'Echo des Mines et de la Metallurgie*, no. 6, 1958, p. 365-367.)

See item 495-W, 1958. (W18r, 17-51)

176-W. (Translation—BISI no. 769.) Results of Testing the Mode of Operation of Blooming Mills. Werner Nurnberg. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1593-1607.
See item 53-W, 1958. (W23a, W23n; 4-52, ST)

177-W. (Translation—BISI no. 811.) Continuous Pusher-Type Heating Furnace With Fully Automatic Control. Josef Heimerl. *Stahl und Eisen,* v. 77, Dec. 26, 1957, p. 1873-1877.
See item 106-W, 1958. (W20h, 1-61; ST, 5-59)

178-W. (Translation—BISI no. 853.) Selection of Tool Steels for Hot Working. J. Klarding. *Metall,* v. 12, Jan. 1958, p. 12-20.
See item 213-W, 1958. (W19g, W19n, 17-57, E14; ST)

179-W. (Translation—BISI no. 883.) Automatic Regulation of Hot Blast Stove Heating. L. V. Brodetsky and P. Q. Pikalov. *Stal',* Jan. 1958, p. 21-22.
See item 278-W, 1958. (W17g, D1)

180-W. (Translation—BISI no. 988.) Experience in Designing and Operating Evaporative Cooling of Metallurgical Furnaces. S. M. Andonyev. *Stal',* Mar. 1958, p. 271-280.
See item 369-W, 1958. (W10f, 17-51)

181-W. (Translation—BISI no. 1042.) The New Openhearth Steel Plant No. 3 of the Hoesch-Westfalenhutte A. G., Dortmund. Hans von der Warth. *Stahl und Eisen,* v. 78, Jan. 23, 1958, p. 79-87.
See item 154-W, 1958. (W18r, D2, A5b, 10-55)

182-W. (Translation—BISI no. 1064.) New Method of Vibrating Converter Bottoms. Ernest Glaesener. *Stal und Eisen,* v. 78, Aug. 21, 1958, p. 1169-1175.
See item 518-W, 1958, (W18p; RM-h)

183-W. (Translation—Brutcher no. 4372.) Design of a Vacuum Installation for Pouring Ingots of up to 120 Tons. V. K. Novitskii. Paper from "Problems of the Use of Vacuum in Metallurgy". Moscow, 1958, p. 107-111.
Vacuum chamber for pouring steel ingots weighing up to 132 net tons. Design details of vacuum chamber proper, the cover, the pouring ladel. (W19e, D9, 1-73)

184-W.* Compound Core Movements in Die Casting Dies. H. K. and L. C. Barton. *Machinery (London),* v. 94, Feb. 25, 1959, p. 439-449.
Core designs for compound core withdrawal. (W19n, 17-51)

185-W.* (German.) Reactions Between Solid Materials and Their Application to Arc Welding. O. Knotek. *Metall,* v. 13, Feb. 1959, p. 96-103.
Testing electrode coating materials by sintering techniques; welding electrodes with sintered cores. 12 ref. (W29h, K1a)

186-W.* (German.) Trends in Power and Blast Generation for Iron and Steel Works. Richard Simon. *Stahl und Eisen,* v. 79, Feb. 19, 1959, p. 199-204.
New trends in pig iron and steel ingot production related to power requirements in blast furnace operations. 30 ref. (W11g, D-general)

187-W.* Steel Based Compound Cuts Tool Cost 85%. *Production,* v. 42, Sept. 1958, p. 48-49.
Powdered metal bonded by thermosetting plastic produces punch and die set for prototype draws. (W24p, W24n; ST, NM-d30, 6-72)

188-W.* Arc Melting of Reactive and Refractory Metals. Maurice Cook and E. Swainson. *Institute of Metals, Journal,* v. 87, Feb. 1959, p. 161-173.
Historical development of techniques and equipment. Various types of arc furnaces with cooled crucibles and provision for melting in vacuum or under protective atmosphere. Design of consumable-electrode nonpouring furnaces. Applications. 43 ref. (W18s, C5h, 1-73; EG-d)

189-W.* The Recirculating Steel Melting Furnace as a New Unit for Producing Low Carbon Steel. Mark A. Glinkov. Paper from "Annealing of Low Carbon Steel, Proceedings". Lee Wilson Engineering Co., Inc., Cleveland, Oct. 1957, p. 43-50.
Application of recirculating principle to various types of furnaces. Steel can be easily produced with low C+Mn+S+P which is highly suitable for electrical purposes. 6 ref. (W18g, D10; CN-g)

190-W.* Rotary Melting Furnaces. *Automobile Engineer,* v. 49, Feb. 1959, p. 78-80.
Design, operation and uses of rotary and tilting types. (W18b)

191-W.* Composition and Application of Anodes. D. J. Fishlock. *Metal Finishing,* v. 57, Mar. 1959, p. 55-59.

Characteristics of inert anodes for Cr, Cd and Ni plating. 22 ref. (W3h; Pb-b, Ti, ST, SS, C)

192-W.* Trends in Furnace and Equipment Design. Lester F. Spencer and Charles Weiner. *Tooling & Production*, v. 24, Mar. 1959, p. 53-56.

Trends in heat treating and general classes of furnaces and components used. (W27)

193-W.* Air-Cooled Crucibles for Cold Mold Arc Melting. M. M. Kirk, P. C. Magnusson and G. L. Schmidt. *U. S. Bureau of Mines, Report of Investigations*, no.5443, 1959, 23 p.

Forced-air cooling of cold mold arc furnaces for melting Zr and similar metals investigated and found to be practical from the standpoint of heat transfer. This technique offers significant reduction in explosion hazard from that inherent in water cooling. (W18s, W18h; Zr)

194-W. A Russian Fine Wire Rolling Mill. O. Terder. *Iron and Steel*, v. 32, Feb. 1959, p. 44.

A 12-stand mill for the continuous rolling of fine wire developed by the Ministry of Machine Construction of the U.S.S.R. (W23, 4-61)

195-W. Cold Heading. *Iron and Steel*, v. 32, Feb. 1959, p. 53-54.

New four-blow progressive header having one shearing and four subsequent heading stations produces high-tensile bolts. (W24j, 1-67)

196-W. Mannesmann's New Seamless Mill at Saulte Ste. Marie. Robert Hartenstein and Astor L. Thurman. *Iron and Steel Engineer*, v. 36, Feb. 1959, p. 139-148.

(W23h, 18-67)

197-W. Remote Position Control of Screwdown Drives of Primary Rolling Mills. L. N. Bramley, F. Seredynski, L. J. Chant and G. K. Steel. *Iron and Steel Institute, Journal*, v. 191, Feb. 1959, p. 176-185.

6 ref. (W23p, 18-74)

198-W. Application of Remote Position Control to Forges. L. J. Chant and F. Seredynski. *Iron and Steel Institute, Journal*, v. 191, Feb. 1959, p. 185-191.

(W22p, 18-74)

199-W. Economic Advantages of Gas-Fired Heat Treating Furnaces. F. C. Schaefer. *Metal Treating*, v. 10, Jan-Feb. 1959, p. 2-3, 35, 48-50.

(W27g)

200-W. Vacuum Furnaces Aid Heat Treatment. *Metal Treatment and Drop Forging*, v. 26, Feb. 1959, p. 72.

Normal operating temperature is around 1200° C. Provision is made for the forced cooling of the furnace by introducing argon or hydrogen into the chamber. (W27, 1-73)

201-W. Vibration-Controlled Hammer. Rolt Hammond. *Metal Treatment and Drop Forging*, v. 26, Feb. 1959, p. 73-76, 78.

Vibrations in the forging process; design of foundations to minimize vibration and noise. (W22b)

202-W. (German.) Medium-Frequency Induction Furnaces. *Giesserei-Praxis*, no. 4, Feb. 25, 1959, p. 69-72.

Advantages of the medium-frequency induction furnace include fast melting, uniform bath composition and temperature as a result of electrodynamic mixing. (W27K)

203-W. (German.) Graphite Consumption During the Melting of Alloy Cast Iron in the 300-Kg Graphite Bar Electric Furnace. Karl Wagner. *Giesserei*, v. 46, Feb. 26, 1959, p. 114-116.

Scaling losses of the current-carrying graphite sections of the furnace. Service life of graphite bars and contacts. (W18, E10; NM-k36)

204-W. (German.) Power and Blast Generating Plants in Four Iron and Steel Works. *Stahl und Eisen*, v. 79, Feb. 19, 1959, p. 185-187.

Specific power requirements per ton of pig iron produced. (W11g, D-general)

205-W. (Hungarian.) Fundamentals of Molding Box Design. Imre Szilagyi. *Kohaszati Lapok-Ontode*, v. 91, Sept. 1958, p. 215-219.

Guide bushings and pins, recommended sizes, shapes and materials. (W19g)

206-W. (Italian.) Furnace Roofs. *Refrattari*, Dec. 1958, p. 93-101.

Thermal, static, chemical and structural problems of roof design. Refractories for openhearth, electric arc and heating furnace roofs; behavior or refractories during furnace operation. 5 ref. (W18r, W18s, W27; RM-h)

207-W. (Russian.) Coatings for Arc Welding Electrodes. A. A. Brokhin. *Svarochnoe Proizvodstvo*, Jan. 1959, p. 16-20.
6 ref. (W29h)

208-W.* (Polish.) Heat Conductivity, Expansion and Reactivity of Carbon Materials Used in Blast Furnace Brickwork. Eugeniusz Mazanek and Jan Janowski. *Hutnik*, v. 25, Nov-Dec. 1958, p. 447-456.
Results indicate great advantages in using carbon materials for brickwork of lower part of blast furnaces. Good heat conductivity of carbon bricks secures adequate heat removal. 13 ref. (W17g; RM-h, C)

209-W.* (German.) Construction and Design of Die Casting Dies. A. Hohmann. *Giesserei Praxis*, no. 5, Mar. 10, 1959, p. 77-78.
Toughness, heat resistance and service life are determined by steel type, hardening and heat treatment. (W19n, 17-51, 2-64)

210-W.* (Hungarian.) Operation and Metallurgy of Basic-Lined Cold Blast Cupolas. Ferenc Varga. *Kohaszati Lapok-Ontode*, v. 91, Oct-Nov. 1958, p. 235-242.
Preliminary experiments in 300 and 800-mm. and subsequent production-type operations in 900 and 1300-mm. diameter basic lined cupolas; wear resistance of magnesite, dolomite, corundum and acid linings. 8 ref. (W18d; RM-h38)

211-W. Which Welding-Power Source Should You Buy? C. A. McClean. *Iron Age*, v. 183, Mar. 26, 1959, p. 143-150.
(W29a)

212-W. Starch Content Effect on a Rammed Graphitic Mold Material for Casting Titanium. H. W. Antes and R. E. Edelman. *Modern Castings*, v. 35, Mar. 1959, p. 97-102.
(W19g, E-general; Ti)

213-W.* (German.) Czechoslovakian Experiences With Blast Preheaters Installed in Cupola Furnaces. Bretislav Sochor. *Freiberger Forschungshefte*, v. B30-2, 1958, p. 119-132.
New stoves installed in cupola furnaces work very satisfactorily. Since the blast preheating temperature does not exceed 400° C. they can be manufactured of ordinary boiler sheets. (W18d, W17m)

214-W.* Honeycomb Sandwich Fixtures at 2000° F. Frank J. Filippi. Paper from "ASTE Collected Papers", v. 58, Book no. 2, Paper no. 132. American Society of Tool Engineers, Detroit, 1958, 8 p.
Design of firing fixture and retort for brazing honeycomb sandwich in a controlled atmosphere. Pneumatic fixtures. (W29k, K8j, 2-62, 1-71; 7-59, SS)

215-W.* (Czech.) Crushing of Ferromanganese With the Help of Electrical Current. Josef Stloukal. *Zvaranie*, v. 8, Jan. 1959, p. 25.
Ferromanganese is crushed between two Cu plates moved in parallel directions while a transformer current passes. (W15n; AD-n31, *Mn*)

216-W. Review of Aluminum Cranes. A. H. Koepf. *Iron and Steel Engineer*, v. 36, Mar. 1959, p. 69-88.
Weight reduction effect of Al construction for overhead traveling cranes makes possible higher material handling rates by permitting higher bridge and trolley accelerations and speeds. (W12q; Al, 17-57)

217-W. Reactor Metallurgy. Bettis Technical Review, No. 10. *U. S. Atomic Energy Commission, WAPD-BT-10*, Oct. 1958, 115 p. (Available from U. S. Office of Technical Services, Washington 25, D. C. $2.75.
Covers fabrication, mechanical properties and corrosion of structural materials and fuel elements. Papers abstracted separately. (W11p, T11)

218-W. (Italian.) Use of Electric Induction Furnaces in Italy. *Fonderia*, v. 8, Jan. 1959, p. 7-17.
(W18a)

219-W. (Italian.) Controlled Atmospheres. Pt. 3. *Trattamenti Termici*, v. 2, Jan-Feb. p. 19-21, 27.
Atmospheres based on fuel gas reactions. Exothermic gas generators, operations, gases produced. (To be continued.) (W28q)

220-W. (Russian.) Flat-Bottom Ladles for Hot Pig Iron. G. I. Gerasimof, F. A. Korablin, V. M. Nemkin and V. A. Lednov. *Stal'*, Feb. 1959, p. 110-111.
Flat-bottom ladles are more economical and convenient than those with spherical bottoms. (W18n)

221-W. (Russian.) Operation of One-Way Fired Recuperative Soaking Pits. M. E. Boiko, V. S. Gulunov and I. M. Ezikov. *Stal'*, Feb. 1959, p. 170-175.
6 ref. (W20g)

222-W. (Russian.) Use of Central Molds Made of Cast Iron With Spheroidal Graphite. A. B. Bobrov and A. A. Sinitsyn. *Stal'*, Feb. 1959, p. 189-191.

Molds made from magnesium-inoculated cast iron are 2.17 times more durable than those fabricated from gray iron. Mold strength is reduced without heat treatment or when poured from cupola with excessive Mn, phosphorus or sulphur content. 4 ref. (W19c; CI-r, AD-p36, *Mg, P, S, Mn*)

223-W.* Filler Metals for Joining. Orville T. Barnett. *Welding Engineer*, v. 44, Apr. 1959, p. 48-50.

Classification of steel filler wires and electrodes; mechanical properties of weld metals deposited by rods or wires using submerged-arc or gas-shielded process. (W29h, K1d, K1e; ST)

224-W. (Translation.) Reheating Furnace for Alloy Steel. M. R. Courdille. *Iron and Coal Trades Review*, v. 178, March 6, 1959, p. 561-564. (From Centre de Documentation Siderurgique, CIT, no. 5, 1958.)

Advantages and disadvantages of walking beams and notches for moving items along the hearth. (W20h, W12, F21b, AY)

225-W. (Translation—BWRA.) Electrical Circuits of Machines for Resistance Welding of Thin Metal. M. P. Zaitsev. *Avtomaticheskaya Svarka*, v. 65, Aug. 1958, p. 83-88.

New circuit for a seam welding condenser machine enables high welding pulse frequency to be obtained with greater efficiency. (K3, 1-52)

226-W.* Vacuum Brazing Furnace Design. G. Jewett Crites. *Industrial Heating*, v. 26, Mar. 1959, p. 462-464, 466, 468, 470, 480, 482, 484, 486, 494.

Equipment details for brazing stainless steel and Ti honeycomb sandwiches in relation to atmospheres, temperature, mechanical and electrical requirements. (W29m, 17-51, K8j; SS, Ti, 7-59)

227-W. Automatic Controls for Protective Atmospheres. William C. Diman. *Metal Progress*, v. 75, Apr. 1959, p. 79-83.

Automatic proportioning valves, dew point indicators, flash back arrestors, blow-offs, flame controls, temperature regulators, pressure regulators, alarms, flow meters and system interlocks are assembled according to the needs for protecting workmen, equipment and material in progress. (W28q, X7, X13f)

228-W. Loose Abrasive Finishing Machines. Fred T. Hall. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 37-44.

Equipment employs principle of revolving parts through a static mass of loose abrasive. (W2s)

229-W. Plating Rack Design and Insulation. Frank J. Klein. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 135-138.

Use of synthetic resin coatings and plastisol as plating rack coatings and insulating material. (W3g, 17-51)

230-W. Annealing and Dies in Process Drawing of Wire. A. Mohrnheim. *Wire and Wire Products*, v. 33, Dec. 1959, p. 1465-1468B, 1507-1508.

Modern process drawing requires the calculation of the minimum number of drawing dies and annealing steps. Practical methods can determine, by ordinary calculating means, die sizes, length and speed of wire and the diameters of the take-up drums. 6 ref. (W24n, F28)

231-W. (German.) Melting Furnaces for Nonferrous Metals. H. Boswinkel. *Metall*, v. 13, Apr. 1959, p. 299-305.

Various furnace types, characteristics, production data, economy. 9 ref. (W18; EG-a38)

232-W. (German.) Continuous Annealing of Steel Strip Coils. Hans-Joachim Pohle. *Stahl und Eisen*, v. 79, Mar. 19, 1959, p. 361-362.

Substitution of the new rotary-type furnace for the conventional batch-type annealing furnace increases capacity ten-fold and integrates all pretreatment and annealing processes, which are performed in an automatic sequence. (W27h, J23, 1-63; CN, 4-53)

233-W. (Slovakian.) Nonrotating Power Supplies for the Automation of Argon-Shielded Arc Welding. Pavel Zuffa. *Zvaranie*, v. 8, Feb. 1959, p. 41-43. (W29a, 18-74, K1d)

234-W.* Modern Heat-Treatment Equipment. L. G. W. Palethorpe. *Wild-Barfield Heat-Treatment Journal*, v. 7, Mar. 1959, p. 2-8.

Batch-type controlled-atmosphere, shaker-hearth furnace, rotary-drum furnace and mesh-belt conveyor furnace. (W27)

235-W.* Basis of Selection of Quench Media. R. H. Lauderdale. Paper from "Quenching of Steels". American Society for Metals, Cleveland, 1958, p. 51-66.

Hardenability of steel; section size and symmetry; dimensional tolerances and mechanical property requirements. Quenching with water, water spray, water-base solutions, oil and compressed air. Effect of agitation. (W28p, J26n, J5; ST, SS)

236-W.* (Czech.) Effect of Composition on Quality and Mechanical Properties of Welds With 25% Cr, 20% Ni Type Electrodes. Jaroslav Vidrma. *Zvaranie*, v. 8, Mar. 1959, p. 85-88.

Effects of carbon, Si, Mn, phosphorus and sulphur and of the molecular ratio between these elements on the quality of weld metal. Influence of electrode coating. 6 ref. (W29n, K1, 2-60; SS-e, *Cr, Ni, P, S, C, Si*)

237-W.* (Czech.) Structural Changes in Weld Metal Used in High-Pressure Steam Equipment. Karel Lobl and Jaroslav Jezek. *Zvaranie*, v. 8, Mar. 1959, p. 88-91.

Various weld metals tested for structural stability and classified according to their suitability at various service temperatures and under service conditions. 5 ref. (W29h; AY, 3-71)

238-W.* (Slovakian.) Austenitic Electrode VUS-EA3 for Weldments Exposed to High Temperatures and Pressures. Stefan Horvath. *Zvaranie*, v. 8, Mar. 1959, p. 78-85.

Development of VUS-EA3 and tests performed with various core and coating materials. 6 ref. (W29h, 2-62; SS-e, *Mn, Cr*)

239-W. Recent Developments in Weld Electrodes. W. P. Campbell. *Canadian Metalworking*, v. 22, Apr. 1959, p. 58-60, 62-63.

Iron powder, low-hydrogen and heat treatable electrodes. 10 ref. (W29h)

240-W. No. 3 Openhearth Shop of Hoesch-Westfalenhutte A. G., Dortmund. Ernst Wiegand. *DEMAG News*, no. 151, 1958, p. 1-7.

History of the Ruhr area, present status of DEMAG plant. (W18r, D-general, A2)

241-W. DEMAG Electric Furnaces in Steel Foundries. R. Genwo. *DEMAG News*, no. 151, 1958, p. 7-15.

Development of DEMAG furnaces, operational costs of modern types. 8 ref. (W18s, D5, 17-53)

242-W. Non-Sparking Trolley Wheels Developed for Hazardous Locations. *Industrial Gas*, v. 37, Apr. 1959, p. 12-13.

Beryllium-copper components, heat treated at low temperature in gas oven, wear as well as steel. (W12r, Q9n, J27; Cu-b; *Be*, 17-57)

243-W. Progress With Basic Roofs for Open Hearth Furnaces. Pt. 1. *Industrial Heating*, v. 26, Mar. 1959, p. 571-572, 574, 576, 578.

Roof lives vary from less than silica average to three times the silica average, with the average figure less than double that of silica. (W18r, RM-h38)

244-W. Open Hearth Bottoms and Pouring Aisle Refractories. Pt 1. *Industrial Heating*, v. 26, Mar. 1959, p. 580, 582, 584, 586, 588.

New bottom practice and installations for openhearth furnaces; quality control in pouring through improved refractory nozzles. (To be continued.) (W18r, RM-h38)

245-W. Remote Control Aids Rolling Mill. *Iron Age*, v. 183, Apr. 23, 1959, p. 104-105.

Four different roll combinations permit rolling of nuclear fuel elements in a glove-box enclosure. (W23, T11g)

246-W. To Select a Reactor Use Systems Engineering. Joseph F. Skelly. (Paper no. 1 from Symposium on Fluid Bed Reactors, University of Arizona, p. 25-33.) *Mining World*, v. 21, Apr. 1959, p. 27-28.

Relating the reactor to the mineral handling installation. (W15)

247-W. Induction Heating Equipment Is Fast, Flexible, Economical. *Steel*, v. 144, Apr. 6, 1959, p. 146-149.

(W27k)

248-W. (French.) Welding Equipment and Welding Materials. Ilie Vasile and Vladimir Popovici. *Metalurgia si Constructia de Masini*, 1958, p. 56-60.

(W29)

249-W. (French.) Equipment for Welding Rails Using Trolley Wire Current. Petre Stoianovici. *Metalurgia si Constructia de Masini*, 1958, p. 65-67.

4 ref. (W29, T23q)

250-W. (French.) Suitability of D. C. Generators for Welding. Viorel Miklosi. *Metalurgia si Constructia de Masini*, 1958, p. 77-82.
14 ref. (W29a)

251-W. (Italian.) Use of Copper-Beryllium Alloys in Die Casting Machines. *Aluminio*, v. 28, Mar. 1959, p. 141.
Pistons of better wear resistance made of the alloy "Berylco 10". (W19n, Cu-b, *Be*, 17-57)

252-W.* (German.) Aluminum Bronze and Steel Drawing Rings Compared. K. Keller. *VDI-Berichte*, v. 39, 1959, p. 55-59.
For drawing high-alloy Cr-Ni-Mn steels, dies made of special alloys capable of withstanding abrasion are needed. Aluminum bronzes with and without Ni are compared with high-chromium steel, Stellite and carbide tool materials. 6 ref. (W24n; SS, *Cr*, *Ni*, *Mn*, Cu-s, *Al*, 17-57)

253-W.* For Mig Welding Extruded Uranium Welding Wire Proves Best. E. L. Brundige, G. S. Hanks and J. M. Taub. *Welding Engineer*, v. 44, May 1959, p. 58.
Preparation of billets, extrusion and finishing of filler wire. (W29h; U, 17-57)

254-W. Multi-Station Welding a Money Saver When Fabricating Modern Refineries. C. H. Voelker. *Welding Engineer*, v. 44, May 1959, p. 30-31.
Wiring systems used in catalytic crackers. (W29)

255-W. (French-German.) Modernization of the Rolling Mill of the "Fonderie Boillat S.A.". E. Gueissaz. *Pro-Metal*, v. 12, Apr. 1959, p. 124-128.
At Reconvilier, Switzerland. (W23)

256-W. (French-German.) The New Schmitz Rolling Mill. Ph. de Raemy. *Pro-Metal*, v. 12, Apr. 1959, p. 129-137.
Swiss equipment. (W23f)

257-W. (French-German.) Electrical Equipment of the Schmitz Twin Rolling Mill. J. Flach. *Pro-Metal*, v. 12, Apr. 1959, p. 137-141.
Swiss equipment. (W23f)

258-W. (German.) Improved Synchronization and Increased Rotations of Crank-Driven Production Machines. Hanns Kirchbach and Fritz Zeunert. *VDI Zeitschrift*, v. 101, Apr. 1, 1959, p. 385-392.
Improvements demonstrated with reference to a cold rolling mill. (W23f)

259-W. (Italian.) Modern Forging Manipulators. G. Papuli. *Metallurgia Italiana*, v. 51, Mar. 1959, p. 94-100.
(W22)

260-W. Atlas Steel Limited. T. J. Ess. *Iron and Steel Engineer*, v. 36, Apr. 1959, p. A1A16.
Layout of electric furnaces, continuous casting facilities, blooming mill, billet mill, forging department, bar and rod mills, cold draw department, strip mill, annealing department, cold strip mill, tube mill and sheet mill. (W23, W22, W18s, 18-67)

261-W. Recent Developments in Design and Control of Hot Strip Mills. R. W. Barnitz and H. H. Shakely. *Iron and Steel Engineer*, v. 36,
Single stand reversing roughing mills with automatic programming. (W23c, W23p, 17-51, 18-67)

262-W. Recent Furnace Installations. O. D. Rice and R. W. Ewalt. *Iron and Steel Engineer*, v. 36, Apr. 1959, p. 102-110.
Slab reheating furnace for strip and plate mill. Loom reheating furnace for bar mills and soaking pit for blooming mills. (W20g, W20h, 18-70)

263-W. Welding Electrode With Built-In Kinks. Thomas W. Shearer. *Metal Progress*, v. 75, May 1959, p. 95.-
Corrugated electrode compensates for wide trim tolerances by depositing an extra wide weld bead that straddles the seam. (W29h; 4-61)

264-W. Automatic Quenching of Steels. O. E. Cullen. Paper from "Quenching of Steels". American Society for Metals, Cleveland, 1958, p. 67-77.
(W27, W28, J26n, 18-74; ST)

265-W. (German.) Inductive Heating of Light Metals and Steel. Wolfgang Koester. *Zeitschrift fur Metallkunde*, v. 49, Oct. 1958, p. 523-526.
Efficiency of induction heating equipment. (W27k)

266-W.* (Hungarian.) Ore Beneficiation With Magnetic Separators. Laszlo Visnyovszky. *Kohaszati Lapok*, v. 92, Jan. 1959, p. 34-35.
New type of magnetic separator using a-c. permits more effective separation of Fe-containing and refuse ore. (W15r)

267-W.* (Hungarian.) Composition and Properties of Soldering Wires. Elemer Koves. *Kohaszati Lapok,* v. 92, Jan. 1959, p. 38-40.

Soldering wires made of Sn, Pb and Sb alloys permit more rapid soldering operation if fluxing material, consisting of urea-formaldehyde and other resins, is introduced into the wire in an amount of 2-3% by weight. Types of soldering wire, composition of fluxing materials and methods of production. 5 ref. (W29; Sn, Pb, Sb, SGA-f)

268-W.* Equipment Used for Vacuum Melting and Casting in the Iron and Steel Industry. A. S. D. Barrett and M. E. Harper. *Iron and Steel Institute, Journal,* v. 191, Apr. 1959, p. 366-374.

Research and production equipment. Advantages of vacuum melting, degassing and casting. (W18a, W19a, D8m, D9p, 1-52, 1-73)

269-W.* Rule-Steel Dies Stamp Tough Materials. Charles Hazzard. *Metalworking Production,* v. 103, May 1, 1959, p. 774-776.

Thin working edges braced with inexpensive plywood for piercing and blanking operations in tough materials. (W24n, G2g, G2h; ST, Ti, Cu-n)

270-W. (German.) A New Combined Radiation-Convection Recuperator for Hot Blast Cupolas. Gert Wellensiek. *Giesserei,* v. 46, Apr. 23, 1959, p. 236-238.

(W18d)

271-W.* (German.) Moisture Absorption by Basic Carbon Steel Electrodes and Its Prevention. E. Kauhausen and S. Sadowski. *Schweissen und Schneiden,* v. 11, Apr. 1959, p. 115-120.

Tests with electrodes stored in air at various humidities. For coatings, the use of materials producing hydrophobic particle surfaces is advised. Vertical welds obtained from electrodes with less than 1% water content in the coating showed no pores. 10 ref. (W29h, P10m, K1a)

272-W.* (Russian.) Improved Method of Feeding Compressed Air to Openhearth Furnaces. I. M. Koburneev, C. A. Petrov, A. A. Sorokin and I. S. Timoshpol'skii. *Stal',* Mar. 1959, p. 212-214.

Compressed air fed in finely divided streams through small pipes laid inside doghouses is shown to be the most efficient method of supplying air to an openhearth furnace. Method increased roof life, raised furnace's productivity and lowered fuel consumption. (W18r, D2)

273-W. (Russian.) Improved Design Eliminates Hearth and Bottom Cracks in Blast Furnaces. G. G. Oreshkin and V. A. Brilliantov. *Stal',* Mar. 1959, p. 206-208.

Inside and outside surfaces of the hearth bottom are in the shape of spherical segments. To prevent cracking, the earth bottom is designed so that it has an equal thermal conductivity throughout the furnace area. 4 ref. (W17g, 17-51)

274-W. (Russian.) Increased Productivity of Cold Tube-Rolling Mills and Durability of Rolling Equipment. Yu. F. Shevakin, Ya. E. Osada and K. E. Gnezdilov. *Stal',* Mar. 1959, p. 255-258.

New roll designs, developed by the Moscow Steel Institute for cold tube-rolling mills reduces the total pressure of metal upon the rolls, thereby increasing the durability of rolling equipment. (W23k, W23h, 17-51)

275-W.* (German.) Welding Electrodes for Corrosion Resistant Chromium-Nickel Steels. J. P. Kienberger. *Oerlikon Schweissmitteilungen,* v. 17, no. 33, 1959, p. 10-19.

Composition and properties of Cr-Ni steels. Production and testing of electrodes; composition of weld metal produced with various electrodes and resulting properties. (W29h, K1a; SS)

276-W. Republic's Flat Rolled Expansion in the South. L. S. Mobley. *Iron and Steel Engineer,* v. 36, May 1959, p. 94-96.

Alterations and additions to blooming mill were made so that ingots yielding 49-in. wide slabs could be rolled. New units installed include a 4-stand, 4-high tandem cold reducing mill, an annealing department, a single-stand, 4-high temper mill and a continuous galvanizing line. (W23a, W23c)

277-W. Electrical Equipment for a Modern Sheet Temper Mill. D. E. Rea. *Iron and Steel Engineer,* v. 36, May 1959, p. 97-107.

Knowledge of mechanics and possession of sheet work and mill friction test data used to calculate the drive power requirements of a sheet temper mill. 4 ref. (W23c)

278-W. Monolithic Refractory Constructions in Steel Plant Equipment. George D.

Cobaugh and Charles R. Hauth. *Iron and Steel Engineer*, v. 36, May 1959, p. 110-116.

Application of properties of ramming mixes, plastic refractories and castable refractories. (W17, W18, W27; RM-h)

279-W. Tool Steel Pressure Limits Hiked for Impact Extrusions. *Western Metalworking*, v. 17, May 1959, p. 40-41. (W24n, G5; AY, TS, 17-57)

280-W. (German.) New Hot Blast Equipment for Cupolas in Small and Medium Foundries. Ernst R. Becker. *Giesserei-Praxis*, no. 8, Apr. 25, 1959, p. 127-132. (W18d)

281-W. (Hungarian.) Improved Lining Materials for Steelwork Ladles. Ferenc Nagy. *Kohaszati Lapok*, v. 92, Feb-Mar. 1959, p. 70-76.

8 ref. (W19b; RM-h)

282-W. (Italian.) Controlled Atmospheres. *Trattamenti Termici*, Mar-Apr. 1959, p. 17-19.

(To be continued.) (W28q, J2k)

283-W.* Basic Roof in Great Britain. J. Mackenzie. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 211-217.

Roof life, output rate, fuel consumption and costs with basic roofs. 4 ref. (W18r; RM-h38, 17-57, 17-52)

284-W.* The Basic Roof—Problems and Progress. C. W. Cravens. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 239-256.

Performance of openhearth roof arches constructed of cast refractory material. Problems with hard-burned Magnesite brick. (W18r, 17-57; 17-51; RM-h38)

285-W.* Evaluation of Arched Versus Flat Suspended All-Basic Roof for Open Hearth Furnaces. A. H. Sommer. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 228-239.

Design and construction of roofs; roof brick consumption. (W18r, 17-57, 17-51; RM-h38)

286-W.* Progress Report on Flat Basic Roof Installation. J. F. Pollack, L. D. Yager, Harold A. Muttach, M. H. Stadler, Jr., George C. Lawton and H. C. Barnes. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical and Petroleum Engineers, New York, 1958, p. 256-270.

Design and construction of openhearth roof, roof life and furnace output. (W18r, 17-51, 17-57; RM-h38)

287-W.* The Carbon Subhearth. J. E. Smith. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 271-274.

Structure, operating performance and advantages of carbon block subhearth installed under a conventional rammed bottom in openhearth furnace. (W18r, 17-57; RM-h39)

288-W.* New Open Hearth Bottom Installation. M. H. Stadler, Jr., T. D. Hess, George Grosvenor, J. D. Stone and Hobart M. Kraner. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 283-295.

Bottom materials and furnace operation; delays and bottom repairs. (W18r, D2, 17-57; RM-h38)

289-W.* (German.) Heating Methods to Eliminate Scaling of Steel. P. O. Veh. *Industrie-Anzeiger*, v. 81, Apr. 7, 1959, p. 410-412.

Various types of heating furnaces using combustion gases—a mixture of CO_2/CO and H_2O/H as a reduction atmosphere; induction heating. (W20h, R2q, J2k; ST)

290-W.* Open Hearth Furnace Producing 20,000 Tons of Steel Per Month. E. G. Kondas, J. E. Hood, H. A. Parker, J. Anderton and J. T. Clisham. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 422-430.

Furnace design and operating statistics. (W18r, D2, 17-51)

291-W.* Design, Maintenance and Operation of Two-Pass Checkers. J. Anderton. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 430-448,

Design of openhearth furnace regenerator installation; operation and cleaning. 12 ref. (W18r, D2h, 17-51, 18-71)

292-W. Resistance Heating. *Modern Metals*, v. 15, May 1959, p. 72-73.

Simplifies forming of hard alloy aircraft parts; possessed advantages of high heat concentration, cleanliness, economy, adaptability. (W29n)

293-W. Use of Scrap Hoist for Charging Open Hearth Furnaces. MacBeth Sample. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 31". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 47-48.

(W12b, D2a)

294-W. Use of a Supercharger. H. M. Parker. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 49-55.

Equipment results in improved furnace efficiency and scrap melting rates. (W12b, D2a, W12n; RM-p)

295-W. Control of Open Hearth Heat Weight. E. J. Whittenberger. Paper from "Proceedings of the 41st Conference National Open Hearth Steel Committee of the Iron and Steel Division, v. 41". American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, 1958, p. 56-71.

Variables that influence in-motion weighing of charge material. (W12b, D2a, RM-p, CI-a)

296-W. (Czech.) Computations on the Service Efficiency of Electrodes. Jaroslav Vidrma. *Zvaranie*, v. 8, Apr. 1959, p. 101-104.

7 ref. (W29h, 17-52)

297-W. (Czech.) The Problem of Weld Surfacing in Steel Mills. Manufacture of a Continuous Tubular Electrode. Bohumil Kalita. *Zvaranie*, v. 8, Apr. 1959, p. 108-110.

(W29h, L24)

298-W. (German.) Modern Foundry Plants. Waldemar Gesell. *Industrie-Anzeiger*, v. 81, May 12, 1959, p. 575-578.

(W19m)

299-W.* Ingot Molds—a Critical Survey. K. G. Harris. *British Foundryman*, v. 42, May 1959, p. 230-240.

Examination of chemical composition reveals the importance of carbon in influencing ingot-mold life, while an association of Mn and sulphur at certain optimum temperatures can give rise to defects known as "scruff marks". Trace elements, in particular Pb and Cr, have a deleterious effect on mold life. 7 ref. (W19c, D9k)

300-W.* What Makes a Good Steel Shot. Charles E. Carlin. *Metal Progress*, v. 75, June 1959, p. 83-86.

Microstructure is a good clue to the life of the shot used in blast cleaning or peening metal parts. Life, hardness and size distribution of the shot affect the efficiency of blasting operations. (W2a, L10c; ST)

301-W. BCIRA Experimental Cupola. *Foundry Trade Journal*, v. 106, May 28, 1959, p. 613-622.

Hot blast cupola capable of operating at 800° C. (W18d, E10a)

302-W. Vacuum Brazing Furnace Design. G. Jewett Crites. *Industrial Heating*, v. 26, May 1959, p. 924, 926.

Calculations for enabling the prediction of furnace heating and cooling rates and proper design of insulation. (W29m, 17-51)

303-W. Choosing and Using Resistance Welding Alloys. *Industry & Welding*, v. 32, June 1959, p. 44-45, 55-56.

(W29h, K3; Cu-b)

304-W. Pattern For Better Alloys. *Metal Progress*, v. 75, June 1959, p. 123.

Vanadium-Alloys' new consumable electrode furnace operates under great vacuum, promises higher quality for vacuum melted metals. (W18s, 1-73)

305-W. Basic Roofs on Large Open Hearth Furnaces at Appleby-Frodingham. A. Jackson. *Refractories Journal*, v. 35, Apr. 1959, p. 136-152.

Paper presented at a special technical meetings of the Refractories Assoc. of Great Britain, held at the Iron and Steel Institute, London, Mar. 1959. (W18; RM-h38)

306-W. (French.) Automatic Welding Equipment. *Metallurgie et la Construction Mecanique*, v. 91, Apr. 1959, p. 265-267.

Multiple point welding machines, welding presses. (W29)

307-W. (Japanese.) Progress on the Construction of an Openhearth Furnace Roof. M. Takamuku, K. Okamoto and S. Tamamoto. *Sumitomo Metals*, v. 10, Oct. 1958, p. 216-233.

Vicissitudes of the roof. (W18r; RM-h)

308-W. (Russian.) High-Temperature Hot Blast Stoves for Blast Furnaces. I. D. Kirichenko and E. B. Kochinev. *Stal'*, Apr. 1959, p. 298-304.

(W17m)

309-W. (Russian.) Development of Large Electric Furnaces. *Stal'*, Apr. 1959, p. 331-332.

European and American equipment. (W18s)

310-W. (Russian.) High Durability Inserts for Guides Used in Continuous Rod Mills. I. S. Trishevskii, V. V. Klepanda and A. V. Orlov. *Stal'*, Apr. 1959, p. 342-344.

When cast iron roller guides cannot be used, because of design trouble, friction guides with steel inserts that have a boronized working surface or a Cr-plated surface can be successfully used. Boronized steel inserts prolonged the guide life 13½ times, Cr-plated surface prolonged 7 times as compared with cast iron guides. (W23d)

311-W. New Furnace Bricks Build on Steel's Boom. *Chemical Week*, v. 84, June 20, 1959, p. 105-106.

High-temperature-resistant basic refractories for openhearth furnace roof. (W18r; RM-h38)

312-W. (Japanese.) Ladle Linings in the Manufacture of Electric Steel. U. Ozawa, T. Mutoh and S. Tokoro. *Governmental Industrial Research Institute, Nagoya, Report*, v. 6, Jan. 1957, p. 54.

(W18n, RM-h)

313-W.* (Russian.) Comparative Characteristics of Cast Iron Used for Chill Molds. V. V. Gusev. *Liteinoe Proizvodstvo*, Mar. 1959, p. 26-29.

Cast iron with a spheroidal graphite structure has greater sturdiness for chill molds than cast iron with laminar graphite. Heat resistance of cast iron is determined by its hardness and growth stability. (W19c, Q29n; CI)

314-W. (Translation—BISI no. 1142.) The Work of Planning the Design of a Heavy Plate Rolling Mill. Wilhelm Hilterhaus. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1525-1535.

See item 41-W, 1959. (W23b; ST)

315-W. (Translation—BISI no. 1143.) Assessing the Design and Operation of a Heavy Plate Rolling Mill on the Basis of Operational Results. Paul Diestel. *Stahl und Eisen*, v. 78, Oct. 30, 1958, p. 1536-1545.

See item 42-W, 1959. (W23b; ST)

316-W. One Casting Machine for Aluminum or Zinc. *Precision Metal Molding*, v. 17, June 1959, p. 28-29.

Cold chamber vacuum die casting machine can be used with either metal simply by changing the melting pot. (W19f, E13; Zn, Al)

317-W.* (Russian.) Advantages of Wedge-Shaped Bottoms in Ingot Molds. Yu. V. Zavershinskii. *Stal'*, v. 19, May 1959, p. 413-417.

Wedge-shaped (28-30° to the vertical) bottoms in ingot molds reduce their susceptibility to metal adherence, improve ingots quality and reduce the amount of crop-shear discards. Specific heat impinged by a stream of molten metal on wedged-type bottoms is from 2 to 8 times les than in flat-type bottoms. 3 ref. (W19c)

318-W. Control of Carbon Pickup in Uranium Metal by Induction Furnace Tuning. J. W. Mahaffey. National Lead Co. of Ohio. *U. S. Atomic Energy Commission*, NLCO-768, Feb. 11, 1959, 12 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.50.

Tuning the high-frequency, coreless induction furnaces by adjusting the variable capacitator banks to obtain a standard impedance of 3.3 to 3.6 ohms is an effective means of standardizing these furnaces and provides control of carbon pickup by correct time-power control. (W18a, E10r; U)

319-W. (Russian.) Gland and Pneumatic Packing for Charge Distributor of Blast Furnaces. M. S. Voronov. *Stal'*, May 1959, p. 397-398.

Newly designed packing for revolving distributor of a blast furnace charge gives a much tighter seal of the mechanism when operating at higher gas pressure. (W17g, D1)

320-W. (Russian.) Improved Design of Secondary Circuits for Steelmaking Arc Furnaces. Yu. E. Efroimovich, V. V. Timoshenko and V. P. Tsukanov. *Stal'*, May 1959, p. 421-424.

New design of secondary circuits possess a sharply reduced reactance (1.2-2.5 times) and lowered resistance (10-15%). (W18s)

321-W. (Russian.) Modern Continuous Billet Mill. M. M. Shternov. *Stal'*, May 1959, p. 429-432.

Continuous billet mill with horizontal rolls compared with alternate vertical and horizontal rolls. (W23k, 1-61)

322-W. (Russian.) Mechanism for Feeding of Metal Into Rolls of a Rolling Mill. B. D. Smolovikov and L. Shevchenko. *Stal'*, May 1959, p. 441-443.

(W23p)

323-W. New Quenching Bath Chemical. Mack Gordon. *Metal Treating*, v. 10, May-June 1959, p. 10, 52.

Water soluble chemical which is non-inflammable and has no obnoxious odor. (W28p)

324-W. Arc Phenomena, Basic and Applied. E. W. Johnson. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 101-120.

Behavior of consumable electrode arcs at subatmospheric inert gas pressures and in vacuum investigated to provide a basis for predicting the behavior of vacuum melting arcs. 4 ref. (W18s, 1-73)

325-W. Selection of Power Supply and Methods of Arc Electrode Motion Control. E. J. Borrebach. Paper from "Vacuum Metallurgy". Reinhold Publishing Corp., 1958, New York, p. 121-137.

Atuomatic furnace electrode regulation in vacuum arc furnaces. 3 ref. (W18s, 1-73)

326-W. (German.) Electric Salt Bath Furnaces for the Heat Treatment of Wire. Carl Albrecht. *Draht*, v. 10, May 1959, p. 219-221.

(W27j, J2j; 4-61)

327-W.* Molybdenum-Base Alloy Is Superior Diecasting Die Core Material. *Foundry*, v. 87, July 1959, p. 136-138.

Advantages for Mo cores include decreased downtime for polishing, longer life before heat checking and replacement, and lower scrap from tears on the casting surface. Disadvantages are lack of mechanical strength and ductility, low hardness, low abrasion resistance, sensitivity to thermal shock at lower temperatures. (W19n; Mo-b, 17-57)

328-W. How to Ventilate Electric Arc Furnaces. D. M. Hysinger. *Modern Castings*, v. 36, July 1959, p. 30-32.

Types of exhaust hoods, ventilators and louvers. (W10d, E-general)

329-W. Core Boxes for Shell Cores. J. E. Stock. *Modern Castings*, v. 36, July 1959, p. 71-72.

Reasons for the use of gray iron shell core boxes in preference to those made of Al. (W19g, 17-57; CI-n, Al)

330-W.* Filler Wire for Welding Army Ordnance Armor. S. M. Silverstein, R. P. Sopher and P. J. Rieppel. *Welding Journal*, v. 38, May 1959, p. 232s-240s.

Mn-Ni-Mo-V ferritic steel and a Mn-Mo-V ferritic steel filler wire with desired strength, ductility, crack resistivity, and notch toughness when deposited by inert gas-shielded metal-arc process. Additions of 0.3% misch metal improved the properties. 9 ref. (W19h, K1d, T2g; SS-d, *Mn, Ni, Mo, V*, 4-53)

331-W. New Operational Features on Patricia Blast Furnace at Fairless Works. R. H. White, W. O. Smith and P. E. Hutchings. *Iron and Steel Engineer*, v. 36, June 1959, p. 75-86.

Basic characteristics, electrical controls and instrumentation. (W17g, D1a)

332-W. Mains Frequency Crucible Type Induction Melting Furnaces. *Wild-Barfield Heat-Treatment Journal*, v. 7, June 1959, p. 10-14.

(W18a, W18c)

333-W. (French.) Universal Molds. R. Grunberg. *Metallurgie et la Construction Mecanique*, v. 91, May 1959, p. 371-375.

Recessed and side-block molds used in the U. S. and Soviet Union for die casting of Zn and Al alloys. (W19g, E13; Zn-b, Al-b)

334-W. (German.) Propane Annealing and Hardening Furnace. *Werkstattstechnik*, v. 49, June 1959, p. 332.

Description and service data. (W27g)

335-W. (Polish.) Carbon Linings in Blast Furnaces. Stefan Zielinski and Wladyslaw

Woznacki. *Hutnik*, v. 26, May 1959, p. 178-186.
20 ref. (W17g; RM-h39)

336-W.* Molybdenum Die Casting Dies. *Precision Metal Molding*, v. 17, July 1959, p. 32, 52-53.
Melting and machining properties make sintered Mo attractive. (W19n; Mo, 6-71, 17-57)

337-W. (Book.) A Treatise on the Internal Mechanics of Ball, Tube and Rod Mills. H. E. Rose and R. M. E. Sullivan. 258 p. 1958. Chemical Publishing Co., Inc., 212 Fifth Ave., New York. $6.
Ball, tube, road, pebble, batch, grate-discharge, trunnion-overflow, hardinage and airswept mills; open and closed-circuit grinding; dry and wet milling. Power to drive a mill; surging; lifters; vibration frequency spectrum; destruction of gearing. Rose's theory of metal wear; factors affecting ball wear; influence of corrosion. Role of additives in milling. 110 ref. (W15, B13)

338-W. (Russian.) An Industrial Rotary Furnace. A. A. Garkusha and A. Z. Ryzhavskii. *Metallurg*, June 1959, p. 20-21.
(W18b)

339-W. (Russian.) Experience With Roller Coupling Boxes Made From Pipes. A. I. Fridland. *Metallurg*, June 1959, p. 32-33.
Roller coupling boxes previously produced either by forging or of cast iron subjected to cementation can be replaced by couplings made of pipes. (W23)

340-W.* Production of Medium-Sized Ingot Molds. H. P. Millar. *British Foundryman*, v. 52, June 1959, p. 292-301.
Manufacture, usage and failure characteristics of five-ton molds produced for the steeltube industry. Ingot molds should be manufactured from a low-phosphorus, high-carbon iron and be constant in section and free from cold laps, inclusions and shrinkage cavities. (W19c, E19; ST, 9)

341-W.* Developments in Vacuum Sintering Furnaces. M. Donovan. *Powder Metallurgy*, no. 1-2, 1958, p. 104-113.
Vacuum equipment, heating systems and thermal insulators. (W26e, 1-73)

342-W. Simplified Energy Calculations for Multiple Wire-Drawing Machines. F. Liekmeier. *Draht (English Edition)*, no. 41, June 1959, p. 55-59.
Energy requirements for a given drawing process on a certain machine with a known number of drafts and basic drafting plan to determine the drawing speed at which the existing motor is fully loaded. (W24k, F28)

343-W. Plating Drums for Mass-Production Electroplating. Horst von Uslar. *Draht (English Edition)*, no. 41, June 1959, p. 62-64.
Operating methods and equipment. (W3b)

344-W. Design Can Influence Foundry Cooling. H. E. Knowles. *Foundry*, v. 87, Aug. 1959, p. 57-59.
High heat loads ordinarily rule out conventional cooling methods in a foundry. Temperature control is primarily a question of ventilation—putting air in motion either naturally or artificially. (W10f, E-general)

345-W. The Windscale Atomic Piles. Tom Bishop. *Metal Progress*, v. 76, July 1959, p. 105-109.
Ten years ago the British Government built two Pu-producing piles at Windscale, similar to the American piles at Hanford except the coolant was atmospheric air rather than river water. Both of these piles were shut down about a year ago because the graphite moderator was dangerously overheated by "Wigner energy". It is unlikely that the British power-producing piles which use carbon dioxide as coolant and heat-transfer medium will be similarly endangered. (W11p)

346-W. (Dutch.) Seal Test Shutters for Observation Holes in Cupolas. D. H. Soeters. *Metalen*, v. 14, June 15, 1959, p. 168.
(W18d)

347-W. (Russian.) Application of Water-Cooled Mandrel Bars in Disk-Piercing Tube Mills. N. E. Protskii and P. D. Mavrodii. *Stal'*, June 1959, p. 546-550.
Improved design with graduated wall thicknesses prolonged mandrel life 10-15 times. Best results were obtained with mandrels made of 3KH2V8 steel. (W23h, F26q, W24p)

348-W. Foundry Melting Equipment Review—Trends in Nonferrous, Steel and Iron Foundries. Pt. 1. Melting in Nonferrous Shops. D. W. Brown. *Foundry*

Trade Journal (Special Exhibition Issue and Catalog), v. 106, May 1959, p. 15-17.
4 ref. (W18, E10; EG-a38, ST, CI)

349-W. Foundry Melting Equipment Review—Trends in Nonferrous, Steel and Iron Foundries. Pt. 3. Developments in Melting Equipment for Ironfounders. W. J. Driscoll. *Foundry Trade Journal (Special Exhibition Issue and Catalog)*, v. 106, May 1959, p. 20-24.
Lining-less, water-cooled and hot blast cupolas. Electric and other melting furnaces. (W18d, E10; CI)

350-W. Patternmaking Progress. W. D. Hartley. *Foundry Trade Journal (Special Exhibition Issue and Catalog)*, v. 106, May 1959, p. 25-28.
Wood, resin and metal pattern equipment used in the United Kingdom. (W19j)

351-W. Modern Foundry Mechanization. J. Bain. *Foundry Trade Journal (Special Exhibition Issue and Catalog)*, v. 106, May 1959, p. 29-34.
(W19, E-general)

352-W. Clean Air for Foundries. W. H. White. *Foundry Trade Journal (Special Exhibition Issue and Catalog)*, v. 106, May 1959, p. 35-40.
(W10d, E-general)

353-W.* (Hungarian.) Use of Ductile Cast Iron for Steel Plant Ingot Molds. B. Koeroes. *Kohaszati Lapok-Ontode*, v. 42, Apr. 1959, p. 111-113.
Soviet experiments directed at using nodular gray iron to manufacture ingot molds having superior qualities and useful life. 8 ref. (W19c; CI-r, 17-57)

354-W. Ultra High Temperature, High Vacuum Furnace Key to Production of New Materials Having Optimum Properties. *Industrial Heating*, v. 26, July 1959, p. 1346-1358.
New furnace provides for a controlled temperature range of 3000° F. in combination with a high vacuum of the order of 0.1 micron. (W27, 1-73)

355-W. (French.) Normal and Sandwich-Type Tunnel Kilns. M. Korach. *Acta Technica Academiae Scientiarum Hungaricae*, v. 25, no. 1-2, 1959, p. 25-62.
10 ref. (W27)

356-W.* The New Medium-Section Mill at the Cleveland Works of Dorman Long (Steel) Ltd. V. Harrison and V. Stephenson. *Iron and Steel Institute, Journal*, v. 192, June 1959, p. 132-142.
Reheating furnaces, rolling mills, saws, material flow and plant layout. (W23)

357-W. Australia's Largest Blast Furnace. *Australasian Engineer*, v. 51, June 8, 1959, p. 77-78.
(W17g, D1)

358-W. (German.) Welding Wires, Rods and Electrodes. *Aluminium*, v. 35, Aug. 1959, p. 477-479.
Standards and classification. (W29h, S22)

359-W. (German.) Welding, Brazing and Soldering Equipment and Testing Apparatus. Alexander Mattig. *VDI-Zeitschrift*, v. 101, July 1959, p. 939-944.
(W29, S13, 1-53)

360-W. (Russian.) Improved Method of Fettling the Bed of Openhearth Furnaces. A. V. Malakha, I. M. Pokrass, I. I. Bekker and A. M. Ofengenden. *Metallurg*, July 1959, p. 14-17.
New fettling method increases furnace hearth life. (W18r, D2; RM-h)

361-W. (Russian.) 500-Ton Openhearth Furnace Fired With Coke-Oven Gas. M. I. Zidchevskii. *Metallurg*, July, 1959, p. 17-20.
New furnace is heated with coke oven gas and mazut. The furnace is used for scrap-ore melting with an addition of 70% conversion pig iron. (W18r)

362-W. (Russian.) Bell Mouth Installation Between Rolling Stands. V. P. Emel'yanov. *Metallurg*, July 1959, p. 27-28.
The installation of a receiving bell-mouth on the trough just before the rolling stock approaches the stand increased production, thereby eliminating cobbles which resulted when the stock missed the reciving guide. (W23p, F23, ST)

363-W. (Slovakian.) VUS-AS-4 Machine for Production of Electroslag Weldments. Martin Mosny. *Zvaracsky Sbornik*, v. 8, no. 2, 1959, p. 148-193.
(W29, K6)

364-W. Pattern Engineering Materials. J. Edward Olson. *Modern Castings*, v. 36, Aug. 1959, p. 98-102.
New plastic-rubber pattern material withstands pressures and abrasions of

molding operations. Properties and disadvantages of this material. (W19j)

365-W.* (Czech.) Production of Rolls in the Iron Works of Trinec (Czechoslovakia). V. Viochna. *Slevarenstvi*, v. 7, Apr. 1959, p. 131-133.
Production of hardened cast iron rolls 700 mm. in diameter 800 to 1650 mm. long; spheroidal graphite cast iron rolls; spheroidal graphite iron compound rolls for sheet rolling mills. (W23k; CI-r, 17-57)

366-W.* (Czech.) Cast Steel Rolls for Thin Sheet Rolling Mills. A. Sprencl. *Slevarenstvi*, v. 7, Apr. 1959, p. 133-138.
Features of the production of cast alloy steel rolls for rolling thin sheets. New heat treatment involves isothermal annealing at high temperatures. (W23k, J23, F23; AY)

367-W. The B.C.I.R.A. Experimental Cupola Installation. H. J. Leyshon and R. I. Higgins. *British Cast Iron Research Assoc., Journal*, v. 7, June 1959, p. 658-666.
The plant can be used to investigate the widest possible range of cupola problems and can be readily adapted for cold or hot blast melting. (W18d)

368-W. (German.) Low-Shaft Furnace Construction. Walter Koch. *Neue Hutte*, v. 4, July 1959, p. 398-403.
10 ref. (W17h)

369-W. Rolls Stand Up for Three Years in High-Temperature Furnace. *Industrial Gas*, v. 38, Aug. 1959, p. 9.
Centrifugally cast from 22H alloy, the 10-in. diameter rolls withstand temperatures of 2150° F. without replacement for a period of three years. (W20h, W12r, 17-57; SS)

370-W. New Improvements in B & P Rolling Mill Process. *Magnesium*, Aug. 1959, p. 1-4.
Equipment and layout of Brooks & Perkins new Mg rolling mill. (W23, F23; Mg)

371-W. Gunned Materials Increase Lining Life in Electrics. Ralph E. Forsman. *Steel*, v. 145, July 27, 1959, p. 114, 116.
Refractories are blended with water in a nozzle mix gun and applied between heats. They are sprayed on thin spots in the furnace lining, to balance wear, so all parts fail at the same time. (W18s; RM-h)

372-W.* Know Your Filler Metals. Pt. 2 Orville T. Barnett. *Welding Design & Fabrication*, v. 32, Aug. 1959, p. 32-33, 52-53.
Factors in selection of filler metals. (To be continued.) (W29h)

373-W.* (German.) Closure of Crucible Induction Melting Furnaces. H. Zepernick. *Giesserei*, v. 46, July 30, 1959, p. 451-453.
Commonly used closing lids and covering systems. Function of the crucible closing door during the melting process. (W18c, W27k)

374-W. (German.) Graphical Determination of the Time Required to Heat a Semiproduct in an Electrical Furnace. K. Kudrass. *Aluminum*, v. 35, May 1959, p. 258-260.
(W27k, 1-55)

375-W. Radiation Recuperators on Oil-Fired Soaking Pits. J. F. Whitfield. *Iron & Coal Trades Review*, v. 179, Aug. 14, 1959, p. 27-30.
(W20g)

376-W. Special Features of Stelco's New Soaking Pits. E. T. W. Bailey. *Iron and Steel Engineer*, v. 36, July 1959, p. 72-79.
Layout, burner design and controlled circuits of soaking pits. (W20g, 18-67)

377-W. Selection and Control of Electrical Equipment for Modern Foil Mills. Warren Reid and D. E. Abell. *Iron and Steel Engineer*, v. 36, July 1959, p. 89-99.
(W23p, W23f, F23; Al, 4-56)

378-W. Process Programming of Automatically Controlled Rolling Mills. E. H. Browning. *Iron and Steel Engineer*, v. 36, July 1959, p. 107-111.
(W23n, W23p, 18-74)

379-W. Control on Aluminum Foil Mills. W. J. Sutherland. *Iron and Steel Engineer*, v. 36, July 1959, p. 165-173.
(W23p, W23n, F23; Al, 4-56)

380-W.* Developments in Heat Treatment. Pt. 1. Progress of Closed-Quench Furnaces. J. McMullen. *Metalworking Production*, v. 103, July 31, 1959, p. 1179-1182.
Closed-quench furnaces of cylindrical and rectangular types and retort pit furnaces for bright hardening, carbonitriding, gas carburizing and martempering. Gas and electric heating. (W27n, W28n)

381-W. Application of Data-Logging and Programming Techniques to Steel-Mill

Processes. R. W. Barnitz and G. E. Terwilliger. *American Society of Mechanical Engineers*, Paper no. 59-AUT-5, 1959, 8 p. $.80.

Scheduling; mill programming; process control; data logging; application to steel plant rolling mills. (W23p, 18-74)

382-W. Powder-Metal Media for the Tumbling Barrel. Kenneth M. Gleszer and Andrew P. Sampou. *Machinery*, v. 66, Sept. 1959, p. 135-137.

Powder metal has the advantages of a good porous structure and is suitable for impregnation with auxiliary compounds. (W2a, 6)

383-W. Garringtons Induction Heating Equipment. *Machinery (London)*, v. 95, Aug. 5, 1959, p. 168-173.

For the heating of billets prior to forging. (W20h, 1-69)

384-W. How to Select Vacuum Heat-Treating Furnaces. A. D. Garwood. *Metalworking*, v. 15, Sept. 1959, p. 3-5.

Hot wall and cold wall types. (W27, 1-73)

385-W. Developments in Heat Treatment. Pt. 3. Controlled Atmosphere Annealing. J. McMullen. *Metalworking Production*, v. 103, Aug. 28, 1959, p. 1325-1327.

Endothermic and exothermic gas and vacuum furnaces used for spheroidizing high-carbon steel. (W27g, 1-73, J23a, J2k; CN, Cu)

386-W. (Italian.) General Observations on Cupolas and the Blast Cupola. Pt. 1. Guglielmo Somigli. *Fonderia Italiana*, v. 8, Apr. 1959, p. 125-134.

34 ref. (W18d, E10a)

387-W. (Translation.) New Air and Water-Cooled Cutting Torch. H. M. Varfolomeyev. *Engineers' Digest*, v. 20, July 1959, p. 284-285. (From *Svarochnoe Proizvodstvo*, June 1959, p. 34-36.)

Reduction of distortion of components by incorporating water and air-cooling arrangements around the cutting zone. (W29d, G22)

388-W. (Translation—Brutcher no. 4645.) Waste Heat Boiler Systems and Gas Cleaning Plants Downstream of LD Vessels and Converters. H. Rasworschegg. *Berg-und Huttenmann Monatshefte*, v. 104, no. 2, 1959, p. 31-40.

(W17n, D-general)

389-W.* Developments in Heat Treatment. Pt. 2. Controlled Atmosphere Generation. J. McMullen. *Metalworking Production*, v. 103, Aug. 21, 1959, p. 1275-1277.

Production of heat treating atmospheres of controlled carbon potential by catalytic cracking of hydrocarbon gases in endothermic atmosphere generator with dew-point control. (W28q, J28g; ST)

390-W.* High-Capacity and High-Lift Reversing Blooming and Slabbing Mill. W. Mullenbach. *Demag News*, no. 153, 1958, p. 1-7.

Two heavy blooming and slabbing mills built in Duisburg-Hamborn are among the fastest high-capacity slabbing mills. The three-shift operation was introduced immediately after the mill erection. (W23a)

391-W. Durgapur Steel Works and Foundry. *Foundry Trade Journal*, v. 107, Sept. 3, 1959, p. 101-103.

Description of the foundry at the new steelworks at Durgapur, India. (W19, 18-67)

392-W. Straight Line Installation Provides Automated Atmosphere Heat Treating. F. V. Horak. *Industrial Heating*, v. 26, Aug. 1959, p. 1528, 1530, 1532, 1534.

(W27n, W28)

393-W. (French.) Steels for Injection Pistons and Sleeves. *Journal d'Information Techniques des Industries de la Fonderie*, no. 106, June 1959, p. 20-21.

Recommended composition and heat treatment of steels for pistons and sleeves for use in die casting of Al alloys and Zamak. (W19n, J-general; ST)

394-W.* Tool Steels and Heat-Treatments for Aluminum and Magnesium Extrusions. *Precision Metal Molding*, v. 17, Sept. 1959, p. 63.

Heat treat temperatures and resulting Brinell and Rockwell-C hardnesses of nine types of steel. (W24n, J-general, Q29n; TS)

395-W. Flames and Furnaces. Types for Ingot Reheating, Heat Treatment and Refractory Firing. M. W. Thring. *Iron & Steel*, v. 32, July-Aug. 1959, p. 379-384.

Types of furnaces, kilns and soaking pits for various production uses, including continuous and batch types. (W20b, 1-61, 1-62)

396-W.* Vacuum Melting Plant. *Mechanical World and Engineering Record*, v. 139, July 1959, p. 315-317.

British plant uses a Heraeus consumable electrode arc furnace (2 1/2 tons capacity) for Ti, Zr and steel, while a Wild-Barfield/NRC high-frequency induction furnace (600 lb.) is used for Ni, Co and Fe alloys. (W18s, W18a, 1-73)

397-W. Lubricants for Machine Tools. B. M. Dunham. *American Machinist*, v. 103, Sept. 21, 1959, p. 127-132.

(W25; NM-h)

398-W. How to Avoid Die-Plate Failures. Federico Strasser. *Machinery*, v. 66, Oct. 1959, p. 174-180.

Proper selection of toolsteels, correct tool design, adequate heat treatment, good tool construction and precision grinding. (W24n, J-general, Q25; TS)

399-W. Automation in the Press Shop. *Sheet Metal Industries*, v. 36, July 1959, p. 526-534, 536.

(W24g, 18-74)

400-W. (German.) Control and Distribution of Temperature in Heat Treatment Furnaces. Konrad Kostlin and Otto Schaber. *Harterei-Technik und Warmebehandlung.(Supplement to Industrieblatt)*, v. 5, Aug. 1959, p. 403-406.

(W27, S16c)

401-W. (German.) Modern Electric Welding Equipment. Theodor Ricken. *Industrieblatt*, v. 59, Aug. 1959, p. 372-376.

(W29)

402-W. Control of Furnace Temperatures. W. J. Swinn. *Institute of Vitreous Enamellers Bulletin (Silver Jubilee Conference Edition)*, Sept. 1959, p. B1-B14.

Principles of automatic heating rate and temperature control in enamelling furnaces. (W4k, L27, S16)

403-W.* Know Your Filler Metals. Pt. 3. Orville T. Barnett. *Welding Design & Fabrication*, v. 32, Sept. 1959, p. 60-61.

Filler metals with Ni, Cu or Al-base; hard surfacing filler metals. (W29h; ST. Ni-b, Al-b, Cu-b, SGA-f)

404-W.* (German.) Tooth Face Damage and Bearing Capacities Encountered in Rolling Mills. M. Unterberger. *Stahl und Eisen*, v. 79, Sept. 1959, p. 1268-1273.

Fatigue caused by overstressing proved to be the cause of pit formation leading to rolling mill gear damage. To avoid short wear and life span of mill gears, with production over 100 to 1000 hr., the gear-loading must be kept below the permanent rolling strength. (W23, Q7b)

405-W. Rheinhausen Wire Rod Mill. W. Schulz. *Draht (English Edition)*, no. 42, Aug. 1959, p. 94-101.

Equipment and processes with reference to rolling speed and driving power. (W24k; 18-67)

406-W. Factors Influencing the Performance of Grinding Wheels., E. J. Krabacher. *Journal of Engineering for Industry (ASME Transactions, Series B)*, v. 81, Aug. 1959, p. 187-199.

Grinding wheel wear curve and wear ratio as affected by work size, chip load, metal-removal rate and metal surface hardness. (W24c)

407-W.* (Russian.) Corrosion of Anode Fasteners in the Electrolysis of Aluminum. M. A. Korobov. *Tsvetnye Metally*, no. 7, 1959, p. 52-58.

Corrosion at 800-900° C. by products of the carbon anode and air and oxygen. Alloy steels had a higher corrosion resistance than carbon steel. Effect of the $FeS + Fe_2O_3$ film on the steel surface on the voltage of electrode. (W17k, R6q, 2-61; CN, AY)

408-W.* Development, Properties and Usability of Low-Hydrogen Electrodes. D. C. Smith. *Welding Journal*, v. 38, Sept. 1959, p. 377s-392s.

Fe-powder low-alloy high-tensile electrodes have been developed with sufficient notch toughness in the weldment when used on the new quenched and tempered steels such as T-1 and the HY-80 steels to prevent crack propagation of ship structure at freezing temperatures. 17 ref. (W29h, K1a; ST)

409-W.* (Russian.) Plasma Arc Heating in Welding. K. V. Vasil'ev and A. A. Isachenko. *Svarochnoe Proizvodstvo*, Sept. 1959, p. 5-6.

Thermal efficiency varying with the length of plasma jet. Relative quantity of nitrogen or argon particles as a function of temperature. 4 ref. (W29p)

410-W. A Comparison of Regenerative and Recuperative Soaking Pits. S. H. Brooks.

Iron & Coal Trades Review, v. 179, Oct. 2, 1959, p. 457-467. (W20g)

411-W. (Russian.) The Plasma Arc as a Source of Heat Used in Metalworking. I. D. Kulagin and A. V. Nikolaev. *Svarochnoe Proizvodstvo*, Sept. 1959, p. 1-4.
Technical characteristics of the plasma arc. 4 ref. (W29p)

412-W.* Introduction to Rollmaking. D. de W. Marais. *Engineer and Foundryman*, v. 24, Apr. 1959, p. 102-109.
Definition and classification of rolls; forged and cast steel rolls. Influence of alloying elements on chilled cast iron rolls in relation to surface hardness, chill depth and microstructure. (W23k, 2-60; CI, ST)

413-W.* (Dutch.) High-Efficiency Electrodes. C. J. Verzijlberg. *Lastechniek (NVL)*, v. 25, Sept. 1959, p. 244-245.
Effect of electrode coatings containing Fe powder on light irradiation of the arc, arc voltage, striking of the arc, removability of slag, welding practice and speed. (W29h, K1a)

414-W.* Pipe Mill Bearings Lubricated by Grease Pressure System. *Blast Furnace and Steel Plant*, v. 47, Oct. 1959, p. 1079-1080.
Li-based grease in the friction bearings of electric-weld pipe mill of Jones & Laughlin Steel Corp. withstands conditions of extreme heat and constant pressure. This results in minimum maintenance and high efficiency of the mill. (W23m, 18-73)

415-W. Electric Furnaces Solve Tough Heating Problems. J. E. Friess. *American Machinist*, v. 103, Sept. 7, 1959, p. 123-125. (W27j, W27n)

416-W.* Heating and Cooling in Continuous Furnace Closely Controls Annealed Structure for Machining. A. G. Sturrock. *Industrial Heating*, v. 26, Sept. 1959, p. 1704-1706, 1708, 1710, 1712, 1848.
Control of furnace atmosphere, heating and cooling are automatic. Furnace includes six chambers heated by gas fired "W" type radiant eductor tubes, insuring no atmosphere contamination. (W27n, 1-61)

417-W.* The B.C.I.R.A. Experimental Cupola Installation. *Metallurgia*, v. 60, July 1959, p. 12-16.
Air supply, heating and charging equipment of cupola; instrumentation, molten metal disposal. (W18d)

418-W. Basic Oxygen Furnace Construction and Operating Data. D. R. Loughrey. *Industrial Heating*, v. 26, Sept. 1959, p. 1816, 1818, 1820, 1822.
Description of the two vessels now in operation at Jones and Laughlin's Aliquippa Works. (W18g)

419-W. Modern Design of Slab Reheating Furnaces. H. C. Henschen. *Iron and Steel Engineer*, v. 36, Oct. 1959, p. 75-82.
A 5-zone furnace is flexible in that it can be operated as a 3-zone furnace for maximum efficiency at slow rolling rates, or operated with high preheat zone temperatures for fast rolling, expected increased rolling or quality heating and maximum soaking. (W20; 17-51)

420-W. Modern Regenerative Soaking Pits. Henry S. Hall. *Iron and Steel Engineer*, v. 36, Oct. 1959, p. 83-92.
Regenerative soaking pits can be designed for the entire range of fuels from straight blast furnace gas up to and including bunker C oil. (W20g)

421-W. Product Finishing Problems. Pt. 2. Barrelling. Frank H. Slade. *Product Finishing*, v. 12, Aug. 1959, p. 77-79.
Barrelling process equipment. (W2s, L10d)

422-W. Estimating Zinc Anode Purity. Pt. 3. *Product Finishing*, v. 12, Aug. 1959, p. 80-81.
Methods for detection and determination of As, Fe, Hg, Ag, Mo, Pb, Cd and Mn in Zn anodes. (W3h, S11; Zn)

423-W.* (French.) Metal Matrices and Coining and Embossing Dies Manufactured by Cold Impression. Jean Foucher. *Pratique des Industries Mecaniques*, v. 42, Aug. 1959, p. 218-224.
Compositions and properties of steels suitable for forming dies. (To be continued.) (W24n; AY, 17-57)

424-W. Heated Dies Produce Better Forgings. Paul R. Gouwens. *American Machinist*, v. 103, Oct. 19, 1959, p. 137-144.
Precision-cast Inconel 713C dies, heated to 1600° F., attain precision of form and increased depth of flanges. (W22a; Ni-b, 17-57, 5-62)

425-W. Modern Rolling Mill Gearings. Karl Breuer. *Demag News*, no. 154, 1958, p. 1-15.
(W23n)

426-W. Conversion of a Single-Stand Four-High Temper Mill to a Two-Stand Four-High Tandem Temper Mill. Heinrich Bischoff. *Demag News*, no. 154, 1958, p. 30-32.
An arrangement whereby only one work roll is driven and small work roll barrel diameters are used. (W23c)

427-W.* Cast High Alloy Belts Help Conversion From Batch Heat Treating. *Industrial Gas*, v. 38, Oct. 1959, p. 12-14.
ACI Type HT alloy is used for continuous feed belts and radiant tubes in a heat treating furnace, withstanding temperatures of 1550-1700° F., loads of 20-30 lb. per sq.ft., hot corrosive gases and thermal shock. (W27p, R3n; SGA-h, Fe, *Ni, Cr*, 17-57)

428-W.* (Russian.) Increasing the Durability of Ingot Molds. Yu. R. Mesnyaev and T. S. Kunovalova. *Metallurg*, Aug. 1959, p. 23-24.
Increased life of ingot molds was provided by better drying the chamotte joints connecting the portions of semipermanent molds that are used for casting ingot molds molds, reinforcement of the bottom of the semi permanent mold and adding ferrosilicon to the cast iron in the ladle. (W19c)

429-W. Survey of Special Furnaces for Rocket, Missile, and Aircraft Components. *Metal Treating*, v. 10, Sept-Oct. 1959, p. 4-7.
Inverted pit furnaces of bottom-opening gantry and top-opening and salt pot, electrically heated types. (W27)

430-W. (Russian.) Wear Between Piston and Cylinder of the Fuel Pump in a Diesel Engine. G. A. Tashkinov. Paper from "Friction and Wear of Machine Parts". Akademiya Nauk SSSR, Moscow, 1959, p. 34-47.
7 ref. (W11j, Q9)

431-W. (Russian.) The Electrical Charge Present in the Anode Fasteners of Electrolytic Equipment for Aluminum. M. F. Dogramadzhi. *Tsvetnye Metally*, no. 5, 1958, p. 50-53.
(W17k; Al)

432-W. Control of Large Electric Arc Furnaces in Relation to Their Effect on the Supply System. J. W. S. Payne. *Instrument Practice Automation & Electronics*, v. 13, Aug. 1959, p. 808-814.
Ratio between surges of different durations; effect of changes in electrode regulator performance. (W18s, 18-74)

433-W. (German.) Installation of a Modern Hardening Plant. B. Jousset. *Harterei-Technische Mitteilungen*, v. 14, no. 1, 1959, p. 1-13.
Plant equipment for heat treatment with salt and in gaseous atmospheres. (W27)

434-W. (Polish.) Centrifugal Blowers Used in Cupolas. Miroslaw Gregoraszczuk and Leszek Zurawski. *Przeglad Odlewnictwa*, v. 9, July 1959, p. 206-213.
(W18d)

435-W. (Russian.) Material and Thermal Balances of a Reverberatory Furnace. I. I. Surovov, A. Ya. Mikhailenko and A. A. Tseidler. *Tsvetnye Metally*, no. 10, 1958, p. 29-32.
(W18r, C21c)

436-W. (Russian.) Quality of Steel Used in Kettles for Lead Refining. A. P. Rogach, A. P. Ryzhikova and P. M. Slivinskii. *Tsvetnye Metally*, no. 11, 1958, p. 32-36.
Testing of structure and composition. (W18h, M26; CN-g)

437-W. A Large High-Temperature Vacuum Sintering Furnace. C. B. Sibley. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1958" (American Vacuum Society, Inc.) Pergamon Press Inc., New York 22, 1959, p. 181-184.
Design of a vacuum furnace having three-phase, resistance-heated tungsten elements and metallic shields for use at 2200° C. and above. (W26e, 1-73)

438-W. High-Temperature Resistance Furnace for Operations at 3000° C. James M. Dickinson. Paper from "Fifth National Symposium on Vacuum Technology Transactions—1959". (American Vacuum Society, Inc.). Pergamon Press Inc., New York 22, 1959, p. 192-197.
Furnace has been used for melting point determinations, sintering and heat treatment of metals. 4 ref. (W27j)

439-W. (German.) Welding and Soldering on Nuclear Reactors. H. R. Pufahl, G. M. Slaughter, P. Patriarca and R. E. Lorentz. *Chemische Rundschau*, v. 12, Oct. 1, 1959, p. 528-529.
(W11p, K1, K7)

440-W. Instrumentation for a New Open-hearth Furnace. William A. Dickinson. *ISA Proceedings. 1959 Conference*, v. 9, 1959, p. 1-12.

Description of component parts of combustion control system. (W18r, S18s)

441-W. (Polish.) Modern Preheating Furnace and Possibilities of Improving Polish Furnace Performance. Z. Warczewski. *Hutnik*, v. 26, no. 7-8, 1959, p. 276-288. (W20h, F21b)

442-W. Design and Construction of the New Basic-Bessemer Plant at Port Talbot. J. W. P. Jaffe. *Structural Engineer*, v. 37, Oct. 1959, p. 282-291. (W18, D3, 17-51)

443-W.* High-Speed Melting. J. G. Winget. *Modern Castings*, v. 36, Sept. 1959, p. 44-47.

New small batch-type furnace is versatile and produces clean castings. (W18, 1-62)

444-W. (Translation—Brutcher no. 4632.) Variation of Hydraulic Resistance of Sinter Bed During Sintering Process. G. V. Ksendzyk. *Izvestiya VUZ, Chernaya Metallurgiya*, July 1958, p. 3-16. (W15a)

445-W. (Translation—Brutcher no. 4668.) New Type Electrode, Shanghai-57-1, for Welding Constructional Steels. Weng-ling Wei. *Svarochnoe Proizvodstvo*, Jan. 1958, p. 30-31. (W29h, K1; ST, SGB-s)

SECTION X

INSTRUMENTATION

Laboratory and Control Equipment

1-X. Synthetic Mica High Temperature Strain Gage Research. G. A. Brewer. Brewer Engineering Laboratories. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 151045, Dec. 1957, 244 p. $3.50.

Sintering and utilizing an etched foil sensing element (Nichrome V) within a synthetic mica sandwich, capable of operation at 2000° F. Using a sectioned die and a 15-kw, 10-kc, induction generator, the gages were fabricated at 2050° F. under 1000 psi. pressure. The techniques produced sandwiches having a final thickness of 0.008 in. (X28j; Ni-b, Cr, NM-e, 7-59)

2-X. Simple, Gas-Tight Furnace for Induction Heating. R. D. Grinthal. *Powder Metallurgy Bulletin,* v. 8, June 1958, p. 68-69.

(X24f, 1-69)

3-X. Guide to Cam-Inspection Equipment. Harold A. Rothbart. *Metalworking Production,* v. 102, Nov. 7, 1958, p. 1962-1965.

(X20)

4-X. Processing Data From the Openhearth. R. H. Baulk. *Control Engineering,* v. 5, Nov. 1958.

Openhearth information is analyzed and totaled by electronic equipment. (X14g, D2, 1-53)

5-X.* An Apparatus for Heating Small Samples to Elevated Temperatures at High Pressures. J. Fennell, N. H. Hancock and R. S. Barnes. *Metal Treatment and Drop Forging,* v. 25, Aug. 1958, p. 332-334.

Apparatus incorporates pressure vessel which withstands internal gas pressure of 6000 psi. at 950° C. Shows effects of temperature and pressure on gas bubbles and voids contained in solids; effects upon reaction rates, solubilities and physical properties of materials in general. (X24f, N15d, 2-61, 3-74)

6-X. Cryogenics. Don Fabun. *Modern Metals,* v. 14, Aug. 1958, p. 54-61.

Al, with its low cost, workability, and improved properties at low temperatures, is ideal structural material for equipment used to produce, transport and ship liquid gases. (X24b, 17-57; Al)

7-X. (German.) Antenna Reflectors Made of Alucell. P. Lengrusser. *Aluminium,* v. 34, Nov. 1958, p. 663-664.

Honeycomb-like structure reduces total weight of antenna by 30-50%, allows easy transportation and replacement of parts. (X15q; Al-b, 7-59, 17-57)

8-X. A Programming Universal Elevated-Temperature Testing Machine. S. E. Bramer, K. G. Kahmann and R. Titus. Paper from "Short-Time High-Temperature Testing", American Society for Metals, Cleveland, 1958, p. 114-134.

Machine can produce accurate, reliable data on properties of materials subjected to simulated service conditions and can heat and load specimens rapidly for tests involving tension, compression, shear, creep, stress-rupture and fatigue at elevated temperatures. Materials tested were HM 21-T8 and HK 31-T6 Th-Mg alloys, Hastelloy R 235, Udimet 500 Ni-base alloy and N 155 mixed-base alloy. (X29n, Q-general, 2-62; SGA-h, Ni-b, Mg-b, Th)

9-X. Electrical "Firsts" Update Aluminum Plant. *Steel,* v. 143, Dec. 29, 1958, p. 60-61.

Closed circuit television, electronic and automatic controls help this modern rolling plant to get greater output, higher quality. (X20, X15p, W23; Al-b, 4-53, 4-56)

10-X. (Czech.) Combustion Regulation in Openhearth Furnaces. Vaclav Parma. *Hutnicke Listy*, v. 13, Nov. 1958, p. 979-983.

Apparatus used to automatically regulate the ratio of fuel gas to air in an openhearth furnace. 9 ref. (X13f, D2h, 18-74)

11-X. A Combined Electrolytic Polisher and Microscope. F. Rummele. *Engineers' Digest*, v. 19, Nov. 1958, p. 479-481.

New equipment permits the surface of the specimen to be continuously observed and photographed during specimen treatment. (X4e, X4a)

12-X. Design of a Structure Factor Computer for X-Ray Crystal Structure Analysis. P. V. Venkatakrishnan. *Journal of Scientific & Industrial Research*, v. 17B, Sept. 1958, p. 339-345.

9 ref. (X14j, M22d, 17-51)

13-X. Spotlight on the Plating Laboratory. D. J. Dishlock. *Metal Finishing Journal*, v. 4, Dec. 1958, p. 464-466, 476.

Equipment required. (X21, L17)

14-X. (Italian.) Design of a Variable Slit Photometer for Measuring Effective Line Widths. E. W. Salpeter. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 293-295.

(X3n, S11a)

15-X. (Italian.) New ARL Grating-Type Spectrographic Equipment. W. Barry and M. Scalise. *Metallurgia Italiana*, v. 50, Aug. 1958, p. 343-346.

Operates either as quantometer (with fixed phototubes), spectrograph (with photographic camera) or spectrometer (with movable phototubes). (X3, S11c)

16-X. (Italian.) Recent Applications of the Electronic Probe Microanalyzer. J. Philibert. *Metallurgia Italiana*, v. 50, Sept. 1959, p. 402-406.

13 ref. (X3, S11g)

17-X.* Testing and Examination of Electrodeposits. R. Quarendon. *Product Finishing*, v. 11, Dec. 1958, p. 52-63.

General principle of operation of mechanical surface analyzers is that a fine probe in a light pickup is caused to traverse a selected straight line path of suitable length over the surface of the work. An electromechanical or other form of transducer translates the vertical movement of the probe, relative to the general surface level, into the motion of a pointer on a dial or the pen of a recording meter. 7 ref. (X23, S15; 8-62)

18-X. Weighing Hot Metal Electrically. Ralph Lewtas. *Instrumentation*, v. 41, Nov-Dec. 1958, p. 25.

New electric weighing system at Armco Steel Corp's. Sheffield Div. substitutes load cells for beam and level scale. (X20g; 14-60, ST)

19-X.* Rapid-Quenching Hot Stage for Metallography. G. R. Speich and Morris Cohen. *Review of Scientific Instruments*, v. 29, Dec. 1958, p. 1129-1131.

A microscope hot stage designed for use at temperatures up to 1100° C. and for rapid quenching rates up to 500° C. per sec. The stage is designed for rapid quenching from the austenitizing temperature to some lower transformation temperature in order to study the bainitic reaction in a series of high-purity iron-carbon alloys. (X3p, N8m; ST)

20-X. Immersion Thermocouple Practice. H. V. Schubert. *Iron and Steel Engineer*. V. 36, Jan. 1959, p. 91-97.

Basic design, construction, application and maintenance of the bath thermocouple. (X9q, S16a)

21-X.* A Sensitive Method for Measuring Optical Scattering in Silicon. G. H. Schwuttke, O. A. Weinreich and P. H. Keck. *Electrochemical Society, Journal*, v. 105, Dec. 1958, p. 706-709.

Instrument for observing optical scattering in Si and in intermetallic compounds is also a supplementary tool suitable for studying crystal imperfections in conjunction with the optical methods. Scattering patterns are given for heat treated, crucible-grown Si crystals. 10 ref. (X13, P17d; Si, 14-61)

22-X.* (French.) Metallographic Microscope for Radioactive Specimens. J. Bloch and G. Cherel. *Technique Moderne*, v. 50, Sept. 1958, p. 415-416.

Apparatus capable of examining specimens of irradiated nuclear fuels having radioactivity of around 1000 curies permits study of enriched irradiated U after a cooling off period of three months. (X4a, T11g, U)

23-X. Tube Cameras for Investigating Corrosion Problems. A. G. Arend. *Corrosion Prevention & Control,* v. 5, Dec. 1958, p. 53-55.
(X5h, R11, 1-53)

24-X. (French.) Apparatus for Determination of Combined Carbon in Steels and Cast Irons by Selective Oxido-Reduction. Fernand Marion. *Societe Chimique de France, Bulletin,* Aug-Sept. 1958, p. 1187-1188.
(X21, S11g; ST, CI, *C*)

25-X. (German.) Application of Aluminum in Modern Computing Machines. H. Roth. *Aluminium,* v. 35, Jan. 1959, p. 29-35.
(X14; Al-b, 17-57)

26-X. (German.) Directing Production in Rolling Mills by Communication and Signalling System. Herbert Brosch and Helmut Waburek. *Stahl und Eisen,* v. 79, Jan. 8, 1959, p. 23-32.
Programming and delivery of hot ingots in controlled schedule. Working triangle—main control station, pit furnaces and cranes. Sequence of ingot processing. Application for blooming mills and shears, open and continuous finishing trains. Fundamentals and operating methods of communication and signalling system. (X15, F23, W23; ST)

27-X. (Translation—BISI, no. 1129.) Apparatus for Measurement of Losses in Whole Transformer Sheets. J. Siewierski. *Hutnik,* July-Aug. 1957, p. 333-334.
See item 6-X, 1958. (X26; SGA-n, AY)

28-X. (Italian.) Use of Nickel in Permanent Magnets. Vittorio Rosina. *Nickel,* Aug. 1958, p. 1-7.
Historical notes on development of permanent magnets; magnetic properties of permanent magnet materials, particularly Alnico alloys; production by fusion and sintering; applications of magnets. 4 ref. (X11g; SGA-n, 17-57)

29-X.* (Russian.) Continuous Temperature Measurements of Liquid Steel in a Ladle. P. Ya. Sorokin, A. V. Zabaikin, P. P. Babick and O. A. Zakharov. *Zavodskaya Laboratoriya,* v. 24, Dec. 1958, p. 1475-1477.
Thermocouple embedded in ladle bottom and protruding into the molten steel. 5 ref. (X9q, S16a; ST)

30-X. (Russian.) Some Sources of Error in Recording Temperatures With Thermocouples. A. N. Gordov and N. N. Ergardt. *Zavodskaya Laboratoriya,* v. 24, Dec. 1958, p. 1462-1470.
5 ref. (X9q, S16b)

31-X. (Russian.) Immersed Thermocouples. S. K. Danishevskii. *Zavodskaya Laboratoriya,* v. 24, Dec. 1958, p. 1470-1475.
Properties of thermocouples immersed in molten metal. (X9q, S16a; Pt, *Rh,* W, *Mo, Re*)

32-X. (Russian.) Anisometer to Determine Effects of Stresses and Deformation Upon Austenite Disintegration. P. V. Novichkov. *Zavodskaya Laboratoriya,* v. 24, Dec. 1958, p. 1510-1511.
Testing machine which creates stresses, elongational and torsional deformations. (X29)

33-X.* False Negative Permanent Strains Observed With Resistance Wire Strain Gages. Clarence J. Newton. *ASTM Bulletin,* no. 235, Jan. 1959, p. 42-44.
Optical gages proved this false indication probably due to creep in electrical gages or their bonding cement. 5 ref. (X28j; Q25; ST)

34-X.* A Machine for Evaluation of High-Temperature Alloys Under Combined Static and Dynamic Stresses. Paul E. Hawkes and C. Harold Ek. *ASTM Bulletin,* no. 235, Jan. 1959, p. 46-51.
Metals are tested with resonance-type machine which simulates centrifugal and vibrational forces between 1000-1800° F. 4 ref. (X29q, Q25, 2-62)

35-X. (Translation—Brutcher no. 4383.) Small-Size Instrument for Electropolishing and Electro-Etching of Microsections. L. Ya. Popilov. *Zavodskaya Laboratoriya,* v. 24, no. 7, 1958, p. 890-892.
See item 88-X, 1958. (X4e, X4f)

36-X.* Control Engineering in a Steelworks. M. Thomas. *Process Control and Automation,* v. 6, Feb. 1959, p. 50-55.
Instrumentation, communication and control problems, particularly in relation to heat, vibration and dirty atmospheres. (X-general, D-general)

37-X. The Cathode-Ray Oscilloscope. B. R. Evans. *Metal Treatment and Drop Forging,* v. 26, Feb. 1959, p. 53-59.
Metallurgical applications include tests for alloy composition, condition of material (process undergone during manufacture)

and presence of flaws, cracks or porosity. (X25j, X8)

38-X.* (French.) Apparatus for Testing the Corrosion of Stainless Steel in Aqueous Environment and at High Temperature. E. Pouillard, H. Coriou and M. Grall. *Metaux Corrosion-Industries*, v. 34, Jan. 1959, p. 20-35.

Autoclaves and apparatus for the investigation of corrosion occuring in nuclear reactor cooling systems. (X1a, R11; SS)

39-X. Interference Microscope With a Wide Range of Applications. *Machinery (London)*, v. 94, Mar. 11, 1959, p. 561-563.

New instrument suitable for measuring surface finishes. (X3q)

40-X.* (French.) Practicality of the Standardized Image Quality Indicator Used in Radiography. G. Chanty. *Soudage et Techniques Connexes*, v. 13, Jan-Feb. 1959, p. 33-42.

Stepped wedge indicator recently standardized in France is both flexible and economical. Machining procedures, protection against clogging of holes and marine corrosion. (X8g)

41-X. (Italian.) Measurement, Regulation and Reading of Temperatures. Pt. 2. *Trattamenti Termici*, v. 2, Jan-Feb. 1959, p. 22-24, 28.

(To be continued.) (X9)

42-X. (Russian.) Instrument for Testing Corrosion of Materials in Highly Agressive Media at Elevated Temperatures. V. I. Ginzburg. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 220-222.

(X1a)

43-X. (Russian.) Instrument for Polishing Microsections. M. L. Grinberg. *Zavodskaya Labòrator a*, v. 25, no. 2, 1959, p. 229-230.

(X4e)

44-X. (Russian.) X-Ray Camera With Device for Tensile Deformation of Samples. V. M. Kardonskii and M. D. Perkas. *Zavodskaya Laboratoriya*, v, 25, no. 2, 1959, p. 236-237.

(X8g, Q24)

45-X. (Russian.) Tensile Tests Samples Cast in an Arc Furnace. V. P. Vinokurov. *Zavodskaya Laboratoriya*, v. 25, no. 2, 1959, p. 240-241.

Details of a laboratory furnace. (X24f)

46-X. Instrumentation. Harold A. Kahler. *Technical Proceedings of the 45th Annual Convention, American Electroplaters' Society*, 1958, p. 123-127.

Control instrumentation in the plating room. 10 ref. (X-general, L17)

47-X. (German.) Optical Equipment for Material and Surface Testing. A. Metz. *Industrieblatt*, v. 59, Mar. 1959, p. 79-82.

Details of new camera metallographic microscopes, hardness testers, dilatometers, surface interference microscopes, light slit instruments and profilometers. (X23, X3, M23b, Q29)

48-X. Selection of Pumping Systems for Vacuum Metallurgical Processes. A. S. D. Barrett and M. E. Harper. *Institute of Metals, Journal*, v. 87, Mar. 1959, p. 227-234.

The four main types of systems are the oil-sealed rotary pump, the Rootes blower, the vapor diffusion pump and the vapor booster pump. 5 ref. (X13e, 1-73)

49-X. (Russian.) Apparatus for Measuring Temporary Deformation During Welding. K. K. Khrenov and I. M. Zhdanov. *Svarochnoe Proizvodstvo*, Mar. 1959, p. 16-18.

Apparatus measures transverse and longitudinal temporary deformation occurring during butt welding, with degree of error not exceeding 0.06%. (X29, K-general, 3-68)

50-X. Measures Thermal Conductivity. *Iron Age*, v. 183, May 7, 1959, p. 101.

Apparatus cuts off heat flow except by conduction through specimen. Thermocouples measure thermal gradient. (X24, P11h)

51-X. Low Temperature-BMF Characteristics of Chromel-Alumel Thermocouples. John F. Carlson. *Industrial Heating*, v. 26, Apr. 1959, p. 688, 690, 706.

(X9q, 2-63, 17-52)

52-X. A Metallograph for the Mill. G. H. Boss. *Metal Progress*, v. 75, May 1959, p. 81-83.

A portable metallograph, complete with polishing and etching equipment, has been devised for shop use. It is designed for examining heavy machine components on the spot; optical examination at 900 × is possible, and good photomicrographs at 250 × have been obtained. (X4a, X4e)

53-X.* Special Research Equipment in Physical Metallurgy. E. C. Roberts and D. H. Polonis. *Trend in Engineering*, v. 11, Apr. 1959, p. 13-18.

Electrical resistance apparatus, magnetic balance, quenching furnaces. (X25, X11, X24f)

54-X. Microscopes. Modern Design of Optical Equipment. *Metal Treatment and Drop Forging*, v. 26, Apr. 1959, p. 155-158, 160.
(X3p)

55-X. (German.) Vacuum Techniques in Metallurgy. *Industrie-Anzeiger*, v. 81, Jan. 30, 1959, p. 119.
Production and control of vacuum atmospheres. (X13e)

56-X. Method of Analysis and Control of Gas Atmospheres Used in the Processing of Electronic Parts and Devices. M. J. Elkind and D. R. Benn. Paper from "Symposium on Cleaning of Electronic Device Components and Materials". American Society for Testing Materials, STP no. 246, Philadelphia, 1958, p. 101-112.
Instruments for analyzing oxygen and moisture in atmospheres of heat treating furnace, crystal-growing furnaces, storage and assembly facilities. 4 ref. (X7j)

57-X. (Czech.) Electrolytic Polishing Equipment for Metallographs. Josef Krumpos. *Hutnicke Listy*, v. 14, May 1959, p. 448-451.
6 ref. (X4e, M20p)

58-X. (Czech.) Use of the Steeloscope in Production Control. L. Rockl. *Hutnicke Listy*, v. 14, May 1959, p. 451-454.
5 ref. (X3c)

59-X. Laboratory Evaluation of Nichrome-Foil Strain Gage Installations Up to 1200° F. William R. Forlifer. Paper from "Symposium on Elevated Temperature Strain Gages". American Society for Testing Materials, STP no. 230, Philadelphia 3, 1958, p. 42-50.
Bonding techniques, temperature compensation methods, effects of temperature cycling and sensitivity variations. (X28j, 2-62)

60-X. Optical Strain Gages for Use at Elevated Temperatures. H. K. Howerton. Paper from "Symposium on Elevated Temperature Strain Gages". American Society for Testing Materials, STP no. 230, Philadelphia, 3, 1958, p. 51-56.
Three types of commercially available optical gages suitable for operation at 500, 1000 and 1500° F. Their use is for the determination of mechanical properties of material at high temperature and for evaluating the performance of remote strain gages. (X28j, 2-62)

61-X. Evaluation of Several Gage Configurations Fabricated With Armour Alloy "D". Jack J. Shrager. Paper from "Symposium on Elevated Temperature Strain Gages". American Society for Testing Materials, STP no. 230, Philadelphia 3, 1958, p. 87-96.
Materials for measuring static strains at temperatures up to 1600° F. The most promising of the strain alloys proved to be alloy D which has a nominal composition of 70% Fe, 20% Cr and 10% Al. (X28j, 2-62; Fe-b, *Cr, Al*)

62-X. (Russian.) A Rapidly Acting Photoelectric Pyrometer. M. E. Gluberson. *Metallurg*, May 1959, p. 25-26.
(X9r)

63-X. (Book.) Symposium on Elevated Temperature Strain Gages. American Society for Testing Materials, STP no. 230. 163 p. June 1958. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $4.50.
Sponsored by Aeronautical Structures Laboratory, Naval Air Material Center, Philadelphia, Dec. 4-5, 1957. Papers abstracted separately. (X28j, 2-62)

64-X. Pneumatic Comparator Calibrates Slip Gauges. P. J. Sim. *Metalworking Production*, v. 103, June 5, 1959, p. 991-995.
Construction, operation and design calculations of a prototype pneumatic slip gage comparator with a magnification of 30,000. (X28j)

65-X. Vacuum Pumping Systems. H. A. Steinherz. Paper from "Vacuum Metallurgy" Reinhold Publishing Corp., 1958, New York, p. 3-20.
Type of vacuum pumps currently available and criteria which govern their selection for specific applications. (X13e, 1-73)

66-X. Apparatus for Carbon Content Determination. R. Rew. *B.C.I.R.A. Journal*, v. 7, Apr. 1959, p. 651-655.
(X21, S11; CI)

67-X. Thermostatic Bimetal. *Australasian Manufacturer*, v. 44, June 6, 1959, p. 54-56.
Thermocouple materials having a wide range of sensitivity. (X9q; SGA-a)

68-X. Television in Industry. F. D. Grimmer. *Metal Treatment and Drop Forging*, v. 15, June 1959, p. 243-245.

Closed circuit television used in steel mils. (X15p, D-general)

69-X. Classical Potentiostat: Its Application to the Study of Passivity. N. D. Greene. *Corrosion*, v. 15, July 1959, p. 369t-372t.

The performance of a classical potentiostat can be increased by reducing its total series resistance and maximum current output. An improved classical potentiostat with an ultimate potential control of ± 1 millivolt. 24 ref. (X25h, X1, R10c)

70-X.* Refractory Metal Thermocouples. J. C. Lachman. *American Society of Mechanical Engineers*, Paper no. 59-HT-21, 1959, 10 p. $.80.

Thermo-electric properties of refractory metals. Pure metal combinations of Rh versus Mo and Rh versus W were calibrated to 4000° F. in vacuum, hydrogen and inert-gas atmospheres. Both Rh-Mo and Rh-W thermocouples have a high thermal emf. which is reasonably linear with temperature. The practical application of Rh-Mo is limited to about 3200° F. by loss of thermoelectric potential. (X9q, P15; RL, Mo, W, EG-d37)

71-X. (French.) Thermocouples Used in the Foundry. E. R. Perry. *Revue de Nickel*, v. 25, May-June 1959, p. 53-58.

8 ref. (X9q, E-general)

72-X.* An Electron Bombardment Furnace for the Production of Vacuum-Melted Metals. Ed. Candidus. Paper from "Proceedings of First Symposium on Electron-Beam Melting". Alloyd Research Corp., Watertown, Mass., 1959, p. 27-33.

Experimental and production furnaces for electron bombardment heating, water-cooled melting chamber and mold. (X24f, C5k, 1-52, 1-73; Ta, Cb, Mo, W)

73-X.* Recent Developments in Testing Machines and Related Instrumentation. Ib Jensen. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 277-283.

Instrumentation and controls adapting universal testing machines to creep and relaxation testing. Fatigue testing equipment. (X29n, Q3, Q7, 1-53)

74-X.* Recent Developments in Testing Machines and Instrumentation. Pt. 2. B. L. Lewis. Paper from "Mechanical Properties of Metals (Their Determination, Interpretation and Significance)". Pennsylvania State University, University Park, Pa., 1958, p. 285-296.

Development of universal testing machines. Electronic control and recording components. Programming. (X29n)

75-X. A Molybdenum Resistance Cooling Curve Furnace. W. Oldfield. *Journal of the Less Common Metals*, v. 1, Feb.1959, p. 77-79.

Design of a cooling curve furnace which gives an approximately uniform rate of loss or gain of heat over small temperature ranges during solidification. (X24f, N12)

76-X. Arc Furnace and Electron Bombardment Techniques Used in Studies of the Refractory Metals. F. O. Jones, A. G. Knapton and J. Savill. *Journal of the Less Common Metals*, v. 1, Feb. 1959, p. 80-84.

Use in melting point determinations and annealing. (X24f, P12n, J23; EG-d37)

77-X.* (Czech.) Recorder for Determination of Rolling Pressure. M. Kokeisl and Z. Sigut. *Strojirenstvi*, v. 9, May 1959, p. 385-387.

Instantaneous pressure value of the rolling mill provides maximum utilization of the rolls since pressure is recorded on a continuous graph. Cylinder containing strain gages is inserted and the elastic deformation occurring during rolling is recorded. (X29q, X12, F23)

78-X.* (French.) Results Obtained With an Electrostatically Excited Extensometer. R. Cabarat. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 131-143.

Apparatus and method for measuring modulus of elasticity and damping capacity based on possibility of maintaining longitudinal vibrations in the specimen by electrostatic excitation. Equipment can be used at temperatures to around 800° C. and permits calculation of logarithmic decrement of vibrations. 11 ref. (X29p, Q8g, Q21a, Q22)

79-X.* (French.) Development of an X-Ray Micro-Analyzer at the A.E.I. Research Laboratory at Aldermaston (England), Based on the Castaing-Guinier Technique. T. Mulvey. *Memoires Scientifiques de la Revue de Metallurgie*, v. 56, July 1959, p. 163-171.

New instrument makes possible mechanical and electronic scanning of specimen, in addition to point analysis. Preliminary results indicate that Castaing-Guinier method can be applied to light elements, such as carbon, as well as heavy elements. 22 ref. (X3, M21e, S11p)

80-X. Furnaces for the Study of High-Temperature Equilibria. C. W. Haworth. *Journal of the Less-Common Metals*, v. 1, Apr. 1959, p. 106-109.

Four kinds of laboratory furnaces described—conventional wound furnaces; induction heating; high-current furnaces; and argon-arc furnaces. 8 ref. (X24f)

81-X. (Russian.) Pressure of Saturated Aluminum Vapor. Yu. A. Priselkov, Yu. A. Sapozhnikov and A. V. Tseplyaeva. *Izvestiya Akademii Nauk SSSR-Otdelenie Tekhnicheskikh Nauk*, Jan-Feb. 1959, p. 106-109.

New device allowing measurement pressure and effusion. 4 ref. (X12, P12c; Al)

82-X.* The Measurement of Liquid Iron Temperatures. *Castings*, v. 5, June 1959, p. 25-28.

The type recommended is a radiation pyrometer mounted with a water-cooled jacket and temperature indicator with recorder. Calibration of emissivity guarantees accurate readings. The pyrometer can be used with an indicator, millivoltmeter or a recorder. (X9r, S16; Fe, 14-60)

83-X.* Mechanical Testing With a 3000° F. Radiant Heat Furnace. J. K. Hoy. *Metal Progress*, v. 76, Sept. 1959, p. 81-83.

Furnace is powered by quartz pencil lamps. Predetermined test temperatures with programmed heating cycles are obtained and accurately stabilized with an automatic control recording system. (X24f, Q27, 2-62)

84-X.* (German.) Practical Experience With the FH46 Thickness Indicator Applied in Rolling Mills. Rolf Hinkfoth. *Freiberger Forschungshefte*, v. B-36, May 1959, p. 83-107.

Possibilities of measuring rolled sheet thickness with or without direct contact with the rolled product. Comparison of noncontact thickness indicators of the pneumatic, ultrasonic, magnetic and induction types. (X20c, W23f)

85-X. (German.) Instruments for Thickness Measurements in Cold Rolling. Rolf Hinkfoth. *Neue Hutte*, v. 4, Aug. 1959, p. 478.

15 ref. (X20c, F23, 1-67, S14)

86-X. An Automatic Polishing Machine for Remote Metallography. F. L. Brown, S. H. Paine, R. J. Fousek and J. L. Armstrong. Argonne National Laboratory. *U. S. Atomic Energy Commission*, ANL-5904, Aug. 1959, 18 p. (Available from U. S. Office of Technical Services, Washington 25, D. C.) $.75.

Requirements for successful polishing of metallographic specimens, design of a machine for remote polishing of radioactive specimens. 10 ref. (X4e, M20p)

87-X. Back-Reflection Symmetrical Focusing Camera. R. A. Vandermeer. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 87-89.

Use in precision lattice constant measurement. (X5j, M26)

88-X. The Flat-Plate Camera. Alfred E. Attard. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 89-92.

Range of measurements possible with this type of X-ray equipment. (X5j, M22g)

89-X. Preferred Orentation Cameras. B. E. Sundquist. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 95-96.

Sample preparation techniques, instrumentation, interpretation of films and special applications. 14 ref. (X5j, M26c)

90-X. X-Ray Micro-Diffraction Cameras. Margot E. Bergmann. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 96-100.

10 ref. (X5j, M22g)

91-X. Small-Angle Scattering Camera. Robert H. Bragg. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 100-104.

Camera designs, experimental procedure and interpretation of data. 11 ref. (X5j, M22g)

92-X. Rotating-Crystal Camera. John A. Wheeler, Jr. *Norelco Reporter*, v. 6, July-Oct. 1959, p. 105-108.

Camera, method and interpretation. (X5j, M22g)

93-X. (French.) Platinum/Platinum-Rhodium Thermocouples for Measuring Temperatures in the Foundry. E. R. Perry. *Fonderie Belge*, v. 29, Sept. 1959, p. 201-205.

(X9q, E-general, S16a)

94-X. Apparatus for Conducting Tensile Tests at Moderately Elevated and Sub-Zero

Temperatures. F. J. Anders, M. W. Toaz and E. J. Ripling. *Society for Experimental Stress Analysis, Proceedings*, v. 16, no. 2, 1959, p. 127-138.
18 ref. (X29, Q27b, 2-63)

95-X. (English.) Method for Detection of Pinholes in Protective Coatings. F. L. Sos and E. Sterk. *Acta Technica (Budapest)*, v. 25, no. 3-4, 1959, p. 247-255.
Method based on copying the actual state of the surface coat. Method shows similarities to exposure of a photographic plate; the reduction of the Ag salt, however, is an electrochemical and not a photochemical reaction. 18 ref. (X23; NM-g, 9-68)

96-X. Tuyere Controls on No. 1 Blast Furnace at Fairless Works. Jack E. Webber. *ISA Proceedings. 1959 Conference*, v. 9, 1959, p. 13-20.
Theory and installation of air propositioning control on the tuyeres. (X7f, W17g)

ADDRESSES OF PUBLICATIONS

A

A. B. Metal Digest, Buehler, Ltd., 2120 Greenwood St., Evanston, Ill.

ABM Boletim da Associacao Brasileira de Metals, Viaduto Dona Paulina, 8º Andar, Palacio Maria, Sao Paulo, Brazil

l'Acciaio Inossidabile, via Lancetti, 36, Milan, Italy

Acier-Stahl-Steel, 47, rue Montoyer, Brussels 4, Belgium

Aciers Fins et Speciaux Francais, 12, rue de Madrid, Paris, 8e, France

Acta Chemica Scandinavica, Gunnar Neumuller, Nybodagatan 5, Solna, Denmark

Acta Chimica Sinica, The Science Press, 117, Chao Yang Meng St., Peking, China

Acta Metallurgica, Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y.

Acta Metallurgica Sinica, The Science Press, 117, Chao Yang Meng St., Peking, China

Acta Physica, Postafiok 440, Budapest 62, Hungary

Acta Physica Polonica, Panstwowe Wydawnigtwo Naukowe, ul Smolensk 14, Krakow, Poland

Acta Physica Sinica, Chinese Physical Society, 42, Tung Hwang Ching Chen, Peking, China

Acta Polytechnia Scandinavica, Box 5073, Stockholm 3, Sweden

Acta Technica, Magyar Tudomanyos Akademia Konyutara, Akademia utca 2, Budapest 5, Hungary

Adhaesion, Hadert-Lexikon-Verlag, Martin Luther Str. 88, Berlin, W. 30, Germany

Advanced Materials Technology, Carborundum Co., Research and Development Division, Niagara Falls, N. Y.

Advances in Physics, Taylor & Francis Ltd., 18 Red Lion Ct., Fleet St., London, England

Aero/Space Engineering, Institute of Aeronautical Sciences Inc., 2 E. 64th St., New York 21, N. Y.

AGARD Reports, Advisory Group for Aeronautical Research and Development, N. A. T. O., Palais de Chaillot, Paris

Airco News, Air Reduction Sales Co., 150 E. 42nd St., New York 17, N.Y.

Aircraft and Missiles, Chilton Co., Chestnut and 56th St., Philadelphia 39, Pa.

Aircraft Engineering, 12 Bloomsbury Sq., London, W.C. 1, England

Air Engineering, 450 W. Fort St., Detroit 26, Mich.

Alloy Casting Institute, 114 E. 40th St., New York 16, N. Y.

Alloy Digest, Engineering Alloys Digest, Inc., P. O. Box 156, Upper Montclair, N. J.

Alloy Metals Review, Widness, Lancashire, England

Alluminto, Rivista della nuova metallurgia, via S. Giovanni sul Muro 9, Milan, Italy

Aluminium, Aluminium-Verlag GmbH, Jagerhofstr. 29, Dusseldorf, Germany

Aluminium Suisse, 40 Shauffacherguai, Zurich 4, Switzerland

Aluminum Bulletin, Aluminum Association, 551 Fifth Ave., New York 17, N.Y.

Aluminum Development Association, Information Bulletin, 33 Grosvenor St., London, England

Aluminum Laboratories Ltd., Abstract Bulletin, Kingston, Ont., Canada

American Ceramic Society, Bulletin and Journal, 4055 N. High St., Columbus 14, Ohio

ACS Journal, American Chemical Society, 1155 16th St., Washington 16, D. C.

American Foundryman (See Modern Castings)

A.I.Ch.E. Journal, American Institute of Chemical Engineers, Journal, 25 W. 45th St., New York 36, N. Y.

A.I.M.E., Metallurgical Society, Transactions, 29 W. 39th St., New York 18, N.Y.

American Institute of Physics, 57 E. 55th St., New York 22, N. Y.

American Jewelry Manufacturers, 207-11 Sheraton-Biltmore Hotel, Providence 2, R. I.

American Journal of Physics, 57 E. 55th St., New York 22, N. Y.
American Machinist, McGraw-Hill Publishing Co., 330 W. 42nd St., New York 36, N. Y.
American Mineralogist, U. S. Geological Survey, Washington 25, D. C.
American Nuclear Society, Transactions, 86 E. Randolph St., Chicago 1, Ill.
American Petroleum Institute, Proceedings, 50 W. 50th St., New York 20, N.Y.
American Refractories Institute, Technical Bulletin, c/o S. M. Phelps, Mellon Institute, Pittsburgh 13, Pa.
American Society for Quality Control, Transactions, Rm. 6197, Plankinton Bldg., 161 W. Wisconsin Ave., Milwaukee 3, Wis.
American Society of Mechanical Engineers, Transactions, 29 W. 39th St., New York 18, N. Y.
American Society of Naval Engineers, Journal, Continental Bldg., 1012-14th St., N.W., Washington 5, D. C.
ASTM Bulletin, 1916 Race St., Philadelphia 3, Pa.
Ampco Welding News, 1745 S. 38th St., Milwaukee, Wis.
Analyst, W. Heffer & Sons, Ltd., Cambridge, England
l'Ande Electrique, Editions Chiron, 40, rue de Seine, Paris, 6e, France
Annalen der Physik, Salomonstr. 18b, Leipzig, C1, Germany
Annales des Mines, Compagnie Francaise d'Editions, 40, rue du Colisee, Paris, 8e, France
Annales de Physics, Academic Press, 111 Fifth Ave., New York, N. Y.
Annali di Chimica, Societa Chimica Italiana, viale Liegi, 48, Rome, Italy
Applications and Industry, American Institute of Electrical Engineers, 33 W. 39th St., New York 18, N. Y.
Applied Magnetics, Indiana Steel Products Co., Valparaiso, Ind.
Applied Mechanics Reviews, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.
Applied Scientific Research, Martinus Nighoff, The Hague, Netherlands
Applied Spectroscopy, Society for Applied Spectroscopy, P. O. Box 1228, 417 Cleveland Ave., Plainfield, N. J.
Archive fur das Eisenhuttenwesen, Verlag Stahleisen MbH, Schliessfach 2590, Dusseldorf, Germany
Archiwum Hutnictwa, Przedmiescie 79, Skrytka, Pocztowa 455, Warsaw, Poland
Arma Engineering, American Bosch Arma, Garden City, N. Y.
ARS Journal (formerly Jet Propulsion), American Rocket Society, 500 Fifth Ave., New York 36, N. Y.
Asaciacion Quimica Argentina, Anales, Hipolito Yrigoyen 679, Buenos Aires, Argentina
Asarco Nonferrous Metals Digest, American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Association of Bronze and Brass Founders, British Nonferrous Metals Research Association, 81-91 Euston St., London, N.W. 1, England
Astronautics, American Rocket Society, Inc., 500 Fifth Ave., New York 36, N.Y.
Australia, Commonwealth Dept. of Supply, 339 Swanston St., Melbourne, C. 1, Australia
Australasian Engineer, 20 Loftus St., Sydney, Australia
Australasian Institute of Mining and Metallurgy, Proceedings, Osborne House, 399 Little Collins St., Melbourne, Australia
Australasian Manufacturer, 16 Bond St., Sydney, Australia
Australian Institute of Metals, Journal, 18 Queen St., Melbourne, C. 1, Australia
Australian Journal of Applied Science, 314 Albert St., East Melbourne, C. 2, Victoria, Australia
Australian Journal of Chemistry, 314 Albert St., East Melbourne, C. 2, Victoria, Australia
Australian Journal of Physics, 314 Albert St., East Melbourne, C. 2, Victoria, Australia
Australian Machinery & Production Engineering, 243 Elizabeth St., Sydney, Australia
Australian Welding Journal, 243 Elizabeth St., Sydney, Australia
Austrian Machinery and Steel Construction Review, am Heumarkt 12, Vienna 3, Austria
Automatic Machining, 65 Broad St., Rochester 14, N. Y.
Automation Progress, Leonard Hill Technical Dept., Stratford House, 9 Eden St., London, N.W. 1, England
Automotive Industries, Chestnut & 56th St., Philadelphia 39, Pa.

B

Balgarskai Akademii Nauk, Academie Bulgare des Sciences, Sofia, Bulgaria
Battelle Technical Review, Batelle Memorial Institute, 505 King Ave., Columbus 1, Ohio
Bell Laboratories Record, Bell Telephone Laboratories, Inc., 463 West St., New York 14, N. Y.
Bell System Technical Journal, American Telephone & Telegraph Co., 195 Broadway, New York 7, N. Y.
Bergakademie, Bergakademie Freiberg/SA, Germany
Berg und Huttenmannische Monatshefte der Montanislischen Hohschule, Springer-Verlag, Molkerhastei 5, Vienna 1, Austria
Bericht der Oberhessichen Gesellschaft fur Nature und Heilkunde, Universitatsbibliothek, Bismarckstr. 37, Giessen, Germany
Bettis Technical Review, Bettis Atomic Power Division, Westinghouse Electric Corp., Pittsburgh, Pa.
Birmingham Metallurgical Society, Journal, 253, Longbridge Lane, Northfield, Birmingham 31, England
Blast Furnace and Steel Plant, Steel Publications, Inc., 624 Grant Bldg., Pittsburgh 30, Pa.
British Cast Iron Research Association, Journal, Bordesley Hall, Alvechurch Birmingham, England
British Ceramic Society, Transactions, Federation House, Stoke-on-Trent, England
British Chemical Engineering, Drury House, Russel St., London, W.C. 2, England
British Foundryman, Institute of British Foundrymen, St. John St., Chambers, Deansgate, Manchester 3, England
British Journal of Applied Physics, Institute of Physics, 47 Belgrave Sq., London, S.W. 1, England
British Nuclear Energy Conference, Journal, 1-7 Great George St., London S.W. 1, England
British Steelmaker, 7 Chesterfield Gardens, Curzon St., London, W. 1, England
British Welding Journal, Institute of Welding, 54 Princess Gate, London, S.W. 7, England
Brown Boveri Review, Brown Boveri Corp., 19 Rector St., New York 6, N.Y. (Also Brown, Boveri and Co., Ltd., Baden, Switzerland)
Bulletin de l'Academie Polonaise des Sciences, Polska Akademia Nauk, Palac Kultury i Nauki, Warsaw, Poland
Bulletin de l'Institut International du Froid, 177, Blvd. Malesherbes, Paris, 17^{e}, France

C

Cahiers de Physique, 3 and 5 Blvd. Pasteur, Paris 15^{e}, France
California Mineral Information Service, Division of Mines and Geology, Ferry Bldg., San Francisco 11, Calif.
Cambridge Philosophical Society, Proceedings, Cambridge University Press, 200 Euston Rd., London, N.W., England
Canadian Ceramic Society, Journal, 49 Turner Rd., Toronto, Ont., Canada
Canadian Chemical Processing, Hugh C. Maclean Publications Ltd., 1450 Don Mills Rd., Don Mills, Ont., Canada
Canadian Dept. of Mines and Technical Surveys, Information Circular and Research Reports, Division of Administration, National Research Council, Ottawa 2, Ont., Canada
Canadian Journal of Chemistry, National Research Council, Ottawa 2, Ont., Canada
Canadian Journal of Physics, National Research Council, Ottawa 2, Ont., Canada
Canadian Machinery, 481 University Ave., Toronto 2, Ont., Canada
Canadian Metals, Box 4000, Terminal A, Toronto 1, Ont., Canada
Canadian Metalworking, 1450 Don Mills Rd., Don Mills, Ont., Canada
Canadian Mining Journal, National Business Publications Ltd., Gardenvale, Que., Canada
Canadian Mining and Metallurgical Bulletin, Canadian Institute of Mining and Metallurgy, 906 Drummond Bldg., Montreat 2, Que., Canada
Canadian Welder, 365 Bannatyne Ave., Winnipeg 2, Man., Canada
Carbide Engineering, 222 E. Willow Ave., Wheaton, Ill.
Castings, Wingello House, Angel Place, Sydney, Australia
Castings Institute of Japan, Journal, Nippon Imono Kyokai, Totsukamachi, Tokyo, Japan

Castings Research Laboratory, Waseda University, 500, Totsuka 1-chome, Shinjuku-ku, Tokyo, Japan

Cast Iron Pipe News, Cast Iron Research Association, Suite 3440, Prudential Plaza, Chicago 1, Ill.

Centre de Documentation Siderurgique (See I.R.S.I.D.)

Ceramic Age, Ceramic Publications, Inc., Ninth-Chester Bldg., Cleveland 14, Ohio

Ceramics, Wheatland Journals Ltd., 157, Hagden Lane, Watford, Hert., England

Chartered Mechanical Engineer, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminister, S.W. 1, England

Chase Centaur, Chase Brass and Copper Co., Inc., Waterbury 20, Conn.

Chemical Age, Bouverie House, 154 Fleet St., London, E.C. 4, England

Chemical and Engineering News, American Chemical Society, 1155 16th St., N.W., Washington 6, D. C.

Chemical Engineering, 330 W. 42nd St., New York 36, N. Y.

Chemical Engineering Progress, American Institute of Chemical Engineers, 25 W. 45th St., New York 36, N. Y.

Chemical Industry and Engineering (See Chemical Processing)

Chemical Processing, 11 E. Delaware Place, Chicago 11, Ill.

Chemical Products and Chemical News, Temple Chambers, Temple Ave., London, E.C. 4, England

Chemical Reviews, Williams & Wilkins Co., Mt. Royal & Guilford Ave., Baltimore 2, Md.

Chemical Society, Journal, Burlington House, Piccadilly, London, W. 1, England

Chemical Society of Japan, Bulletin, No. 5, 1-chome, Surugadai-Kanda, Chiyoda-ku, Tokyo, Japan

Chemical Week, 330 W. 42nd St., New York 36, N. Y.

Chemicke Listy, Ceskoslovenska Spolecnost Chemicka Pri Csav, Hradcany, Hradcanske Nam. 12, Prague 1, Czechoslovakia

Chemie fur Labor und Betrieb, Umschau Verlag, Stuttgarten Str. 20-24, Frankfurt-am-Main, Germany

Chemie-Ingenieur-Technik, Verlag Chemie GmbH, Pappelallee 3, Weinheim/Bergstr., Germany

Chemiker Zeitung, Alfred Huthig Verlag GmbH, Wilckensstr. 3, Heidelberg, Germany

Chemische Rundschau, Buckdruckerei Vogt-Schild AG, Solothurn, Switzerland

Chemist-Analyst, J. T. Baker Chemical Co., Phillipsburg, N. J.

Chemistry and Industry, Society of Chemical Industry, 14-16 Belgrave Sq., London, S.W. 1, England

Chicago Purchasor, 134 N. LaSalle St., Chicago 2, Ill.

Chimie Analytique, Societe de Productions Documentaires, 28, rue St. Dominique, Paris 7^{e}, France

Ciencia y Tecnica de la Soldadura, Instituto de la Soldadura, Serrano, 144-A, Madrid, Spain

Cobalt (English Edition) Cobalt Information Center, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio

Colorado Engineer, University of Colorado, Boulder, Colo.

Colorado School of Mines, Mineral Industries Bulletin, Dept. of Publications, Golden, Colo.

Comptes Rendus, l'Academie des Sciences, Quai des Grands-Augustins, 55, Paris, France

Comptes Rendus / Doklady Balgarskoi Akademii Nauk, Bulgarska Akademiia ria naukite, Sofia, Bulgaria

Contemporary Physics, Taylor & Francis Ltd., 18 Red Lion Court, Fleet St., London, E.C., 4, England

Control, Rowse Muir Publications Ltd., 3 Percy St., London, W. 1, England

Control Engineering, 330 W. 42nd St., New York 36, N. Y.

Copper Journal of the Copper Development Association, 55, S. Audley St., London, W. 1, England

Copper and Brass Bulletin, 420 Lexington Ave., New York 17, N. Y.

Cornell Engineer, 1, Carpenter Hall, Ithaca, N. Y.

Corrosion, National Association of Corrosion Engineers, 1061 M & M Bldg., Houston 2, Tex.

Corrosion and Protection of Materials, Research Institute for the Protection of Materials, U mestanskeho pivovaru 4, Prague 7, Czechoslovakia

Corrosion et Anticorrosion, 28, rue St. Dominique, Paris, 7^{e}, France

Corrosionomics, Fansteel Metallurgical Corp., Chemical Equipment Div., North Chicago, Ill.

Corrosion Prevention and Control, 97, Old Brompton Rd., South Kensington, London, S.W. 7, England
Corrosion Technology, Leonard Hill House, 9 Eden St., London, N.W. 1, England
Cost Engineering, Industrial Research Service, Inc., Masonic Bldg., Dover, N. H.
Cuivre, Laitons, Alliagres, 45, ave. du Roule, Neuilly, Seine, France
Current Engineering Practice, India House, Opp. G.P.O., P. B. no 1374, Bombay 1, India
Current Science, Bangalore 6, India
Czechoslovak Chemical Communication, Collections, Artia, Smecky, 30, Prague 2, Czechoslovakia
Czechoslovak Heavy Industry, 13, ul. 28, rijna, Prague, Czechoslovakia
Czechoslovak Journal of Physics, Ustav Technicke Fysiky Csav, Cukrovarnicka 10, Prague, Czechoslovakia

D

Datamation (Formerly Research and Engineering), 141 E. 44th St., New York 17, N. Y.
Demag News, Demag A. G., Duisburg, Germany
Design Engineering, Box 4000, Terminal A., Toronto 1, Ont., Canada
Design News, 20 N. Wacker Dr., Chicago 6, Ill.
Deutsche Eisenbahn Technik, VEB Verlag Technik, Berlin, W. 8, Germany
Deutsche Farben-Zeitschrift, Dr. Hans Kittel, Wissenschaftliche Verlagsgesellschaft, Stuttgart, Germany
Deutschen Akademie der Wissenschaften zu Berlin, Abhandlungen, Akademie-Verlag, Berlin 1, Germany
Diamond Data, Industrial Diamond Div., Engelhard Industries, Inc., 113 Astor St., Newark 2, N. J.
Die Casting Engineer, Society of Die Casting Engineers, Inc., 19382 James Couzens Hwy., Detroit 35, Mich.
Doklady Akademii Nauk SSSR, Akademii Nauk SSSR, Shubinskii per 10, Moscow, Russia
Draht, Prost & Meiner Verlag, 13a, Coburg/Ofr., Germany
Draht (English Edition), Prost & Meiner Verlag, 13a, Coburg/Ofr., Germany

E

Eaton Engineering Forum, Eaton Manufacturing Co., 739 E. 140th St., Cleveland 10, Ohio
Edgar Allen News, Edgar Allen and Co. Ltd., 3 St. James Sq., London, S.W. 1, England
Egyptian Academy of Sciences, Proceedings, "Dar el Hikma", 42, Qasr el Aini St., Cairo, Egypt
Egyptian Journal of Chemistry, National Research Center, Technical Bureau, Dokki, Cairo, Egypt
Electrical Engineering, American Institute of Electronic Engineers, 33 W. 39th St., New York 18, N. Y.
Electrical Manufacturing, 205 E. 42nd St., New York 17, N. Y.
Electrochemical Society, Journal, 1860 Broadway, New York 23, N. Y.
Electrochemical Society (India), Bulletin, Indian Institute of Science, Bangalore 3, India
Electronic Engineering, 28 Essex St., Strand, London, W.C. 2, England
Electronics, 330 W. 42nd St., New York 36, N. Y.
Electronics Industry, Chestnut and 56th St., Philadelphia 39, Pa.
Electronics Technician, 480 Lexington Ave., New York 17, N. Y.
Electroplating and Metal Finishing, 85 Udney Park Rd., Teddington, Middlesex, England
Elektro Anzeiger, Verlag W. Girardet, Essen, Germany
Elektro-Warme, Dr. W. Glassen, Vulkan-Verlag, Haus der Technik, Essen, Germany
Elin-Zeitschrift, Edgar Gruder, Volksgartenstrabe 3, Vienna 1, Austria
Endeavour, Imperial Industries Ltd., North Block, Thames House, Millbank, London S.W. 1, England
Energia Industrial, Avda. de Mayo 963 Buenos Aires, Argentina
Engenharia, Mineracao Metallurgia, Revista de Mineracao e Metalurgia Ltd., rua 7 de Setembro, 135-2, Rio de Janeiro, Brazil
English Electrical Review, English Electric Co., Queens House, Kingsway, London, W.C. 2, England
Engineer, 28, Essex St., Strand, London, W.C. 2, England
Engineer, Western Electric Co., Inc., 195

Broadway, New York 7, N. Y.
Engineer and Foundryman, 206-8 Jubilee House, 15 Simmonds St., Johannesburg, South Africa
Engineering, 330 W. 42nd St., New York 36, N. Y.
Engineering Institute of Canada, Transactions, 2050 Mansfield St., Montreal 2, Que., Canada
Engineering and Mining Journal, 330 W. 42nd St., New York 36, N. Y.
Engineering Journal, Engineering Institute of Canada, 2050 Mansfield St., Montreal 2, Que., Canada
Engineer's Digest, 120 Wigmore St., London, W. 1, England
l'Equipement Mecanique, 40, rue du Colisee, Paris, 8e, France
Erdol und Kohle, Industrie Verlag von Hernhaussen, Hamburg 11, Germany
ETZ-Electrotechnische Zeitschrift, Zentralblatt fur Elektrotechnik, Berlin, Germany
Explorer, Stainless and Strip Division, Jones & Laughlin Steel Corp., Detroit 34, Mich.
Explosivstoffe, Erwin Barth Verlag, Schwetzinger Str. 154, Mannheim 1, Germany

F

Fansteel Metallurgy, Fansteel Metallurgical Corp., North Chicago, Ill.
Faraday Society, Transactions, Discussions, 6 Gray's Inn Sq., London, England
Farbe und Lack, Curt R. Vincentz Verlag, Hannover, Germany
Feingerate Technik, Unter den Linden 12, Berlin, N.W. 7, Germany
Fertigungstechnik, Unter den Linden 12, Berlin, N.W. 7, Germany
Finish (See Metal Products Manufacturing)
Fizika Metallov i Metallovedenie, Akademiia Nauk SSSR, Sverdlovsk, Moscow, Russia
Fonderia, via Mameli 19, Milan, Italy
Fonderia Italiana, via Moscova, 16, Milan, Italy
Fonderie, 12, ave. Raphael, Paris 16e, France
Fonderie Belge, 21, rue des Drapiers, Brussels 5, Belgium
Foote Prints, Foote Mineral Co., 18 W. Chelten Ave., Philadelphia 44, Pa.
Foundry, Penton Bldg., Cleveland 13, Ohio
Foundry Trade Journal, John Adam House, 17-19 John Adam St., London, W.C. 2, England
Franklin Institute, Journal, Ben Franklin Parkway at 20th St., Philadelphia 3, Pa.
Freiberger Forschungshefte, Akademie Verlag, Berlin, Germany
Frontier, Armour Research Foundation, Technology Center, Chicago 16, Ill.
Fusion de Metales, Apartado 667, Monterrey, N.L., Mexico

G

Galvano, la Surface Metallique, 79, ave. des Champs-Elysees, Paris 18e, France
Galvanotechnica, via Campigli 10, Varesa, Italy
Galvanotechnik, Eugen G. Leuze Verlag, Silcherstra. 3, Saulgau 1, Wurttemberg, Germany
Gas-Wasser-Warme, Mariahilfer Str. 63, Vienna 6, Austria
General Motors Engineering Journal, 3044 W. Grand Blvd., Detroit 2, Mich.
Geological, Mining and Metallurgical Society of India, Bulletin, Presidency College, Calcutta, India
Giesserei, Giesserei-Verlag GmbH, Breite Str. 27, Dusseldorf, Germany
Giesserei-Praxis, Fachverlag Schiele & Schon GmbH, Markgrafenstr. 11, Berlin, S.W. 61, Germany
Giessereitechnik, Oranienburger Str. 13-14, Berlin, C. 2, Germany
Gjuteriet, Kungsgatan 80, Stockholm K, Sweden
Gieterij-Centrum, Metaalinstituut T.N.O., Delft, Netherlands
Goldsmiths Journal, 226 Latymer Ct., Hammersmith, London, W. 6, England
Government Industrial Research Institute, Nagoya, Report, Hirate-Machi, Kita-ku, Nagoya, Japan
Grinding and Finishing, 222 E. Willow Ave., Wheaton, Ill.
Grits and Grinds, Norton Co., Worcester, Mass.

H

Harterei-Technischen Mitteilungen, Institut fur Harterei-Technik, Postfach 13, Bremen-St. Magnus, Germany

Hitachi Review, Hitachi, Ltd., Tokyo, Japan
Hokkaido University, Research Institute for Catalysis, Journal, Hokkaido University, Sapporo, Japan
Hutnicke Listy, Spalena 51, Prague, Czechoslovakia
Hutnik, Instytotow Metalurgii, ul. k. Miarki 12, Aliwice, Poland
IBM Journal of Research and Development, 590 Madison Ave., New York 22, N. Y.
I/EC (Industrial and Engineering Chemistry), American Chemical Society, 1155 16th St., N.W., Washington 6, D.C.
Inco, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Inco Corrosion Reporter, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Indian Ceramics, 17, Sourin Roy Rd., Behala, Calcutta 34, India
Indian Chemical Society, Journal, 92 Upper Circular Rd., Calcutta 9, India
Indian Institute of Metals, Transactions, 31 Chowringhee Rd., Calcutta 16, India
Industria Mineraria, via Sardegne, 14, Rome, Italy
Industrial Chemist, 33 Tothill St., Westminster, London, S.W. 1, England
Industrial Diamond Review, 226 Latymer Ct., Hammersmith, London, W.6, England
Industrial Finishing, 1142 N. Meridian St., Indianapolis 4, Ind.
Industrial Finishing (British), Arrow Press Ltd., 1 Stamford St., London, S.E. 1, England
Industrial Gas, 48 W. 38th St., New York 18, N. Y.
Industrial Heating, Union Trust Bldg., Pittsburgh 19, Pa.
Industrial Quality Control, American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee 3, Wis.
Industrial Science and Engineering, 201 N. Wells St., Chicago 6, Ill.
Industrie-Anzeiger, Verlag W. Girardet, Essen, Germany
Industrieblatt, Neckarstr. 121, Stuttgart O, Germany
l'Industrie Ceramique, 9 rue Lafayette, Paris 9^{e}, France
l'Industrie Chemique le Phosphate, 8, rue de Miromesnil, Paris 8^{e}, France
Industrie Chimique Belge, 32, rue Joseph II, Brussels, Belgium
Industrie des Plastiques Modernes, 40, rue du Colisee, Paris 8^{e}, France
l'Industrie Francaise, Achats & Entretien du Materiel Industriel, 6, rue de Liege, Paris 9^{e}, France
Industrielle Organisation, Zurichbergstr. 18, Zurich 7/32, Switzerland
Industry and Welding, 812 Huron Rd., Cleveland 15, Ohio
Ingegnere Mecannca, Istituto Propaganda Internazionale, via Tadino 62, Milan, Italy
Ingenierie e Industria, Santiago del Estero 643, Buenos Aires, Argentina
Institut de Recherches de la Siderurgie (IRSID), 185, rue President Roosevelt, St. Germaine-en-Laye, France
Institute of Marine Engineers, Transactions, 76 Mark Lane, London, E.C. 3, England
Institute of Metal Finishing, Transactions, 32 Great Ormond St., London, W.C. 1, England
Institute of Metals, Journal, 17 Belgrave Sq., London, S.W. 1, England
Institute of Vitreous Enamellers, Bulletin, Ripley, Near Derby, England
Institution of Chemical Engineers, Transactions, 16 Belgrave Sq., London, S.W. 1, England
Institution of Electrical Engineers, Proceedings, Savoy Place, London, W. E. 2, England
Institution of Engineers, Journal, 8 Gokhole Rd., Calcutta, India
Institution of Mechanical Engineers, Proceedings, 1 Birdcage Walk, Westminster, S.W. 1, England
Institution of Mining and Metallurgy, Bulletin, 44 Portland Place, London, W. 1
Institution of Production Engineers, Journal, 10 Chesterfield St., London, W. 1, England
Instituto del Hierro y del Acero, Artes Graficas, Langa y Compania, Madrid, Spain
Instrument Engineer, George Kent Ltd., Biscot Rd., Luton, Beds., England
Instrument Practice, 9 Gough Sq., Fleet St., London, E.C. 4, England
ISA Journal, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa.
Instrumentation, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Ave., Philadelphia 44, Pa.
Instruments and Control Systems (formerly Instruments and Automation), 845 Ridge Ave., Pittsburgh 12, Pa.

Instruments and Laboratories, 92, rue Bonaparte, Paris 6e, France
Insulation, 8 Buckingham St., London, W. C. 2, England
Interceram, Herderstr. 2, Lubeck, Germany
International Journal of Applied Radiation and Isotopes, Pergamon Press, 4 & 5 Fitzroy Sq., London, W.1, England
Ion, Paseo del Prado, 18-20, Madrid, Spain
Iowa Engineer, Iowa State College, Ames, Iowa
IRE Transactions of Nuclear Science, Institute of Radio Engineers, 1 E. 79th St., New York 21, N. Y.
Iron Age, Chestnut & 56th St., Philadelphia 39, Pa.
Iron and Coal Trades Review, John Adam House, 17-19 John Adam St., Adelphi, London, W.C. 2, England
Iron & Steel, Dorsey House, Stamford St., London, S.E. 1, England
Iron and Steel Engineer, 1010 Empire Bldg., Pittsburgh 22, Pa.
Iron and Steel Institute, Journal, 4 Grosvenor Gardens, London, S.W. 1, England
Iron and Steel Institute of Japan, Journal, Tetsu-to-Hagane Abstracts, Nippon Tekko Kyokai, Naka-14-go-kan, 10 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan
Istanbul Teknik Universitesi Bulletin, Istanbul Teknik Universitesi, Giimiissuyu, Turkey

J

Japan Electrotechnical Laboratory, Bulletin, Nagata-cho, Chiyoda-ku, Tokyo, Japan
Japan Foundrymen's Society, Journal (IMONO), 30, Toyokawa Bldg., no. 4, Higashi 8-chome, Ginza, Chuo-ku, Tokyo, Japan
Japan Journal of Applied Physics, Faculty of Engineering, University of Tokyo, 1, Motofujicho, Bunky-ku, Tokyo, Japan
Japan Journal of the Metal Finishing Society, Kinzoku-Hyomen-Kijutsu-Kyokai, Kobikikan Bldg., 7 Higashi 6 chome, Ginza, Chuo-ku, Tokyo, Japan
Japan Society of Mechanical Engineers, Journal, Marunouchi Bldg., 561, Chiyoda-ku, 2 Marunouchi, 2-chome, Tokyo, Japan
Japanese Government Mechanical Laboratory, Bulletin, Journal, Reports, Sumiyoshi-cho, Suginami-ku, Tokyo, Japan
Japanese Welding Society, Journal, 29, Higashi Matsushitacho, Kanda, Chiyoda-ku, Tokyo, Japan
Jerindustri, Kristian Augustsgate 23, Oslo, Norway
Jerkontorets Annaler, Kungstradgardsgatan 6, Stockholm-C, Sweden
Journal de Chimie Physique, 11, rue Pierre-Curie, Paris, France
Journal du Four Electrique, 86, rue Cardinet, Paris 17e, France
Journal of Applied Mechanics, 29 W. 39th St., New York 18, N. Y.
Journal of Applied Physics, American Institute of Physics, 335 E. 45th St., New York 17, N. Y.
Journal of Basic Engineering, 29 W. 39th St., New York 18, N. Y.
Journal of Chemical Physics, American Institute of Physics, 57 E. 55th St., New York, N. Y.
Journal of Electronics and Control, 18 Red Lion Ct., Fleet St., London, E. C. 4, England
Journal of Electronmicroscopy, Japan, Nagata-cho 2-1, Chiyoda, Tokyo, Japan
Journal of Engineering Education, American Society for Engineering Education, University of Illinois, Urbana, Ill.
Journal of Engineering for Industry, 29 W. 39th St., New York 18, N. Y.
Journal d'informations techniques des Industries de la Founderie, 12, ave. Raphael, Paris 16e, France
Journal of Inorganic and Nuclear Chemistry, 4 & 5 Fitzroy Sq., London, W. 1, England
Journal of the Less-Common Metals, 110-112 Spuistra. Amsterdam-C, Holland
Journal of the Mechanics and Physics of Solids, 4 & 5 Fitzroy Sq., London, W. 1, England
Journal of the Metallurgical Club, Royal College of Science and Technology, Glasgow, C. 1, Scotland
Journal of Metals, A.I.M.E., 29 W. 39th St., New York 18, N. Y.
Journal of Nuclear Energy, 4 & 5 Fitzroy Sq., London, W. 1, England
Journal of Nuclear Materials, 68-70 N.Z. Voorburgwal, P. O. Box 103, Amsterdam-C, Holland
Journal of Nuclear Physics, 68-70 N.Z. Voorburgwal, P. O. Box 103, Amsterdam-C, Holland

Journal of Physical Chemistry, American Chemical Society, Ohio State University, Columbus 10, Ohio
Journal de Physique et la Radium, 12, place Henri Bergson, Paris 8e, France
Journal of Research, National Bureau of Standards, Office of Technical Information, Washington 25, D. C.
Journal of Scientific Instruments, Institute of Physics, 47 Belgrave Sq., London, S.W. 1, England
Journal of Technology, Calcutta, Bengal Engineering College, P. O. Botanic Garden, Howrah, India
Journal de la Soudure (see Zeitschrift fur Schweisstechnic)

K

Kohaszäti Lapok, Szabadsag Ter 17, Budapest 5, Hungary
Korose a Ochrana Materialu, u Mistanskiho Pinovaru 4, Prague 7, Czechoslovakia
Kumamato University, Faculty of Engineering, Memoirs, Kumamoto, Japan
Kyoto University, Faculty of Engineering, Memoirs, Kyoto, Japan

L

Lastechniek, Nederhandse Vereniging voor Lastechniek, Zeestr. 62, 's-Gravenhage, Netherlands
Light Metal Age, 549 W. Randolph St., Chicago 6, Ill.
Light Metals, Temple Press Ltd., Bowling Green Lane, London, E.C. 1, England
Light Metals (Japanese), Hibuija Asai Seinei Bldg., no. 2, 1 Yuraku-cho, Chi yo Da-ku, Tokyo, Japan
Light Metals Bulletin, British Aluminium Co. Ltd., Norfolk House, St. James Sq., London, S.W. 1, England
Linde Tips, Linde Air Products, 30 E. 42nd St., New York, N. Y.
Liteinoe Proizvodstvo, Gosudarstvennoe Nauchno-Tekhnicheskoe, Izdatel 'stvo Mashinostroitel '-noi Literatury, Moscow, Russia
London Imperial College of Science and Technology, Chemical Engineering Society Journal, Roderic Hill Bldg., Prince Consort Rd., London, S.W. 7, England
Louisiana State University, Engineering Experiment Station Bulletin, Baton Rouge, La.
Lubrication, Texas Co., 135 E. 42nd St., New York 17, N. Y.
Lubrication Engineer, American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill.

M

Macchine, via Mameli, 19, Milan, Italy
Machine and Tool Blue Book, 222 E. Willow Ave., Wheaton, Ill.
Machine Design, Penton Bldg., Cleveland 13, Ohio
Machine Moderne, 15, rue Bleue, Paris 9e, France
Machine Production (and Canadian Supply), 341 Church St., Toronto 2, Ont., Canada
Machinery, 93 Worth St., New York 13, N. Y.
Machinery Lloyd, 6 Cavendish Place, Regent St., London, W. 1, England
Machinery (London), Clifton House, 83-117 Euston Rd., London, N.W. 1, England
Machinery Market, 146a Queen Victoria St., London, E.C. 4, England
Magazine of Standards, American Standards Assoc., Inc., 70 E. 55th St., New York 17, N. Y.
Magnafacts, Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.
Magnesium, Brooks & Perkins Inc., 1950 W. Fort St., Detroit 16, Mich.
Mass Production, 4 Ludgate Circus, London, E.C. 4, England
Materialprufung, Materials Testing, Materiaux, Deutscher Verband fur Materialprufung, Unter den Eichen 87, Berlin-Dahlem, Germany
Materials in Design Engineering, 430 Park Ave., New York 22, N. Y.
Mechanical Engineering, A.S.M.E., 29 W. 39th St., New York 18, N. Y.
Mechanical World & Engineering Record, 31, King St., West Manchester 3, England
Mededelingen, Dienst voor Schone Kunsten der Gemeente's-Gravenhage, The Hague, Netherlands
Messe-Kurier, Verlag und Redaktion, Postfach 6147, Hannover 6, Germany
Metal Age, Birkett House, 27 Albemarle St., London, W. 1, England

Metal Bulletin, Birkett House, 27 Albemarle St., London, W. 1, England
Metal Cuttings, National Twist Drill & Tool Co., Rochester, Mich.
Metal Finishing, 381 Broadway, Westwood, N. J.
Metal Finishing Journal, John Adam House, 17-19 John Adam St., Adelphi, London, W.C. 2, England
Metal Forming and Fabricating, 201 N. Wells St., Chicago 6, Ill.
Metal Industry, Dorset House, Stamford St., London, S.E. 1, England
Metal Powder Assoc., Proceedings, 420 Lexington Ave., New York 17, N. Y.
Metal Powder Report, 59-62 High Halborn, London, W.C. 1, England
Metal Products Manufacturing, Elmhurst National Bank Bldg., York St. at Park Ave., Elmhurst, Ill.
Metal Progress, American Society for Metals, Metals Park, Novelty, Ohio
Metal Removing, 179 Winton Rd., North, Rochester 10, Pa.
Metal Treating, Metal Treating Institute, 271 North Ave., New Rochelle, N. Y.
Metal Treatment, 2 Caxton St., Westminster, London, S.W. 1, England
Metal Treatment and Drop Forging, John Adam House, 17-19 John Adam St., Adelphi, London, W.C. 2, England
Metalen, Uitgave: de Hofstad- Vakpers, Scheepmakerastr. 1-3-'s Gravenhage, The Hague, Netherlands
Metall, Hubertusallee 18, Berlin-Grunewald, Germany
Metallen, AB Svenska Metallverken, Vasteras, Sweden
Metalloberflache, Carl Hanser Zeitschriften Verlag GmbH, Munich 27, Germany
Metallurgia Italiana, via Moscova 16, Milan, Italy
Metallurgical Abstracts, the Institute of Metals, 17 Belgrave Sq., London, S.W. 1, England
Metallurgical Reviews, The Institute of Metals, 17 Belgrave Sq., London, S.W. 1, England
Metallurgie, 26 Place Tolozan, Lyon, France
Metallurgie et la Construction Mechanique, 79, ave. des Champs-Elysees, Paris 8^{e}, France
Metallurgist (incorporating the Bulletin of the Institution of Metallurgists), 4 Grosvenor Gardens, London, S.W. 1, England
Metals (Japanese), 10 Ichibancho, Chiyoda-ku, Tokyo, Japan
Metalurgia y Electricidad: Revista Technica Nacional, 7, Cuesta de Santo Domingo, Madrid, Spain
Metalworking, 221 Columbus Ave., Boston 16, Mass.
Metalworking Production, 95, Farringdon St., London, E.C. 4, England
Metaux-Corrosion-Industries, 32, rue du Marechal-Joffre, St. Germain-en-Laye, France
Microtechnic, 23. ave. de la Gare, Lousanne, Switzerland
Mill and Factory, 205 E. 42nd St., New York 17, N. Y.
Mine and Quarry Engineering, 33 Tothill St., London, S.W. 1, England
Mineral Industries Bulletin, College of Mineral Industries, Pennsylvania State University, University Park, Pa.
Mineral Industries Journal, Virginia Polytechnic Institute, Blacksburg, Va.
Mines et Metallurgie, l'Echo des Mines et de la Metallurgie, 86, rue Cardinet, Paris 17^{e}, France
Mines Magazine, Colorado School of Mines Alumni Assoc., Golden, Colo.
Mining and Industrial Review, 206-208 Jubilee House, 15 Summonds St., Johannesburg, South Africa
Mining and Metallurgical Society of America, Bulletin, 11 Broadway, New York 4, N. Y.
Mining Congress Journal, American Mining Congress, Ring Bldg., Washington 6, D. C.
Mining, Electrical and Mechanical Engineer, Cromwell Bldg., Blackfriars St., Manchester 3, England
Mining Engineering, A.I.M.E., 29 W. 39th St., New York 18, N. Y.
Mining Journal, 15 Wilson St., Mooregate, London, E.C. 2, England
Mining Magazine, 482, Salisbury House, London Wall, London, E.C. 2, England
Mining World, 500 Howard St., San Francisco 5, Calif.
Missiles and Rockets, 1001 Vermont Ave., N.W., Washington 5, D. C.
Missouri University, School of Mines and Metallurgy, Bulletin, Rolla, Mo.
Modern Assembly Practice, 221 Columbus Ave., Boston, Mass.
Modern Castings, American Foundrymen's Society, Golf and Wolf Rd., Des Plains, Ill.

Modern Machine Shop, 431 Main St., Cincinnati 2, Ohio
Modern Metals, 435 N. Michigan Ave., Chicago 11, Ill.
Murex Review, Rainham, Essex, England

N

National Academy of Sciences, Proceedings, University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill.
National Bureau of Standards, Journal of Research, U. S. Government Printing Office, Washington 25, D. C.
National Bureau of Standards, Technical Reports, Washington 25, D. C.
NRIM (National Research Institute for Metals), Transactions, 300, 2-chome, Nakameguro, Meguro-ku, Tokyo, Japan
Nature, St. Martin's St., London, W.C. 2, England
Nature, 92, rue Bonaparte, Paris 6e, France
Neue Hutte, VEB Verlag Technik, Oranienburger Str. 13-14, Berlin, C.2, Germany
New Scientist, Cromwell House, Fulwood Place, High Holborn, London, W.C. 1, England
New Zealand Engineering, Dominion Bldg., P.O. Box 1001, Wellington, New Zealand
Nickel, Corro Monfort, 48, Milan 38, Italy
Nickel Bulletin, Mond Nickel Co. Ltd., Thames House, Millbank, London, S.W. 1, England
Nihon Kinzoku Gakkai-shi, Sendai, Japan
Nihon University, Journal of the Research Institute of Technology, no 8, 1-chome, Surugadai Kanda, Chiyoda-ku, Tokyo, Japan
Nippon Kinzoku Gakkaishi (Journal of the Japan Institute of Metals), Kinzoku Zair-yo, Kenkyujo, Katahiracho, Sendai, Japan
NML Technical Journal, National Metallurgical Laboratory, Council of Scientific and Industrial Research, Jamshedpur 7, India
Nondestructive Testing, Society for Nondestructive Testing, 1109 Hinman Ave., Evanston, Ill.
Norelco Reporter, North American Philips Co., Inc., 750 E. Fulton Ave., Mt. Vernon, N. Y.
Norsk Skogindustrie, Radhusgt. 7b, Oslo, Norway
North Carolina State College, Engineering School Bulletin, Raleigh, N.C.
North East Coast Institution of Engineers and Shipbuilders, Transactions, Bolbec Hall, Newcastle-on-Tyne 1, England
Notas de Fisicas, Centro Brasileiro de Pesquisas Fisicas, ave. Venceslau Bras 71, Rio de Janeiro, Brazil
Nuclear Power, 3 Percy St., London, W.1, England
Nuclear Science and Engineering, American Nuclear Society, 86 E. Randolph St., Chicago 1, Ill.
Nucleonics, 330 W. 42nd St., New York 36, N. Y.

O

Obrobka Plastyczna, Centraline Laboratorium, Obrobki Plastycznej, Pl. C. Sklodowskiej 5, Poznan, Poland
Oerlikon Schweissmittlelungen, Buhrle & Co., Birchastra. 230, Zurich Switzerland
Office of Technical Information, National Bureau of Standards, Washington 25, D. C.
Ohio State University, News in Engineering, 204 Engineering Experiment Station, Columbus 10, Ohio
Oilways, Esso Standard Oil Co., 15 W. 51st St., New York 19, N. Y.
Osaka University, Technology Reports, Faculty of Engineering, Higashinada, Osaka, Japan

P

Pacific Factory, 709 Mission St., San Francisco 3, Calif.
Pakistan Council of Scientific and Industrial Research, Quarterly, 141-S.2, P.E.C.H.S., Karachi-29, Pakistan
Pakistan Journal of Science, Ferozepore Rd., Lahore, Pakistan
Peintures, Pigments, Vereins, 28, rue St. Dominique, Paris 7e, France
Pennsylvania Mineral Industries Experiment Station, Bulletin, College of Mineral Industries, Pennsylvania State University, University Park, Pa.
Periodica Polytechnica, Technische Universitat, P.O.B. 440, Budapest 62, Hungary
Petroleum Engineer, Box 1589, Dallas 21, Tex.

Philips Research Reports, N.V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands
Philosophical Magazine, Taylor & Francis, Ltd., Red Lion Court, Fleet St., London, E.C. 4, England
Physica, Bijlhouwerstra. 6, Utrecht, Netherlands
Physical Society, Proceedings, 1 Lowther Gardens, Prince Consort Rd., London, S.W. 7, England
Physical Society of Japan, Journal, Dept. of Physics, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo, Japan
Physics and Chemistry of Solids, Journal, Pergamon Press, 122 E. 55th St., New York 22, N. Y.
Physics Today, American Institute of Physics, Inc., 57 E. 55th St., New York 22, N. Y.
Pipe Line Industry, Gulf Publishing Co., P. O. Box 2608, Houston 1, Tex.
Pipe Line News, Oildom Publishing Co., 1217 Hudson Blvd., Bayonne, N. J.
Pipes and Pipelines, 97 Old Brompton Rd., South Kensington, London, S.W. 7, England
Pitture e Vernici, via Fatebenefratelle 5, Milan, Italy
Planseeberichte fur Pulvermetallurgie (combined with Powder Metallurgy Bulletin), Postfach 74, Reutte, Tirol, Austria
Plastica, N. V. Reflex, Mathenesserlaan 310, Rotterdam, Netherlands
Plastics Technology, 630 Third Ave., New York 17, N. Y.
Plating, American Electroplaters Society, American Bldg., 445 Broad St., Newark 2, N. J.
Platinum Metals Review, Hatton Garden, London, E.C. 1, England
Polish Academy of Science, Review, Polska Akademia Nauk, Palac Kultury i Nauki, Warsaw, Poland
Powder Metallurgy, Powder Metallurgy Joint Group, Iron and Steel Institute and Institute of Metals, 17 Belgrave Sq., London, S.W. 1, England
Powder Metallurgy Bulletin (See Planseeberichte fur Pulvermetallurgie)
Power, 330 W. 42nd St., New York 36, N.Y.
Power Reactor Technology, Atomic Energy Commission, Washington 25, D. C.
Power Transmission, 1-9, Tudor Dr., Morden, Surrey, England
Prace Instytutow Hutniczych, Instytut Metalurgii, ul. K. Miarki 12, Gliwice, Poland
Prace Instytutow Metalurgii, Instytut Metalurgii, ul. K. Miarki 12, Gliwice, Poland
Pratique des Industries Mecaniques, 92, rue Bonaparte, Paris 6^{e}, France
Praktische Chemie, Jakobergasse 4, Vienna 1, Austria
Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio
Product Engineering, 330 W. 42nd St., New York 36, N. Y.
Product Finishing, 4 Ludgate Circus, London, E.C. 4, England
Production Engineer, Journal of the Institution of Production Engineers, 10 Chesterfield St., Mayfair, London, W.1, England
Products Finishing, 431 Main St., Cincinnati 2, Ohio
Progress of Theoretical Physics, Yukawa Hall, Kyoto University, Kyoto, Japan
Pro-Metal, Metallverband A. G., Berne, Switzerland
Przeglad Odlewnictwa, ul. Straszewskiego 28, Krakow, Poland
Pulp and Paper, 370 Lexington Ave., New York 17, N. Y.

R

Refining Engineer, Box 1589, Dallas 21, Tex.
Refractories Journal, 7 Chesterfield Gardens, Curzon St., Mayfair, London W.1, England
Refrattari, via I. Frugoni, 13, Genoa, Italy
Research and Engineering, 103 Park Ave., New York 17, N. Y. (Now called Datamation)
Research Council of Israel, Bulletin, P.O. Box 801, Jerusalem, Israel
Research, Journal of Science and Its Application in Industry, 4 & 5 Bell Yard, London, W.C. 2, England
Research Reviews, U.S. Office of Naval Research, Supt. of Documents, Washington 25, D. C.
Review of Scientific Instruments, 57 E. 55th St., New York 22, N. Y.
Reviews of Modern Physics, 57 E. 55th St., New York 22, N. Y.
Revista de Ciencia Aplicada, Serrano, 150, Apartado de Correos 743, Madrid, Spain

Revista de la Universidad Industrial de Santander, Bucaramanga, Colombia, S. A.
Revue de l'Aluminium, 11 bis, ave. Kleber, Paris 16e, France
Revue de Mecanique, rue des Drapiers, 21 Brussels 5, Belgium
Revue de la Soudure — Lastijdschrift, 21, rue des Drapiers, 21, Brussels 5, Belgium
Revue de Metallurgie, 25, rue de Clichy, Paris 9e, France
Revue des Materiaux, 19, rue Lafayette, Paris 9e, France
Revue du Nickel, 47 bis, ave. Hoche, Paris 8e, France
Revue Pratique du Froid, 254, rue de Vaugirard, Paris 15e, France
Revue Roumaine de Metallurgie, Scoala Politechica, 132, Calea Grivitel, Bucarest 11, Rumania
Revue Universelle des Mines, de la Metallurgie, de la Mecanique, 22, rue Forgeur, Liege, Belgium
Rivista di Meccanica, via Fantoni, 14, Milan, Italy
Rivista Italiana della Saldatura, viale Sauli, 3-5, Genoa, Italy
Royal Aeronautical Society, Journal, 4 Hamilton Place, London, W. 1, England
Royal Institution of Great Britain, Proceedings, 21 Albemarle St., London, W. 1, England
R.P.I. Engineer, Rensselaer Polytechnic Institute, Troy, N. Y.
Rudarsko-Metalurski Zbornik, Askerceva ul. 20, p.p. 311, Ljubljana, Yugoslavia
Ryan Reporter, Lindberg Field, San Diego 12, Calif.

S

SAE Journal, Society for Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.
Schweissen und Schneiden, Harkorststr. 23, Dusseldorf, Germany
Schweisstechnik, Arsenal, Objekt 221, Vienna 3, Austria
Schweizer Archiv fur Angewandte Wissenschaft und Technik, Buchdruckerei Vogt-Schild, A. G., Soloturn, Switzerland
STZ-Schweizerische Technische Zeitschrift, Gotthardstr. 61, Zurich 27, Switzerland
Science, 1515 Massachusetts Ave., N.W. Washington 5, D. C.
Science Reports of the Research Institutes, Tohoku University, Sendai, Japan
Scientia, via Marangoni 3, Milan, Italy
Scientia Sinica, 38 Suchou Hutung, Peking, China
Scientific American, 415 Madison Ave., New York 17, N. Y.
Scientific and Industrial Research, Journal, Old Mill Rd., New Delhi 1, India
Scientific Lubrication, Broseley, Shropshire, England
Sheet Metal Industries, John Adam House, 17-19 John Adam St., Adelphi, London, W.C. 2, England
Slevarenstvi, Statni Vyzkumny Ustav Materialu a Technologie, Krenova 62, Brno, Czechoslovakia
Societe Chimique de France, Bulletin, 12, rue Cuvier, Paris 5e, France
Societe Royale Belge des Ingenieurs et des Industriels, Revue, 3, rue Ravenstein, Brussels, Belgium
Society for Nondestructive Testing, Journal, 1109 Hinman Ave., Evanston, Ill.
Soudage et Techniques Connexes, 39, rue d'Amsterdam, Paris 8e, France
South African Engineer, Balgownie House, 66, Commissioner St., P. O. Box 963, Johannesburg, South Africa
South African Institute of Mining and Metallurgy, Journal, P. O. Box 1183, Kelvin House, Hollard and Marshall St., Johannesburg, South Africa
South African Mechanical Engineer, P. O. Box 1183, Kelvin House, Hollard and Marshall St., Johannesburg, South Africa
South African Mining and Engineering Journal, P. O. Box 963, Balgownie House, 66 Commissioner St., Johannesburg, South Africa
Southern Power and Industry, 806 Peachtree St., Atlanta 5, Ga.
Space Aeronautics, 205 E. 42nd St., New York 17, N. Y.
Spectrochemica Acta, 4 Fitzroy Sq., London, W. 1, England
Stahl und Eisen, Breite Str. 27, Dusseldorf, Germany
Stainless Steel Architectural Quarterly, 150 E. 42nd St., New York 17, N. Y.
Stal', Moskva Tscetnoi Bul 'var 30, Moscow, U.S.S.R.
Stanford Research Institute, Research for Industry, Menlo Park, Calif.

Stanki i Instrument, Filial Biblioteki Akademi Nauk SSSR, Baltijsk Poselok 42-b, Moscow D219, U.S.S.R.
Steel, 1213 W. Third, Cleveland 13, Ohio
Steel Horizons, Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.
Steel Processing and Conversion, 624 Grant Bldg., Pittsburgh 19, Pa.
Steel Review, British Iron and Steel Federation, Steel House, Tothill St., London, S.W. 1, England
Strain Gage Readings, Stein Engineering Services, 5602 E. Monte Rosa, Phoenix, Ariz.
Strojirenstvi, Krakovska 8, Prague II, Czechoslovakia
Studii si Cercetari de Metalurgie, Laboratorul de Metalurgie, Scoala Politehnica, 132, Calea Grivitei, Bucarest II, Rumania
Sumitomo Metals, 31, Kawaramachi 4-chome, Higashi-ku, Osaka, Japan
Suomen Kemistilehti, Fil. Kand. Pentti, P. O. Box 5041, Helsinki, Finland
Svarochnoe Proizvodistvo, Prospect Myra, 106, Moscow I-164, U.S.S.R.
Sylvania Technologist, Bayside, N. Y.

T

Tech Engineering News, Massachusetts Institute of Technology, Cambridge 39, Mass.
Technica, Birkhauser Verlag, Basel 10, Switzerland
Technik, Oranienburger Stra. 13-14, Berlin C. 2, Germany
Technik und Betrieb, Thimiggas. 82, Vienna 18, Austria
Technique Moderne, 92, rue Bonaparte, Paris 6, France
Technische Mitteilungen Krupp, Essen 22e, Germany
Tecnica Metalurgica, Paseo de Gracia, 50, Barcelona, Spain
Teknisk-Tidskrift, Box 841, Stockholm 1, Sweden
Teknisk Ukeblad, Ingeniorenes Hus, Oslo 9, Norway
Tetsu-to-Hagne, Naka 14-go-kan, 10 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan
Tidsskrift for Kjemi, Bergvesen og Metallurgi, Teknisk Ukeblad Ekspedisjon, Kronprinsensgt. 17, Oslo, Norway
Tin and Its Uses, Fraser Rd., Perivale, Greenford, Middlesex, England
Tohoku University, Technology Reports, Sendai, Japan
Tokyo University, Faculty of Engineering, Journal, Bunkyo-ku, Tokyo, Japan
Tokyo University, Institute of Industrial Science, Report, Chiba City, Japan
Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.
Tooling and Gaging, P. O. Box 97, Milford, Mich.
Tooling and Production, 1975 Lee Rd., Cleveland 18, Ohio
Trattamenti Termici, via Savona 142, Milan (821), Italy
Trempe, 7, rue Ampere, Puteaux, Seine, France

U

Ultrasonic News, 42 Brown House Rd., Stamford, Conn.
Union Carbide Metals Review, 30 E. 42nd St., New York 17, N. Y.
U. S. Bureau of Mines, Government Printing Office, Washington 25, D. C.
U. S. Dept. of Commerce, National Bureau of Standards, Office of Technical Information, Washington 25, D. C.
U. S. Government Research Reports, Supt. of Documents, Government Printing Office, Washington 25, D. C.
University of Tokyo, Institute of Industrial Science, Chiba City, Japan

V

Vacuum, 4 Fitzroy Sq., London, W. 1, England
Vancoram Review, 420 Lexington Ave., New York 17, N. Y.
VDI-Berichte, VDI-Verlag, G.m.b.H., Dusseldorf 10, Germany
VDI-Zeitschrift, Schriftleitung der VDI-Zeitschrift, Prinz-Georg Str. 77-79, Dusseldorf, Germany
Vectors, Hughes Aircraft Co., Culver City, Calif.
Vestnik Mashinostroeniya, Staropanskii Pereulok, 3, Moscow 12, U.S.S.R.
Von Roll Mitteilungen, Gerlafingen 1, Switzerland

W

Washington State Institute of Technology, Bulletin, Pullman, Wash.
Wear-Usure-Verschleiss, Spuistra. 110-112, Amsterdam-c, Netherlands
Welder, Murex Welding Processes Ltd., Waltham Cross, Herts., England
Welding and Metal Fabrication, Dorset House, Stamford St., London, S.E. 1, England
Welding Design and Fabrication, 812 Huron Rd., Cleveland 15, Ohio
Welding Engineer, P. O. Box 28, Morton Grove, Ill.
Welding Journal, American Welding Society, 33 W. 39th St., New York 18, N.Y.
Welding Research Council, Bulletin and Reports, 33 W. 39th St., New York, N.Y.
Werkstattstechnik, Reichpietschrifer 20, Berlin, Germany
Werkstatt und Betrieb, Leonard-Eckstra. 7, Munich 27, Germany
Werkstoffe und Korrosion, Bergstra., Weinhim, Germany
West of Scotland Iron and Steel Institute, Journal, 39 Elmbank Crescent, Glasgow c2, Scotland
Western Electric Engineer, 195 Broadway, New York 7, N. Y.
Western Machinery and Steel World, 681 Market St., San Francisco 5, Calif.
Western Metalworking, 2035 Miramar St., Los Angeles 57, Calif.
Westinghouse Engineer, P. O. Box 2278, 3 Gateway Center, Pittsburgh 30, Pa.
Wild-Barfield Heat Treatment Journal, 71 Broad St., Birmingham 15, England
Wire (English edition of Draht)
Wire and Wire Products, 453 Main St., Stamford, Conn.
Wire Industry, 33 Furnival St., London, E.C. 4, England
Wire Production (now Wire World International)
Wire World International, 28 Chapel Ash, Wolverhampton, Manchester, England
World Oil, Gulf Publishing Co., Box 2608, Houston 1, Tex.

Y

Yale Scientific Magazine, 244-a Yale Station, New Haven, Conn.

Z

Zeitschrift fur Erzbergbau und Metallhuttenwessen, Dr. Riederer-Verlag GmbH, Marienstr. 50, Stuttgart, Germany
Zeitschrift fur Metallkunde, Dr. Riederer-Verlag GmbH, Marienstr. 50, Stuttgart, Germany
Zeitschrift fur Physikalische Chemie, Geest & Portig K-G, Sternwartenstr, 8, Leipzig, C.1, Germany
Zeitschrift fur Schweisstechnik — Journal de la Soudure, Stauffacherquai 36, Zurich 1, Switzerland
Zvaranie, Vyskumny Ustav Svaracsky, Bratislava, Czechoslovakia

AUTHOR INDEX

Author's names are indexed by subject section and item number rather than by page. The numerals preceding the hyphen refer to the serial number of the item; the letter following the hyphen refers to the section.

A

Abashin, G. I. 142-B
Abcouwer, J. S. 165-E, 209-E
Abdeev, M. A. 381-C
Abdul-Fattah 1207-Q
Abdullaev, G. B. 142-N
Abe, Yosuhiko 184-E, 895-Q
Abel, D. H. G. 146-T
Abeles, K. B. 561-P
Abell, D. E. 377-W
Abel's, V. R. 4-P, 71-P
Abignente, Berardo 706-Q
Abkowitz, Stanley 267-C
Aboav, D. A. 556-Q
Abou-Elnaga, M. A. 11-S
Abov, G. 710-M
Abowd, Richard, Jr. 450-Q
Abragimov, Sh. Sh. 792-Q
Abraham, Lothar 28-C
Abrahamson, E. P. 1061-Q, 572-R
Abramov, Isay Viktorovich. 578-A
Abramov, V. V. 372-Q
Abramovich, V. P. 483-Q
Abresch, Karl 254-S
Abrikosov, N. Kh. 150-M
Abrosimov, E. V. 210-D
Abshire, Eleanor 196-A
Accary, A 528-N
Achs, Ballane 72-C
Achs, Marta 72-C
Achter, M. R. . . . . 678-N, 213-Q, ... 381-Q, 407-Q, 771-Q, 1031-Q
Acimovic, Simeon. 548-L, 314-R
Ackermann, F. W. 400-P
Adabaschjan, A. K. 213-S, 421-S
Adachi, Akira 363-D
Adachi, M. 375-N, 609-R
Adam, L. 106-K
Adams, C. M., Jr. 106-D, 102-P
Adams, Clarence R. 71-T
Adams, Clyde M. 2-E, 145-E
Adams, George B., Jr. 156-L
Adams, Max D. 335-C
Adams, P. 593-Q
Adams, Richard W. 124-B
Adamski, F. J. 68-K
Adamson, G. M. 222-F
Adda, Y. . . . . 53-N, 376-N, 531-N, ... 541-N, 569-N, 609-N
Adel'skaya, F. S. 105-J
Ades, L. 261-L, 389-L, 811-L
Adkins, E. F. 309-N, 447-N
Adkins, Howard E. 564-K
Adlassnig, K. 45-H
Adlhart, Otto 184-C
Adolphson, Donald R. 167-Q, 174-Q, 175-Q, 335-Q
Adon'ev, S. M. 490-D
Aengeneyndt, H. W. 374-G
Afanas'ev, A. S. 60-P, 437-R, 482-R, 825-R
Afanas'ev, A. Ya. 203-P
Afanas'ev, V. N. 408-D
Afranas'ev, V. I. 367-D
Agapov, V. F. 282-D
Agashin, A. A. 407-D
Ageenkov, V. G. 348-C
Ageev, N. V. 551-M, 552-M, 553-M
Aggen, G. N. 545-Q
Agladze, R. I. 53-M
Aglitsky, V. A. . . . 109-C, 400-C, 401-C
Agte, C. 493-A, 57-T
Ahearn, P. J. 22-Q, 313-Q, 964-Q
Ahern, S. A. 51-P
Aikazyan, E. T. 477-P
Ailincai, Gh. 28-J
Ainslie, N. G. 408-Q
Aitken, A. C. McL. 170-L
Aitken, A. I. 128-D
Akerman, Karol 116-C, 117-C
Akhundov, G. A. 142-N
Akimenko, A. D. 562-D
Akimova, K. I. 912-Q
Akiyoshi, Takashi. 114-B
Aksenov, K. F. 567-E
Akshentseva, A. P. 288-R
Aksoy, A. M. 474-A, 110-C, 216-C, 448-D
Akulov, A. I. 294-K
Akutagawa, Takeshi 666-Q, 1102-Q
Aladashvili, G. A. 424-G
Albert, Philippe 152-C, 332-N
Alberts, L. 289-P

Albin, B. 330-J
Albrecht, A. B. 62-G
Albrecht, Carl 326-W
Albrecht, William M. 421-M,
. . . . . 182-N, 583-N
Alcock, C. K. 580-R
Aldred, R. 729-R
Alekeev, N. V. 714-M
Aleksandrov, B. N. 124-N
Aleksandrovich, B. L. 1492-Q
Alekseev, Ya. K. 303-J
Alekseeva, I. I. 230-S
Alekseevskii, N. E. 147-P
Aleksfenko, M. F. 88-J
Alers, G. A. 204-Q
Alessandrini, Eileen I. 429-M
Alexander, A. L. 533-R
Alexander, E. C. 420-G, 671-K
Alexander, J. M. 449-G
Alexander, W. O. 360-A
Alexandrov, N. N. 799-R
Alexandrov, V. P. 119-G
Alexenko, P. M. 659-D
Alexopoulos, K. 109-P
Alf, F. 443-L
Alfant, Sam 236-M
Alfelt, Goran 364-S
Alferova, N. S. 88-F, 96-F
Alfille, L. 556-N, 1278-Q
Alford, W. P. 694-P
Al'ftan, E. A. 196-N, 342-N, 596-N
Ali, M. Safdar 773-Q
Alizade, Z. I. 421-P
Allain, Ch. 457-P
Allara, Roberto 457-E, 807-Q
Allard, Marc 178-D, 197-D,
. . . . . 201-D, 295-D, 364-D,
. . . . . 436-D, 481-D, 507-D
Allen, B. C. 251-P
Allen, G. 497-P
Allen, George 256-K, 284-K
Allen, Henry 103-A,
. . . . . 194-A, 118-R, 361-R
Allen, J. M. N. 802-Q
Allen, J. R. 535-L
Allen, J. W. 100-Q
Allen, Lloyd 288-J
Allen, N. P. 299-Q
Allen, R. J. 4-C, 59-C
Allendorf, Hans 346-E
Alleyrac, R. 465-D
Allgaier, Robert S. 96-P
Allison, Herbert W. 656-N
Allmand, T. R. 161-S
Allred, W. P. 268-C, 95-N
Allsop, R. T. 324-T
Alm, G. V. 440-L
Almand, P. 793-L
Alov, A. A. 462-K, 719-K
Alpert, Marshall B. 121-C, 131-S
Altenpohl, Dietrich 63-M, 232-N
Alt'gausen, O. N. 48-J, 415-P
Altman, A. B. 1-H, 52-H, 183-P
Al'tman, M. B. 577-E
Altmeyer, Georg 52-F
Al'tovskii, R. M. 140-L, 459-R
Al'tshuler, L. V. 129-Q
Al'tshuler, O. V. 194-C
Alyamovski, S. I. 122-M
Alyushin, E. I. 140-B
Amano, Hiroshi 456-S, 457-S
Amatuni, A. Ts. 11-P
Amayev, A. D. 1285-Q
Ambartsumyan, R. S. 694-R
Amemiya, Daiji 547-P
Amipova, S. A. 40-B
Amirkhanov, Kh. I. 555-P
Amitani, Shunpei 147-W
Ammann, D. 175-J, 316-P
Amosse, Jean 666-P
Amron, I. 469-L, 473-L
Amspaugh, Jo Ann 30-G
Amy, J. A. 302-N, 330-N
Anaev, B. A. 255-N
Ananthanarayanan, N. I. 270-N
Anastasiadis, Ilias 425-N
Anderko, K. 483-M
Anders, F. J. 94-X
Anders, H. 291-J, 382-R
Anderson, C. A. 56-Q
Anderson, D. G. 142-R
Anderson, E. A. 613-M, 633-R
Anderson, Floyd. 219-J
Anderson, G. B. 631-Q
Anderson, J. A. 455-M
Anderson, J. C. 342-P
Anderson, P. A. 726-P, 727-P
Anderson, R. G. 161-Q
Anderson, Robert E. 352-L
Anderson, W. A. . . 121-J, 242-N, 245-R
Anderson, W. F. 1367-Q
Anderson, W. K. 402-P, 295-T
Anderton, J. 290-W, 291-W
Ando, Zenji 919-Q
Andon'ev, S. M. 383-E, 180-W
Andreescu, N. 285-P
Andreev, I. A. 284-D
Andreev, N. Kh. 640-K, 721-K
Andreev, V. M. 407-C
Andreeva, A. G. 85-M, 557-R
Andreeva, V. V. 149-R, 828-R
Andrei, Emil 28-J
Andrew, Kenneth F. 400-R, 728-R
Andrews, C. R. 248-R

Andrews, K. W. 25-M
Andreyuk, L. V. 193-G
Andrievskii, R. A. . 123-B, 111-H, 140-H
Anenkov, N. I. 94-F
Anfimov, V. M. 291-S
Angerstein-Kozlowska, H. 302-P
Angstadt, C. C. 211-J
Angus, H. T. 12-A
Anisimov, N. P. 82-K
Anitov, I. S. 431-N
Annamalai, P. L. 546-L
Annandale, J. K. 226-F
Annis, R. L. 336-C
Anolick, Eugene S. 357-P
Anoreeva, A. G. 88-J
Anselin, F. 500-P, 622-P
Ansell, G. S. 56-H, 300-N, 1405-Q
Ansorge, Bruno 270-T
Antes, H. W. 212-W
Antill, J. E. 313-C,
. . . . . 314-C, 127-H, 643-R
Antipin, L. N. 105-C,
. . . . . 106-C, 306-C, 453-C
Antipova, E. I. 97-M
Antler, M. 537-Q
Antoniou, A. A. 173-P
Antonov, A. P. 126-Q
Antonov, I. S. 578-L
Antonyuk, F. I. 57-D
Antropov, L. I. 135-R, 816-R
Antropov, O. F. 511-D
Antyshev, A. Ya. 302-J
Anuchkin, M. P. 94-F
Ao, Takeo 642-D
Aoki, I 7-N
Aoki, Kenichiro 233-A
Aotani, Kaoru 230-L
Aoyama, Kozo 233-A
Apaev, B. A. 26-J
Apel'baum, V. N. 117-M, 120-M
Appleman, Buford M. 202-S
Appleton, G. J. 609-L
Aradi, Antal 234-C
Arai, Hideo 154-N
Arakelov, A. G. 140-L
Arakida, Yutaka 639-N
Arand, Georg. 197-E
Arata, Hikaru 310-P
Arbstedt, P. G. 283-C
Arbuzov, M. P. 310-M
Archard, J. F. 1509-Q
Ardentov, V. V. 605-R
Arend, A. G. 104-F, 23-X
Arengold, M. B. 197-M
Arkad'ev, A. G. 376-C, 412-C
Arkharov, V. I. 108-N, 125-N,
. . . . . 126-N, 248-N, 249-N, 17-R
Armstrong, D. 663-M
Armstrong, D. J. 435-Q, 1159-Q
Armstrong, J. L. 86-X
Armstrong, P. E. 250-Q
Armstrong, R. A. 652-P
Armstrong, T. N. 621-Q
Armstrong, W. N. B. 33-L
Arnaud, Dominique 79-S
Arnold, D. S. 95-C
Arnold, Frank L. 56-E
Arnold, Perry C. 456-K
Arnold, S. V. 154-Q, 583-Q
Aronovitz, H. 811-L
Aronsson, Bertil 666-L, 677-M
Arrott, Anthony 650-P, 651-P
Arrowsmith, D. J. 54-L
Arshinov, A. A. 217-P
Arskii, V. N. 5-N, 254-N
Arslambekov, V. A. 428-R
Artem'eva, S. I. 270-J
Artner, Elfriede. 194-S
Arwidson, S. 1384-Q
Arzt, P. R. 223-G, 242-G, 342-G
Asada, C. 96-T
Asada, Hiroshi. 233-A, 368-E,
. . . . . 110-Q, 1392-Q, 4-R
Asahara, Teruzo 755-R
Asai, G. 86-C
Asakuma, Toshihiko 624-D
Asano, Eiichiro 666-Q, 1389-Q
Asanumat, Mitswru. 713-P
Asch, Georges 304-P
Ascough, Harry H. 113-J
Ashcroft, W. K. 325-R
Ashikhmin, F. V. 143-D
Ashinuma, Kan-ichi 312-M, 406-N
Ashkenaze, E. K. 894-Q
Ashley, R. W. 441-S
Ashman, G. W. 691-L
Ashmarin, G. M. 1378-Q, 1379-Q
Asinazi, B. M. 436-L
Aslan, Gilbert L. 265-R
Aspden, R. G. 335-M
Astaf'ev, A. S. 71-K, 490-K, 643-Q
Astashev, N. N. 71-N
Astaulov, V. S. 376-E
Astaulova, A. S. 376-E
Astier, M. J. 200-A, 74-B
Aston, J. L. 305-J
Astrom, H. U. 103-P
Atanasiu, I. 431-P
Ates, F. F. 499-K
Atkin, R. B. 74-D
Atkin, R. L. 162-Q, 108-T, 188-T
Atkinson, H. H. 434-M, 435-M
Atkinson, Ralph H. 55-L
Atkinson, W. S. 423-E

Atlas, L. M. 297-M
Attard, Alfred E. 88-X
Attia, E. A. 934-Q
Attwell, J. F. 490-L
Aubert, H. 66-J, 42-M, 697-M
Aubrion, Gabrielle 1063-Q
Audreeva, V. V. 169-R
Auer-Welsbach, Helga. 275-P
Ault, G. M. 488-A,
. . . . . 11-H, 156-Q, 199-T
Aust, K. T. 188-M, 193-M, 679-M
Aust, Manfred 268-M
Austerman, Stanley B. 263-N
Austin, A. E. 176-M, 187-M
Austin, G. Wesley. 241-D
Austin, J. B. 166-A
Auwarter, Max. 224-C
Auxenfans, M. 84-B
Averbach, B. L. 578-M, 216-N,
. . . . . 346-N, 558-N, 631-N,
. . . . . 632-N, 553-Q, 842-Q, 1325-Q
Averchenkov, D. O. 371-C
Averin, V. V. 547-N
Averkieva, S. K. 140-P
Aversten, Joel 309-K
Avery, H. S. 1117-Q
Aves, W. L. 296-L
Aves, William L., Jr. 815-L
Avidon, A. R. 700-M
Avilov, T. I. 414-K
Avotina, M. P. 221-P
Avraamov, Yu. S. 116-M,
. . . . . 291-Q, 1244-Q
Awano, Taikichi. 128-F, 901-Q
Awatani, Jobu 888-Q
Axelrod, F. A. 118-K
Axon, H. J. 184-M, 87-N,
. . . . . 291-N, 388-N, 390-N
Axtell, Willard. 208-G, 352-G
Ayers, W. D. 120-Q
Azam, N. 530-N
Azarov, K. P. 780-L
Aziz, P. M. 712-R
Azou, Pierre 32-M, 264-N,
. . . . . 540-N, 368-P, 193-Q

B

Baach, Hans 492-N
Baak, T. 92-D
Baake, Reinhold . . . 234-D, 555-D, 574-D
Babadzhan, A. A. 400-C
Babadzhan, E. I. 274-S
Babaev, M. V. 153-S
Babaeva, A. V. 70-S, 278-S
Babareko, A. A. 366-Q
Babarykin, N. N. 164-D, 298-D,
. . . . . 407-D, 423-D
Babayan, V. V. 283-J
Babecki, A. J. 693-Q, 977-Q
Babel, H. W. 211-T
Babenko, S. A. 171-P
Babich, V. K. 604-M, 605-P
Babick, P. P. 29-X
Babikova, Y. F. 178-N
Babina, I. V. 140-B, 437-C, 444-C
Babington, W. 960-Q
Babit, A. S. 875-Q
Babitskaia, S. M. 293-R
Babkin, V. M. 226-J
Babkin, Yu A. 569-R
Bablik, H. 12-L, 29-L, 696-L
Babushkima, G. I. 707-R
Babyak, W. J. 580-M
Bacchella, G. L. 440-M
Bachman, C. H. 15-N
Backensto, E. B. 305-R
Backof, Heinrich 18-E
Backofen, Walter A. 230-G, 1094-Q
Backus, W. E. 155-G
Bacon, A. E. 502-M
Bacon, G. E. 22-M
Bacon, Roger. 31-M
Badeen, J. 602-P
Badet, P. 674-L
Badger, F. S. 417-R
Bad'yanov, B. N. 205-K
Baer, Hans Gunter 286-N
Baertsch, P. 18-C
Baes, Charles F., Jr. 60-C
Bagariatskii, I. A. 591-M, 595-N
Bagby, Fred L. 260-T
Bagdasarov, V. A. 402-C
Bagdyev, G. B. 555-P
Bagley, Bruce R. 654-K
Bagley, K. Q. 294-P
Bagnall, K. W. 181-C
Bagramov, R. A. 338-T
Bagryanskii, K. V. 227-K
Bahr, Asko 435-S
Bahr, Werner 199-E
Baierle, A. 556-L
Baikova, J. P. 114-K
Bailey, A. R. 749-R
Bailey, E. T. W. 376-W
Bailey, G. L. 211-A
Bailey, J. C. 273-P
Bailey, R. E. 804-Q
Bailey, T. W. A. 596-L
Bailey, W. H. 455-Q
Baily, T. F. 469-D
Baimakov, A. Yu 383-C

Baimakov, Yu V. 61-L
Baimler, Miroslav 40-S
Bain, A. M. 166-K
Bain, J. 351-W
Bain, J. W. 388-D
Bain, John H. 167-C
Bainbridge, I. F. 454-Q
Bairakov, V. I. 179-F
Bairamashvili, I. A. 204-R
Baird, B. L. 588-K
Baird, J. 167-H, 581-N
Bairiot, J. V. 197-A
Bakakin, V. V. 39-B
Bakala, Michal. 22-F
Baker, C. J. 31-F
Baker, D. H., Jr. . . 298-C, 338-C, 478-Q
Baker, Norman L. 100-T
Baker, R. G. 298-J
Bakhrakh, L. P. 240-M, 1359-Q
Bakina, N. P. 107-C
Bakish, Robert. 175-A, 117-N
Bakumenko, S. P. 414-D
Balabanov, N. A. 91-G
Balabanov, Vladimir 61-W
Balai, Nicholas 527-K
Balajiva, K. 877-Q
Balakrishnan 735-R
Balandin, I. M. 569-R
Balashova, N. A. 139-P, 827-R
Balazs, Fulop 365-A, 400-A, 449-A
Balbi, Giorgi. 439-R
Balder, T. C. 201-K
Baldovskii, L. A. 412-C
Baldwin, William M., Jr.. 506-N, 1417-Q
Balezin, S. A. . . . 1252-Q, 432-R, 567-R
Balicki, S. 477-E
Balkovetz, D. S. 51-K
Ball, C. J. 281-M
Ball, J. G. 198-M, 291-M
Ballard, W. E. 690-R
Balli, D. 470-P
Ballif, J. L. 47-C
Balluff, R. W. 13-N, 77-N
Bally, D. 413-P
Balsay, Istvan 156-A, 457-D, 135-K
Balsiger, H. E. 423-G
Balster, H. W. 168-D
Balter, M. S. 199-G
Balzer, R. 156-T
Bamberger, E. N. 626-Q
Ban, Thomas E. 75-B
Banbury, P. C. 545-P
Bancila, A. 289-S
Bandel, Gerhard. . . 311-D, 359-D, 686-D
Banerjee, A. K. 290-J
Banerjee, B. C. 76-N, 604-N
Banerjee, D. 67-T
Banerjee, T. 824-L, 825-L, 826-L
Bangert, Lothar. 393-N
Bankovskii, Yu A. 65-S
Banks, Charles V. 14-S, 204-S
Banky, Gyula 142-E
Bantuzmanskii, V. I. 547-D, 548-D
Barabash, I. M. 425-E
Barabov, O. O. 33-N
Baradan'yants, V. K. 67-E
Baranov, A. A. 262-N, 564-N
Baranov, A. I. 1544-Q
Baranov, M. S. 632-L
Baranova, I. A. 178-P
Barash, M. M. 244-K
Barbanel, R. I. 193-F
Barber, C. R. 27-P
Barber, J. A. 700-Q
Barbier, Marie-Jeanne 666-P
Barchiesi, Giuseppe 279-C,
. . . . . 102-E, 228-E
Bard, R. J. 256-C
Bardachev, Yu. P. 304-E
Bardenheuer, F. 499-D, 501-D
Bardin, I. P. 663-D
Bardin, P. C. 38-L, 536-L
Bardsley, W. 207-C, 15-M
Barghusen, John J. 42-C
Bargone, A. 517-D
Barinov, N. A. 205-E
Barker, J. 394-K
Barker, R. S. 197-J, 240-J
Barkman, J. R. 120-A
Barlow, H. C. 55-S
Barmitz, R. W. 599-D
Barnard, K. N. 804-R
Barnes, E. 313-C, 314-C
Barnes, G. A. 545-P
Barnes, H. C. 286-W
Barnes, R. S.. . . . . 523-N, 260-P,
. . . . . 350-P, 629-P,
. . . . . 1060-Q, 1317-Q, 51-X
Barnett, Orville T. . . . 182-K, 174-W,
. . . . . 223-W, 372-W, 403-W
Barney, W. K. 60-T
Barnhardt, L. F. 593-Q
Barnhart, D. H. 765-R
Barnitz, R. W. 164-F, 261-W, 381-W
Baroch, C. T. 62-A, 358-A
Barotitskays, F. I. 409-C
Barr, M. M. 77-C
Barr, Robert Q. 354-N
Barr, W. 423-A, 1099-Q
Barrett, A. S. D. . . 580-A, 268-W, 48-X
Barrett, B. R. 123-J
Barrett, J. J. 241-G
Barrett, T. R. 92-H, 126-H, 153-H
Barriety, L. 318-R, 380-R

Barron, Leo J. 51-T
Barry, W. 15-X
Barth, E. W. 98-W
Barthel, Joachim 113-C, 114-C
Barthelemy, R. E. 19-B
Bartholomew, G. A. 587-P
Bartlett, E. S. 410-L, 762-Q
Bartolome, Werner. 53-J
Barton, H. K. . . . 108-E, 125-E, 140-E, ... 160-E, 274-E, 275-E, ... 311-E, 315-E, 184-W
Barton, K. 529-R
Barton, L. C. 184-W
Barton, P. J. 168-N
Barton, William R. 62-A
Barusch, Maurice R. 311-R
Barutkin, I. N. 308-M, 329-P
Baruzdin, I. T. 578-D
Barzii, V. K. . . . . 67-D, ... 83-D, 443-D, 118-L
Bashanov, N. S. 83-K
Bashforth, G. Reginald . . . . . 52-D, ... 326-D, 538-D, 539-D, 657-D
Bashirov, R. I. 233-P
Basinski, Z. S. 856-Q
Baskette, L. 549-R
Baskey, R. H. 701-Q, 732-Q
Basov. 651-D
Bassett, J. G. 329-S
Bassett, R. G. 600-Q
Bassi, Guido 183-M, 670-M
Bastebaire, F. 51-Q
Bastien, Paul. . . 236-K, 32-M, 411-M, ... 181-N, 264-N, 540-N, ... 650-N, 368-P, 564-P, ... 193-Q, 617-Q, 806-Q, 1308-Q
Bastein, Paul G. 269-F
Basxo, P. T. 373-Q
Bat, A. A. 606-Q
Batashev, K. P. 61-L
Batchelor, Loyd E. 77-L
Batchelor, R. 254-P
Bate, L. C. 208-S
Bateman, Alan M. 524-A
Bates, H. 85-B
Bates, L. F. . . 18-P, 33-P, 188-P, 616-P
Batten, G. H. 338-K
Batten, W. L. 75-H
Batterman, Boris W. 707-M
Batyrev, V. A. 228-M
Bauch, G. 54-C
Baudon, Lucien 221-R
Bauer, A. F. 28-E, 29-E
Bauer, Arthur A. . . . . 40-M, 221-M, ... 236-M, 295-M, 579-M, ... 624-M, 625-M, 657-P
Bauer, G. W. 21-Q, 275-T
Bauer, Georg. 395-M
Baughman, R. A. 1332-Q
Baukrowitz, G. 98-J
Baulk, R. H. 4-X
Baum, B. A. 334-D
Bauman, F. A. 205-S
Baumann, Hans . . . . . 198-D, ... 498-R, 554-R, 600-R
Baumeister, Theodore. 215-A
Baumel, Anton. 601-R
Baumli, Emil. 26-T
Baus, R. A. 608-P
Bauscher, J. A. 111-J
Bayce, A. E. 1220-Q
Bayer, Kurt. 400-L
Bayon, A. 399-L
Baysinger, F. R. 256-K
Bazhenov, V. V. 70-K
Bazin, A. H. 393-M, 509-M
Beach, John G. 740-L, 822-L
Beach, Warren. 754-L
Beachem, C. D. 1044-Q, 1488-Q
Beacom, Seward E. . . . . 402-L, ... 416-L, 579-L
Beamer, P. E. 222-C
Beamer, P. W. 1028-Q
Bean, C. P. 53-P
Bean, Charles H. 223-F
Bear, Joy 131-P
Bear, W. R. 293-S
Beard, Arthur P. 234-T
Beatson, E. V. 219-K
Beatty, Kenneth O., Jr. 247-C
Beaudry, B. J. 294-M
Beaujard, L. 588-D, 76-S, 406-S
Beauvais, Claude 523-M, 534-M
Beaver, H. O., Jr. 12-D
Beaver, R. J. 166-H, 77-S, 217-T
Beaver, W. W. 19-H, 1130-Q
Bechtle, R. 303-G
Beck, E. S. 227-A, 65-L
Beck, F. H. 563-R
Beck, Gunter 16-F, 87-Q
Beck, H. G. 371-L
Beck, Herbert 44-D, 27-N
Beck, R. 142-G, 31-W
Beck, R. G. 750-R
Beck, W. 748-R
Becker, Ernst R. 280-W
Becker, G. 210-L, 814-L
Becker, H. 88-K
Becker, Karl 121-W
Becker, Klaus 517-M, 555-R
Becker, R. 385-Q, 534-Q
Beckham, J. W. 404-E
Beckstrom, J. 568-K
Beder, Lewis B. 111-P

Bedford, Ray G. 653-M
Bedorf, P. 238-L
Bee, K. 540-A
Beecher, Jess 733-R
Beedle, Lynn S. 103-T
Beeghly, H. F. 386-S
Beeman, W. W. 437-M
Beer, Hans 126-B
Beerntsen, D. J. 595-M
Beers, Harry S. 270-G
Beeskow, Hans. 561-M
Beeuwkes, R. 152-Q
Begeman, M. L. 283-K
Begg, G. A. J. 205-T
Begley, R. T. 26-Q
Behal, Victor G. 357-S
Behar, I. 1468-Q
Behne, Neal J. 266-D
Beiser, C. A. 1238-Q
Bekeshko, N. A. 205-P
Bekker, I. I. 688-D, 360-W
Bekker, O. G. 663-D
Bela, V. 328-J
Belash, F. I. 62-B
Belashchenko, D. K. 669-P
Beldstotskaya, P. L. 361-S
Belfor, M. G. 519-K
Belfour, A. J. 1306-Q
Belk, J. A. 280-C
Belkin, E. 420-E
Bell, D. 170-F
Bell, E. G. 369-R
Bell, G. R. 4-H
Bell, James C. 348-R
Bell, L. G. 333-Q
Bell, Patricia E. 1043-Q
Bell, R. L. 15-M
Bella, E. 1432-Q
Bellamy, R. G. 321-C
Bellobono, I. 136-L
Bellot, J. 51-M
Belogurov, B. V. 210-P
Belokurova, I. N. 546-N
Beloruchev, L. V. 209-J
Belous, G. S. 305-D
Belous, Yu. V. 208-P
Belov, K. P. 208-P
Belov, V. M. 158-E
Belov, V. V. 636-K
Belov, V. Ya. 62-W
Belov, Yu. I. 176-H
Belser, Richard B. 338-P
Belyaev, A. I. . . .76-C, 104-C, 307-C, ... 310-C, 311-C, ...436-C, 501-E, 68-S
Belyakov, A. I. . . .354-M, 186-P, 243-Q
Belyakov, L. N. 291-Q
Belyakov, R. S. 254-D, 669-D
Belyankin, F. P. 967-Q
Bement, A. L. 79-P, 937-Q, 1307-Q
Bems, G. 191-P
Benard, Jacques. 365-M, 468-R
Bencaster, A. 456-E
Benda, A. 342-T
Bendel, S. H. 602-R
Bendryshev, O. L. 104-K
Benedict, Manson. 144-W
Benes, Antonin. 317-Q
Benes, F. 487-Q, 1150-Q
Benes, L. 413-P
Benes, Richard 303-R
Benesovsky, Friedrich . . . . . 250-C, ...93-H, 307-M, 423-M, ... 478-M, 560-M, 44-T
Bengtson, Kermit B. 168-C
Benham, P. P. 403-Q
Benham, R. R. 56-L
Benkowsky, G. 85-J
Benn, D. R. 56-X
Benner, Frank C. 363-S
Bennett, Clark R. 208-F
Bennett, D. G. 529-Q
Bennett, G. A. 212-A, 797-R
Bennett, J. A. . . . 188-Q, 214-Q, 1088-Q
Bennewitz, Ruth. 43-P
Benninghoff, Hanns 116-L, 376-L
Benny, A. H. 115-P
Benson, K. E. 79-M
Bentle, G. G. 481-M
Benua, F. F. 704-K, 720-K, 317-L
Beranek, E. 529-R
Bercu, S. 172-F, 249-M, 206-N
Berdyanskii, M. G. 80-W
Bereczky, T. 67-H
Berenstein, L. E. 105-M
Beresnev, B. I. 295-F
Berezhkovskii, D. I. 293-F
Berezkina, L. G. 363-C
Berg, D. R. 335-D
Berg, E. 561-L
Berg, H. 44-C
Berg, Stig 224-R, 574-R
Berg, Victor 185-J
Berge, Philippe 478-P, 517-P
Berger, J. A. 335-M, 1038-Q
Berger, R. 315-G
Berger, S. I. 268-S
Bergeron, C. G. 410-P
Berghausen, Philip E. 137-G
Berghezan, Aurel. . . . . 472-M, ...501-M, 712-Q
Bergmann, Margot E. 90-X
Bergognon, P. 472-D
Bergquist, E. T. 1198-Q

Bergstrom, T. R. 600-Q
Berk, Jan 411-L
Berkin, B. I. 124-N
Berkowitz, A. E. 154-J
Berlincourt, Ted G. 112-P, 579-P
Berman, L. U. 306-R
Berman, S. I. 283-F
Bermejo, F. 438-S
Bermudez, J. M. 78-M
Bernard, J. . . . 1237-Q, 1278-Q, 1281-Q
Bernard, Maurice. 560-P
Bernard, Rene G. 136-H, 160-H
Bernard, W. J. 813-R
Bernett, Eugene C. 1293-Q
Berney, P. J. 90-L
Bernhardt, Keith 240-F
Bernshtein, M. L. 264-M,
. . . . . 629-N, 1381-Q
Bernstein, B. T. 598-N
Berruti, V. 340-N
Berry, J. 458-E, 250-F
Berst, Neil W. 161-G
Bertein, F. 190-C
Berthier, P. 144-K
Bertier, T. L., Jr. 289-F
Bertino, J. P. 256-C, 277-C
Bertorelli, E. 136-L
Bertossa, Robert C. 123-A,
. . . . . 321-J, 472-K
Bertram, E. 13-B
Berukshits, G. K. 90-R
Besedin, P. T. 225-J
Beshers, Daniel N. 436-Q
Beskrovnyi, A. K. 24-J
Besnard, Simone 539-N, 311-P
Besser, A. D. 140-B, 444-C
Best, E. P. 218-M
Betteridge, W. 153-J, 187-N, 781-Q
Betts, Joseph C. 298-P
Bever, M. B. 216-F, 578-M,
. . . . . 307-N, 558-N,
. . . . . 582-P, 590-Q, 1046-Q
Bevis, William M. 767-L
Beyer, Bruno. 155-F
Bezboradko, M. D. 801-R
Bezdicek, Jan 265-G
Bezobrazov, S. V. 103-C, 482-C
Bhadwar, D. V. 426-R, 446-R
Bhide, V. G. 39-M
Bhuchar, V. M. 705-K
Bialobzheskii, A. V. 429-R
Bialonczuk, Maria 20-R
Bianchi, L. M. 442-C
Bianchini, A. 182-C
Bibikova, V. I. 142-B
Bibkov, E. L. 487-E
Bibring, Herve. 47-N, 333-N
Bicelli, L. Peraldo. 332-D
Bichler, Antonin. 475-D
Bichsel, H. 233-N
Bickel, P. W. 693-P
Bickerdike, R. L. 547-M
Bicknell, R. W. 645-M
Bidigare, G. 188-J
Bidmead, G. F. 400-Q
Bieber, Boleslav 414-S
Bieber, C. G. 128-J
Biedermann, Eginhart. 684-R
Biefer, G. J. 371-R, 743-R
Bienia, Gerhard. 227-R
Bienwald, Gerhard 128-W
Bierlein, T. K. 361-M
Bigelow, C. C. 158-Q
Bigelow, W. C. . . . 302-N, 303-N, 330-N
Bigeon, J. 442-L, 494-L
Bigge, Henry C. 336-D
Biggs, B. L. 671-M
Biggs, W. D. 133-T, 147-T
Bigos, Joseph 638-R
Bigot, Roland. 155-J
Bihet, O. L. 1111-Q
Biktagirov, K. K. 993-Q
Billen, Hanns-Heinz 43-W
Billig, E. 1-N
Billigmann, Joseph. 183-F
Biloni, H. 408-N
Binder, J. 105-H, 232-Q, 1131-Q
Binder, W. O. 77-A
Binetti, G. 83-R
Binstock, M. H. 440-L
Birchenall, C. Ernest . . 419-A, 160-N,
. . . . . 662-N, 515-P, 523-P
Birchon, D. 160-L, 190-P
Bird, F. C. 58-J
Birke, Walter 17-E
Birks, L. S. 343-M, 678-N, 178-S
Birks, N. 466-D
Birnbaum, Howard K. 173-N,
. . . . . 646-N, 1093-Q
Biroci, G. 708-P
Biryuk, E. A. 64-S
Biryukova, L. V. 449-C
Bischoff, Heinrich 426-W
Bisert, Werner 129-C
Bishop, Claude R. 661-R
Bishop, Jack 289-A
Bishop, T. 137-W
Bishop, Tom 175-L, 164-T, 345-W
Bishop, W. B. 194-E
Bishop, William O. 124-B
Biswas, S. K. 704-R
Bizinger, I. 639-P
Bizouard, H. 565-M, 401-S, 445-S
Bjorkroth, Karl 232-K, 572-K

Blaber, O. J. 48-C
Black, J. 175-P
Black, J. M. 1-K
Black, James H. 574-L
Black, K. M. 6-C
Black, P. H. 94-G
Black, W. A. 396-D
Blackburn, P. G. 325-L, 177-P
Blade, J. C. 259-M, 331-N
Blaha, Friedrich . . 131-N, 282-N, 560-Q
Blake, Charles A., Jr. 60-C
Blake, P. D. 861-Q
Blackmun, E. V. 573-E
Blanchard, Rene. 305-P
Blandin, A. 423-P
Blanter, M. E. 69-J, 193-N
Blazey, Clement. 878-Q
Bleiberg, M. L. 237-N, 605-N
Blessler, S. E. 82-C
Blet, G. 593-L, 376-S
Blin, J. 555-N, 593-N
Blinson, S. V. 234-S
Blizard, J. W. F., Jr. 285-A
Bloch, J. 593-N, 22-X
Blocher, John M., Jr. 303-L
Block, F. E. 86-C
Block, N. I. 85-M, 521-M, 161-N
Block, Robert J. 679-P
Blodgett, Omer W. 624-K
Blomquist, R. F. 1-K
Blondel, Albert 474-S
Blonn, W. A. 654-N
Bloom, M. C. 10-R, 364-R
Bloom, Quentin M. 97-J
Blount, Eugene I. 483-P
Blucher, Franz 85-A
Blue, Roy E. 315-T
Blumel, Gerhard 9-E
Blumenthal, Bernhard. 255-A
Blundell, Norman F. 525-K, 712-K
Blyum, E. E. 599-M
Boadway, J. D. 740-R
Boas, Walter. 637-M
Bobalek, E. G. 369-R
Bobbin, John E. 223-S
Bobritskii, N. V. 56-K, 523-K
Bobrov, A. B. 222-W
Bobrov, G. V. 462-K
Bobrov, Yu. P. V. 239-E
Bobylev, A. V. 759-R
Bochvar, A. A. 715-M,
. . . . . 385-N, 246-Q, 1282-Q
Bock, W. K. 91-E, 319-P
Bockris, J. O'M. 105-L, 120-L
Bockstiegel, G. 152-H
Boczor, Istvan E. 254-G, 326-M
Bode, Herbert 10-E
Bodnar, Bela 313-E
Bodnar, M. J. 594-K
Boeckhaus, K. 122-K, 40-W
Boehm, F. 134-F
Boehm, Horst 398-M
Boehmer, Glenn E. 139-G, 176-G
Boehmer, M. A. 739-R
Bog, Sigmund. 466-P
Bogachev, I. N. 563-N, 1355-Q
Bogachev, S. I. 625-D
Bogard, A. D. 608-P
Bogatyrev, Yu. M. 236-P
Bogatyreva, E. V. 567-R
Bogdanov, A. F. 7-M
Bogdanov, O. S. 67-B
Bogdanov, V. N. 203-K
Boggs, James E. 535-R, 536-R
Boghen, J. 14-F, 1465-Q
Bognar, Janos 199-S
Bogorad, N. M. 175-H
Bogoyablenskaya, N. V. 492-L
Bogtyreva, S. V. 800-R
Bohm, Horst 235-N
Bohm, Irmtraud. 487-P
Bohn, Jack R. 215-Q
Bohne, C. 402-G
Bohnes, H. 681-R
Boichenko, M. S. . . . 69-D, 239-D, 477-D
Boiko, B. T. 78-M, 147-N
Boiko, M. E. 221-W
Boileau, L. 48-B
Boisov, V. L. 636-P
Bojarski, Z. 237-D, 576-M, 77-Q
Bokshtein, B. S. 83-M, 285-N
Bokshtein, S. Z. 49-N, 177-N, 381-N
Boldina, L. D. 434-C
Bolgiu, Maria 108-P
Bollenrath, F. 595-K, 28-N
Bolling, G. F. 933-Q
Bolognesi, G. P. 379-R
Bol'shakov, K. A. 636-M
Boltaks, B. I. 148-N, 150-N
Boltaks, G. Q. 149-N
Boltax, Alvin. 244-M, 624-N
Bolucke, Karl Friedrich 87-P
Bolzan, J. E. 125-S
Bombara, G. 373-P, 50-R
Bomskov, Hans Birik 101-S
Bonaldi, A. 260-L
Bond, G. C. 284-R
Bondar, V. V. 334-N
Bondarev, V. P. 81-D
Bondarev, Yu. E. 310-Q, 871-Q
Bonde, G. 663-R
Boned, J. A. 15-B
Bonfiglioli, G. 691-P
Bongers, P. 306-T

Bonhomme, W. 92-W
Bonnaure, E. 589-D
Bonnemay, M. 805-L
Bonnier, E. 471-M
Bonsack, Walter. 528-E
Booker, G. R. 19-M
Booser, Richard. 3-T, 279-T
Booss, H. J. 516-P, 548-R
Borachia, P. 1185-Q
Borch, N. R. 185-Q
Borchers, Heinz. 460-A, 107-J,
. . . . . 615-M, 31-N, 130-N, 229-N,
. . . . . 364-N, 423-N, 424-N, 799-Q
Bordes, A. 131-L, 199-L, 670-N
Bordonali, C. 136-L
Borelius, G. 417-N, 392-P
Borg, P. P. 566-E
Borg, Richard J. 515-P
Borisenko, V. G. 118-L
Borisov, A. Ya. 284-D
Borisov, N. D. 230-M, 23-P, 396-P
Borisov, S. I. 97-F
Borisov, V. T. 176-N, 671-N
Borisova, N. I. 276-P
Boriss, P. 147-S
Borland, J. C. 266-G
Born, Kurt 41-D, 690-D, 225-M
Borodin, V. P. 251-D
Borodkina, M. M. 276-M, 135-N
Borok, B. A. 434-C, 11-W
Borovik, E. S. 184-P
Borovik, S. A. 70-S
Borovkov, A. N. 46-F
Borovskii, I. B. 136-M, 228-M,
. . . . . 229-M, 698-M, 138-N, 282-P
Borrebach, E. J. 325-W
Bortaud, P. 6-B
Borzdyka, A. M. 371-Q
Borzov, P. I. 34-J
Bosch, Wouter 501-L
Bosdorf, L. 625-L
Boskovits, J. 109-P
Boss, G. H. 52-X
Boswell, Clay C., Jr. 355-Q
Boswell, F. W. C. 341-M, 582-M
Boswell, R. B. 48-F
Boswinkel, H. 276-E, 283-E, 231-W
Both, D. 301-K
Bott, H. B. 253-K
Bouchayer, R. 459-S
Boucher, Rene 449-N, 537-N
Boudouresques, B. 83-Q,
. . . . . 1278-Q, 1288-Q
Boughner, D. T. 1148-Q
Boulanger, Christian. 170-Q
Boulger, Francis W. 161-F,
. . . . . 234-G, 235-G, 247-G,
. . . . . 264-G, 360-G, 1402-Q, 211-T
Bourcelot, R. 76-L
Bourdier, M. 72-T
Bourion, R. 472-D
Boussard, Francois 199-A
Boussion, M. L. 275-R
Bovarnick, Bennett 157-H, 171-H
Bovics, R. 134-D
Bovin, Yngve 55-W, 65-W
Bovtnta, N. V. 424-C
Bowden, F. P. 320-Q, 1202-Q, 1341-Q
Bowden, S. 80-T
Bowdish, F. W. 43-B
Bowen, F. J. 66-R
Bowen, H. C. 247-R
Bowers, J. E. 1457-Q
Bowers, R. 588-P
Bowersox, C. F. 335-P
Bowley, A. E. 20-P
Bowman, D. C. 836-Q
Boyadzhiev, L. 824-R
Boyarshinov, M. I. 116-F
Boyd, G. 1263-Q
Boyd, G. M. 368-K, 74-Q, 322-Q
Boyd, John A. 260-G
Boyer, Charles B. 319-K
Boyer, Martin G. 192-G
Boyes, Rodney L. 1-E
Boyle, R. F. 231-N, 342-R
Boyle, W. S. 558-P
Bozoyka, A. M. 236-N
Braaten, Erling 485-K
Brace, A. W. 166-L, 366-L, 762-L
Bradbury, E. J. 154-H
Bradley, Richard C. 204-M, 133-P
Bradley, T. R. 239-J
Brady, R. R. 1148-Q
Bragg, Robert H. 91-X
Braidwood, W. W. 273-E, 431-E
Brainin, I. E. 36-J,
. . . . . 165-N, 568-N, 240-S
Bramble, Lloyd 178-T
Bramer, S. E. 8-X,
. . . . . 368-G, 696-Q, 1174-Q
Bramley, L. N. 197-W
Brammer, W. G. 437-M
Brand, Lutz. 184-S
Brandet, Pierre. 87-T
Brandi, H. Th. 15-D, 247-D
Brandis, Helmut. 208-N
Brandon, D. G. 562-M, 554-Q
Brandt, Allen D. 168-A
Brandt, W. E. 126-L
Brasher, Dora M. 250-R, 736-R
Brasier, J. 568-M

Brasse, Friedhelm 128-M
Brasseur, B. 75-G
Bratchikov, S. G. 309-C, 225-D
Brater, D. C. 7-C, 8-C, 456-C
Bratina, W. J. 885-Q
Bratukhina, V. A. 293-Q
Brauer, F. P. 177-S
Brauer, Georg 325-M, 619-M
Brauman, C. A. 68-M
Braun, Horst 127-M, 396-M, 545-M
Braun, I. 46-M
Braun, M. P. 25-F
Brauniger, Gerhard 365-K
Brautti, Giulio 111-S
Braverman, E. M. 406-C
Bray, Ralph. 541-P
Bray, Robert S. 127-J
Braybrook, A. 10-D
Brazhnik, M. I. 129-Q
Brcic, B. S. 81-R
Brebera, A. 673-K
Brechtel, R. 14-T
Breckpot, B. 349-S
Bredzs, Nikoljas 615-K
Breederman, M. 212-A
Breen, J. E. 216-Q
Bregman, J. I. 260-R
Brehmer, T. E. 664-L
Breitenbach, M. J. 687-K
Breitling, V. 326-S
Bremer, Edwin 38-E, 60-E
Bremer, Georg 172-A
Brennecke, M. 665-K
Brenner, Abner . . . 251-L, 164-Q, 197-R
Brenner, P. 180-A, 440-Q, 478-R
Brenner, S. S. 73-Q
Brennert, S. 146-R
Bresee, J. C. 455-C
Breslin, A. J. 296-A
Breslin, James T. 3-H
Bresson, Yves 377-S
Brett, J. 172-H
Breuer, Karl 425-W
Brewer, G. A. 1-X
Brhacek, Lubomir 415-S
Brice, J. C. 206-P
Bride, J. E. 396-L
Bridgeman, P. W. 443-Q
Bridges, W. H. 340-M
Briefs, Herbert 965-Q
Brien, Harry L. 648-D
Brien, R. E. 621-Q
Briggs, C. W. 287-A
Briggs, J. Z. 121-K, 154-L
Bright, K. 34-L
Brighton, K. W. 198-T
Brill, Patricia H. 536-P
Brilliantov, V. A. 273-W
Brindisi, Paul 419-R
Brindley, W. F. 67-R, 220-R
Brinkhanova, L. S. 365-Q
Brinkman, J. A. 680-N
Brinson, G. 136-N
Brion, D. F. 397-D
Brioni, Angelo 393-K
Brisbane, Alton W. 809-Q, 810-Q
Brister, Paul M. 307-T
Britton, S. C. 34-L, 82-R
Brixa, F. 268-T
Broad, E. M. 131-E
Broadbent, P. A. . . . 84-E, 95-E, 1485-Q
Brobst, William A. 186-A
Brockhaus, Jacques Gerhard 27-J
Brockway, L. O. 303-N, 537-Q
Broderick, J. E. 406-G
Broderick, S. J. 324-S
Brodetskii, L. V. . . 122-D, 352-D, 179-W
Brodskii, A. Ya. 80-K
Brody, James K. 120-S
Brody, Robert P. 162-J
Brokhin, A. A. 207-W
Brokhin, I. S. 764-R
Brokmeier, Karl-Heinz 260-E
Broniewski, B. 182-D
Bronshtein, I. M. 149-P
Brooke, T. H. 77-T
Brookes, A. M. P. 837-Q
Brooks, E. J. 343-M, 678-N
Brooks, Harvey 574-P, 602-P
Brooks, S. H. 74-D, 410-W
Brooks, W. B. 673-R
Brooksbank, William A., Jr. 13-S
Broom, T. 283-M
Broomfield, G. H. 326-P, 1041-Q
Brophy, J. H. 603-P
Brosch, Herbert. 26-X
Brossa, F. 376-M
Brotzen, Franz R. 634-N, 706-P
Brotzmann, Karl . . . . 286-D, 287-D, ... 324-D, 426-D, 543-D, ... 682-D, 685-D, 62-J
Broude, V. L. 220-P
Brouns, R. J. 23-S
Brown, Andrew 196-K
Brown, B. F. 457-L, 751-L, 631-R
Brown, D. W. 348-W
Brown, E. G. 49-S
Brown, F. L. 86-X
Brown, G. T. 1254-Q
Brown, G. W. 553-E
Brown, J. R. 538-R
Brown, J. T. . . . . 1023-Q, ... 1167-Q, 1417-Q
Brown, Keith B. 60-C, 100-C

Brown, M. H. 280-R, 281-R
Brown, M. M. 331-M, 473-M
Brown, N. 280-M, 1226-Q
Brown, N. B. 358-Q
Brown, P. E. 177-S
Brown, R. 130-H
Brown, R. H. 280-R, 281-R
Brown, W. F. 529-K, 159-Q,
. . . . . 508-Q, 1188-Q
Brown, W. W. 39-P
Browne, J. D. 234-M
Browning, E. H. 378-W
Browning, James A. 631-K
Browning, W. E. 264-R
Brownlee, L. D. 203-M
Bruce, F. R. 166-C
Bruckart, W. L. 78-F, 134-G,
. . . . . 181-G, 167-K, 832-Q
Bruckner, W. H. 1503-Q, 565-R
Bruggemann, Theodor 583-P
Bruk, B. I. 432-N, 309-P
Brukl, C. 307-M
Bruna, Vaclav 382-S
Brundige, E. L. . . . 148-F, 669-K, 253-W
Brune, Fred G. 337-P
Brunhuber, Ernst 129-E, 269-E,
. . . . . 302-E, 519-E, 576-E
Brunn, Fritz 232-E
Brunner, H. 409-Q
Bruno, Charles 206-K
Bruno, Luigi 129-W
Brunton, J. D. 1180-Q
Bryant, D. L. 525-D
Bryjak, Edmund 77-Q
Bryniarski, J. 110-H
Brynza, A. P. 482-R
Bryukhanova, L. S. 256-Q
Bryukhatov, I. L. 104-M
Bryunetkin, M. G. 389-D
Brzobohaty, Miroslav 106-Q
Bublik, A. I. 592-M, 209-P
Buchanan, Robert F. 120-S
Buchen, Wolfgang 451-E,
. . . . . 488-E, 1056-Q, 424-S
Buchholz, A. 597-K
Buchman, S. P. 403-C
Buck, J. C. 34-T
Buck, Roger 803-R
Buck, T. M. 174-P
Buckel, W. 618-P
Buckeley, A. 31-C, 800-L, 306-P
Buckenham, M. H. 4-B
Buckle, Charlotte 186-J, 47-N
Buckle, H. 525-N
Buckley, S. N. 250-P
Budanova, L. M. 6-S
Buddery, J. H. 153-C, 315-C
Budrin, D. V. 269-J
Buerger, Martin J. 469-M
Bufatin, O. I. 144-S
Buffet, J. 192-F
Bugarev, L. A. 411-C
Buhler, Hans 52-F, 486-P,
. . . . . 490-Q, 1232-Q, 359-S
Buhr, R. K. 1327-Q
Buinov, N. N. 160-M, 74-N, 452-N
Bujes, J. I. 369-S
Bukowiecki, A. 22-R, 332-R,
. . . . . 385-R, 544-R, 547-R
Bulatov, V. D. 400-C
Bulina, J. 1023-Q, 1167-Q
Bullock, G. 343-L
Bullough, R. 171-M, 168-N
Bulychev, D. K. 126-N
Bunard, C. 701-R
Bunce, B. E. 92-L
Bund, W. 60-S
Bundy, F. P. 688-M, 687-P
Bungardt, Karl. 200-N, 209-N,
. . . . . 469-N, 881-Q, 1302-Q
Bunge, Hans Joachim 284-N, 383-P
Bunger, Johannes 211-R
Bungeroth, A. 199-D
Bunin, K. P. 33-N, 88-N, 157-N,
. . . . . 180-N, 313-N, 386-N, 420-N
Bunk, W. 260-M, 425-M
Bunshah, Rointan F. 459-A,
. . . . . 763-Q, 777-Q, 1132-Q
Buntar, A. G. 592-M, 209-P
Bunting, Robert L., Jr. 383-D
Buras, Bronislaw 357-N
Burat, Fritz 382-K
Buray, Zoltan 213-K
Burbank, Jeanne. 722-R, 771-R
Burbank, R. D. 485-M
Burda, Stanislav. 22-F
Burdese, A. 205-N, 399-R
Burdon, P. J. 104-N
Bure, V. V. 378-C
Burg, George. 34-A
Burgers, W. G. 78-N
Burgess, N. T. 327-K
Burghard, H. C., Jr. 634-N
Burgin, Lorraine 80-A,
. . . . . 114-A, 252-A, 675-Q
Buriyan, I. I. 103-M
Burkart, Walter 25-L
Burke, J. 348-N
Burke, J. J. 236-T
Burke, Mary J. 66-A
Burkee, Bill 422-K
Burkhardt, Walter 371-M, 616-M
Burkhutov, N. 84-K
Burley, Charles, Jr. 149-H

Burnard, L. G. 167-G
Burnett, R. C. 201-Q,
. . . . . 285-Q, 802-Q, 1040-Q
Burnoczky, Lajos 71-C
Burns, Robert S. 237-M
Burov, I. B. 494-M
Burov, I. V. 995-Q
Burris, L. 212-A
Burrows, C. F. 152-K, 280-K
Burt, E. D. 109-E
Burton, C. A. 330-K
Burton, George 372-K, 668-K
Burton, H. A. 271-E
Burtsev, I. P. 384-E
Burtseva, I. K. 626-R
Bury, D. E. 659-L
Buryak, E. M. 719-P
Bur'yanov, V. F. 68-W
Busby, Paul E. 212-J
Busch, A. J. 324-S
Busev, A. I. 82-S
Bush, G. W. 1235-Q
Bush, N. L. 530-E
Busk, R. S. 122-J
Busol, F. I. 74-C
Bussy, P. 593-N
Busto, Alan F. 352-K,
. . . . . 389-K, 562-K, 697-K
Butcher, B. R. 570-N, 1074-Q
Butler, D. J. 631-Q
Butler, D. S. 313-C
Butler, J. M. 527-L
Butler, John N. 200-C
Butler, T. J. 93-N
Butomo, D. G. . . . 265-F, 1433-Q, 784-R
Butta, Antonio M. 448-K
Butters, F. G. 170-E
Butuzov, V. P. 189-N
Buyanov, N. V. 8-S
Buyanova, A. N. 124-L
Buyers, A. G. 294-C
Buzansky, Albin 127-E
Byacheslavov, P. M. 568-R
Bykhobskii, A. I. 4-N
Bykhovskii, D. G. 237-S
Bykov, V. A. 38-Q
Byrne, J. B. 20-C
Byrnes, J. J. 132-C
Byron, E. S. 344-L
Bystram, M. C. T. 424-K
Bystrova, K. A. 55-H, 1544-Q

C

Cabane, G. 201-T
Cabarat, R. 78-X
Cabelka, Josef 43-K,
. . . . . 321-K, 433-K, 534-K
Caboz, R. 471-M
Cabrera, N. 35-M
Cacho, Francisco 9-K
Cadek, Josef 476-D
Cadieux, J. H. 77-E, 128-E
Cadoff, Irving 142-M, 406-P
Cagnet, M. 171-R
Cahan, Boris D. 195-R
Cahn, John W. 531-M, 684-M
Cahn, R. W. 35-N
Cahudhuri, A. R. 1095-Q
Caillat, R. 611-P,
. . . . . 1237-Q, 699-R, 793-R
Caine, John B. 92-E, 162-E,
. . . . . 392-E, 274-Q, 719-Q
Cairns, R. E., Jr. 145-Q
Caisso, J. 370-M
Cakharov, P. S. 1360-Q
Calais, D. 37-N, 52-N
Calamari, M. E. 265-D
Calderon, Ed. 607-L, 746-L
Caldwell, H. S. 297-C
Caldwell, M. R. 575-L
Calkins, K. W. 666-R
Calkins, Vincent P. 32-H
Callame, Bernard. 524-R
Callender, W. 93-B
Callow, R. J. 322-A
Calusaru, A. 431-P
Calvert, L. D. 242-R
Calvet, Jean 231-J
Calvo, F. A. 383-L
Camargo, Donald J. A. 71-A
Cambell, Ivor E. 504-A,
. . . . . 68-B, 226-C, 303-L
Cambi, L. 297-A
Cameron, Hugh 315-J
Cameron, Peter 267-D
Campbell, G. 272-T
Campbell, George J. 116-J
Campbell, J. D. 44-Q, 819-Q
Campbell, J. J. 140-M
Campbell, James E. 680-Q, 736-Q
Campbell, John B. 434-P
Campbell, T. T. 249-L
Campbell, W. P. 299-K, 239-W
Campion, P. J. 587-P
Campus, F. 192-Q
Candidus, E. S. 440-C, 72-X
Cannistraro, N. I. 15-L
Cannon, Howard S. 1118-Q
Canonico, D. 281-K
Canzler, H. 331-T
Caplan, D. 309-R

Caplan, R. E. 439-L
Carbaugh, P. W. 95-J
Cardona, Manuel 574-P
Caris, Darl F. 52-T, 83-T
Carius, Wolfhard . . 880-Q, 986-Q, 500-R
Carlen, Jan-Christer 135-F
Carlin, Charles E. 300-W
Carlin, F. X. 194-R
Carlson, Harold C. R. 11-T
Carlson, John F. 51-X
Carlson, O. N. 606-M,
. . . . . 607-M, 190-Q, 250-Q
Carlson, R. G. 88-C, 1265-Q
Carlson, Robert L. 148-Q,
. . . . . 680-Q, 734-Q, 736-Q
Carlson, W. B. 36-T
Carn, W. Fred. 982-Q
Carnahan, D. R. 442-C, 526-D
Carney, D. J. 105-D, 190-D
Carpenter, Frederick D. 11-C
Carr, D. M. 531-R
Carr, Dodd S. 615-Q
Carr, W. H. 12-C
Carrano, S. A. 377-L
Carrea, A. J. 198-M
Carrer, Antonio 18-K
Carrer, M. A. 29-W
Carroll, K. G. 301-N
Carruthers, M. E. 491-R
Carson, N. J. 6-T
Carter, Beryl 189-S
Cartledge, G. H. 654-P,
. . . . . 78-R, 575-R, 668-R
Carus, H. D. 522-A
Carver, J. H. 197-P
Case, D. P. 222-S
Case, E. N. 133-J
Case, L. C. 69-R
Casey, J. B. 125-R
Cash, D. J. 213-L
Cass, W. G. 42-J, 557-L
Castelfranco, James 229-T
Castell, H. C. 37-L
Castleman, L. S. 12-H, 172-H,
. . . . . 50-K, 681-K, 36-N, 121-N
Castro, M. Paz 438-S
Castro, R. 276-Q, 277-Q,
. . . . . 784-Q, 1535-Q, 1536-Q
Cathcart, J. V. 140-M, 11-R
Cathers, G. I. 12-C
Cattaneo, Rinaldo 475-E
Catterall, J. A. 448-M
Cauchetier, J. 618-R
Caugherty, Betty M. 1194-Q
Cavalier, Gilbert 465-P
Cavallaro, L. 379-R, 612-R
Cavanaugh, M. B. 20-S
Cazacu, Iulian 533-Q
Cazafura, Krsto 342-C
Cazaud, R. 297-Q, 782-Q, 825-Q
Cech, R. E. 395-C
Cegielski, W. 106-T
Cels, J. P. 414-L
Cermak, Miroslav 499-M
Cermelj, Samo. 138-T
Cernoch, Svat 429-D
Cerny, Alois 97-S
Certa, A. J. 823-L
Cerveny, L. 519-R
Cessna, J. C. 807-R
Chabachenko, N. I. 239-S
Chaevskii, M. I. 58-Q, 1310-Q
Chafey, James 737-Q
Chalmers, Bruce 487-A,
. . . . . 29-N, 463-N, 519-P
Chamberlain, R. L. 357-C
Chamberlin, Richard I. 245-A
Chambers, D. H. 90-L
Chambers, D. S. 474-Q
Champion, J. A. 119-P
Chandler, K. A. 734-R
Chandler, Roy L. 139-G, 176-G
Chandrasekhar, B. S. 99-P
Chang, S. S. 1363-Q
Chang, S. Y. 475-M
Chang, Tien S. 584-Q
Chanin, G. 570-P
Chankova, E. N. 60-P
Chant, L. J. 197-W, 198-W
Chanty, G. 40-X
Chao, B. T. 231-T
Chapin, E. J. 230-C, 231-C
Chaplygina, E. M. 39-B
Chapman, A. C. 34-P
Chapman, A. G. 635-M
Chapman, J. C. 254-K, 286-K
Chapo, Elek. 146-E
Chaporova, I. N. 12-M
Chapple, A. 84-W
Chari, M. S. R. . . . 317-P, 322-P, 336-P
Charles, J. A. 291-D, 349-D, 433-D
Charles, W. D. 13-C
Charlesworth, John E. 167-C
Charlet, L. 436-S
Charlton, N. 43-E
Charlton, T. M. 104-Q
Charmeau, A. 545-R
Charsley, P. 10-Q
Chase, Herbert 30-F
Chaston, J. C. 184-A, 127-S
Chater, W. J. B. 349-D, 433-D
Chatterji, S. K. 769-R
Chaudhuri, A. R. 684-Q
Chaudron, Georges . 152-C, 176-C, 477-R

Chauvelier, Bernard 58-E
Chauvin, G. 663-L, 115-R
Chaybany, A. 761-L
Chebatarev, N. T. 385-N, 225-R
Chechernikov, V. I. 76-P
Cheftel, H. 25-R, 442-R
Chekin, V. V. 42-B, 476-S
Cheknenko, F. A. 441-D
Chelyadinov, L. M. 556-D
Chelyuctkin, A. B. 180-S
Chemadurova, E. Yu. 66-M, 749-Q
Chen, C. W. 709-Q
Chen, S. S. 23-M
Chen, T. M. 23-M
Cheng, C. S. 23-M
Cheng, K. L. 123-S
Chentsov, A. V. 487-D
Chepelyugin, G. F. 205-K
Cherel, G. 22-X
Cherhykh, N. P. 942-Q
Cherkashina, T. V. 62-S
Cherkasov, B. F. 68-W
Chermak, L. L. 464-C, 678-M
Chermarev, A. P. 150-F, 166-F
Chernashkin, V. G. 66-Q
Chernega, D. F. 506-D, 688-D
Chernikhov, Yu. A. 62-S
Chernikova, I. N. 164-M, 1380-Q
Chernikova, L. A. 69-P
Chernogorov 239-E
Chernogrud, P. G. 281-D
Chernov, G. M. 247-P
Chernov, N. N. 165-D
Chernov, V. S. 241-F
Chernova, P. L. 105-J
Chernovoc, A. V. 88-N, 433-N
Chernyak, G. S. 113-S
Chernysheva, N. G. 416-P
Chesire, Esther 43-A
Chessin, Hyman 1298-Q
Chester, G. V. 498-P
Chesters, J. H. 8-D, 187-D
Chevigny, R. 420-K, 675-K
Chevrier, Andre 89-T
Cheyney, D. R. 452-A
Chiba, Hiroshi 596-P, 410-R
Chiba, Minoru 477-N
Chichagova, N. P. 147-E
Chida, Hiroyuki 187-E
Chien, Ch. 563-D
Chi, Hsung King 199-P
Chikalenko, G. A. 280-D
Chikel', I. 221-E
Chikovani, N. N. 220-P
Child, H. C. 156-D, 261-D, 321-D
Childs, J. K. 756-Q
Chilingarov, G. A. 478-S
Chilton, C. H. 25-C
Chilton, J. 294-C
Chi-Min, Wang. 99-N
Chinn, W. K. 632-R
Chiotti, P. 16-H
Chipman, John . . . . 86-D, 89-D, 96-D, ... 109-D, 518-P, 668-P, 684-P
Chirkin, V. M. 161-M
Chirkova, N. P. 422-C
Chironis, Nicholas 634-Q
Chistyakov, Yu. D. 89-N
Chitkov, A. 261-T
Chi-Tsiang, Tsien 1012-Q
Chittick, Donald 744-R
Chitty, K. S. 277-R
Chizh, L. D. 125-P
Chizhikov, D. M. . . . . 2-C, 288-C, ... 289-C, 301-C, 362-C, 363-C
Chizhikov, Yu. M. 98-F
Cholin, Roger 187-A
Chopovov, D. Ya. 442-P
Choquet, A. 623-Q
Chotkhe, V. I. 69-N
Choubey, R. 649-Q
Chouinard, A. F. 289-K
Chowdhuri, N. 181-H
Chreitfberg, A. M. 685-R
Christensen, Carl J. 254-P
Christensen, Lyle M. 243-F
Christensen, N. 409-N, 9-S
Christensen, R. H. 356-Q
Christiakov, L. V. 276-P
Christian, J. W. 627-M, 1290-Q
Christie, G. L. 804-R
Christine, Richard J. 278-F
Christoffel, R. J. 929-Q
Christopherson, D. G. 816-Q
Christy, R. W. 947-Q
Chu, Gordon P. K. 706-L
Chubb, Walston 236-M
Chuiko, N. M. 536-D
Chukhleb, A. N. 614-N
Chukichev, M. V. 208-M
Chukreev, N. Ya. 35-C
Chuloschnikov, P. L. . . . . 51-K, ... 59-K, 545-K
Church, F. L. 163-C
Churchman, A. T. . . . . 260-P, 350-P, ... 629-P, 656-Q, 1284-Q
Chursin, V. M. 628-P
Chuveleva, N. P. 377-C, 37-H
Chyle, John J. . . . . 442-K, ... 566-K, 589-K, 663-K
Chzhou-Min-Khun. 85-K
Cias, W. 545-N, 1480-Q
Cibula, A. 26-M
Cieslicki, M. R. 943-Q

Cihal, Vladimir . . . 536-N, 145-R, 208-R
Cihelka, Bohuslav. 133-A
Ciochina, C. 28-J
Ciornobrovkin, V. P. 460-P
Cisney, E. A. 520-M
Civera, M. 109-S
Cklyarenko, S. I. 58-P
Claeys, A. 10-S
Clakins, H. W. 275-S
Clancey, W. 962-Q
Clapper, R. B. 958-Q
Clapson, B. 135-H
Clare, J. W. H. 406-M, 515-M
Clarebrough, L. M. 24-M
Clark, A. H. 166-K
Clark, C. Burton 69-B
Clark, C. C. 504-N
Clark, E. E. 74-D
Clark, E. J. 406-K
Clark, G. R. 18-S
Clark, J. J. 193-P, 361-P, 490-P
Clark, J. W. 186-Q
Clark, Lyle L. 119-F
Clark, Manley H. 172-L, 654-R
Clark, P. W. 554-E
Clark, Ralph A. 532-N
Clark, W. D. 235-R
Clark, Walter E. 99-T
Clarke, D. G. 360-R
Clarke, L. 135-E
Clasing, Martin 145-H
Clausing, R. 667-K
Clauss, Francis J. . . 69-Q, 70-Q, 504-Q
Clausse, R. 34-G
Clayton-Cave, J. 41-Q, 1340-Q
Clegg, John W. 165-C
Cleggett, F. 682-K
Clemens, John J. 231-G
Clement, E. J. 11-K
Clemmer, J. B. 146-C
Clevers, J. A. N. 501-K, 606-K
Cliffe, B. 275-K
Cline, J. E. 94-N
Clinger, R. F. 1439-Q
Clisham, J. T. 290-W
Clock, Louis S. 1326-Q
Clogg, Mason, Jr. 833-Q
Close, Gilbert C. 225-G, 379-G
Clough, Philip J. 542-L
Clough, W. R. 414-Q
Clugston, E. J. 91-H
Clusius, K. 372-P
Coates, C. 130-F
Cobaugh, G. D. 338-D, 278-W
Cobo, J. Izaguirre 303-K
Coburn, K. G. 180-L, 763-L
Cocciolo, L. 154-F
Cochardt, Alexander . . . . . 510-N, ... 187-Q, 826-Q
Cochran, A. A. 186-C
Cockrell, W. 253-G
Coen, M. 670-K
Coen, V. 69-H
Coffin, L. B. 86-H
Coffin, L. F., Jr. . . . . 506-Q, 873-Q, ... 1228-Q, 1400-Q, 1403-Q
Coffinberry, A. S. 623-M
Cohen, Bennie 614-Q, 1507-Q
Cohen, H. M. 431-R
Cohen, I. 242-T
Cohen, Karl P. 287-T
Cohen, M. 1325-Q, 242-R, 309-R
Cohen, M. H. 209-M, 239-M
Cohen, Morris . . . . . 216-N, 442-N, ... 473-N, 633-N, ... 842-Q, 175-R, 19-X
Cohen, Raymond K. 449-R
Cohen De Lara, G. 134-D, 253-D
Coheur, P. 294-D
Coit, R. L. 52-W
Cola, G. 255-S
Colan, H. 67-H
Colbus, J. 396-K
Colclough, T. P. 290-D, 600-D
Colding, B. N. 5-G, 293-G, 388-G
Coldren, A. P. 685-Q
Coldwell-Horsfall, Rosemary A. . 38-P
Cole, E. H. 634-P
Cole, H. G. 230-R
Cole, S. W. 210-J, 257-J, 258-J
Coleman, C. F. 100-C
Coleman, G. L. 577-M
Coleman, Robert V. . . . . 50-M, ... 709-M, 786-R
Coles, B. R. 293-P
Coll, Guillermo 71-D
Collette, G. 73-N, 484-N
Collins, A. R. 152-A
Collins, F. 665-K
Collins, H. H. 620-R
Collins, Jerome 384-L
Collins, R. A. 733-Q
Colner, William H. 196-R
Colombani, A. 303-P, 307-P, 524-P
Colombie, Nicole 525-P
Colombier, L. 391-R, 469-R
Colombo, Giampiero . . . . . 346-R, ... 386-R, 619-R
Colonetti, Gustavo 75-Q
Colwell, D. L. 10-A
Comeaux, Roy V. 366-R
Comerford, M. F. 578-M
Compton, J. W. 739-R
Compton, Kenneth G. 103-R

Compton, Vera B. 643-M
Conaway, H. L. 373-M
Conjeaud, P. 253-M
Connally, R. E. 177-S
Connolly, B. J. 1263-Q
Connors, J. S. 761-R
Conrad, G. P. 304-M
Conrad, H. F. 460-E, 410-Q, 981-Q
Constant, Andre 489-Q
Contant, J. G. 598-D
Contractor, G. P. 111-F
Conway, B. E. 120-L
Coobs, J. H. 22-H, 7-T
Cook, E. F. 507-K, 588-K
Cook, E. H. 281-R
Cook, J. W. 813-R
Cook, Maurice 188-W
Cook, Nathan H. 5-G, 80-G
Cook, Nelson E. 692-L, 693-L
Cook, P. M. 815-Q
Cook, T. E. 644-L
Cooke, F. 126-S
Cooksey, C. J. 502-E
Cooley, Robert A. 284-G
Cooper, J. R. A. 422-P
Cooper, R. J. 96-B
Cooper, V. R. 21-C
Cope, R. G. 426-N
Copenhagen, W. J. 564-R
Copson, H. R. 367-R, 714-R
Corbellini, Plinio 489-K
Corbett, J. W. 606-N, 607-N, 685-N, 6-P
Corcoran, William B., Jr. 83-E
Cordes, Heinrich 577-R
Cordier, J. A. 110-D
Corenzwit, E. 333-P
Corey, C. L. 302-N
Corfe, C. F. 534-L, 655-L
Coriou, H. 663-L, 115-R, 116-R, 117-R, 698-R, 38-X
Cornea, Irina. 110-R, 585-N, 298-R, 317-R
Corner, W. D. 117-P
Cornet, I. 515-R
Cornfl'd, V. N. 491-D
Corpelet, J. 184-T
Corten, H. T. 496-Q, 497-Q, 514-Q, 519-Q
Corwin, Steve 733-R
Corzine, P. D. 317-C
Cosgrove, Stanley L. 246-G, 247-G
Cosh, T. A. 319-D, 428-E, 6-Q
Cosman, C. M. 4-Q
Cosneanu, C. 257-E, 584-N, 461-P
Costello, E. de L. 812-Q
Costeraste, Michel 87-T
Cotter, G. H. 431-K
Cotterill, P. 184-M
Cotton, J. B. 77-R, 387-R
Cottrell, A. H. 282-M, 260-P, 350-P, 811-Q, 1512-Q
Cottrell, C. L. M. 941-Q
Couch, Dwight E. 197-R
Couch, H. L. 1085-Q
Coughlin, William J. 390-G
Coulomb, Pierre 82-M, 213-M, 632-M, 221-N, 223-N
Coulter, E. E. 927-Q
Coupain, J. 147-K
Coupette, W. 311-D
Coupette, Werner 359-D, 531-D, 686-D
Courdille, M. R. 224-W
Cousine, Pierre 525-P
Coussement, R. 474-E
Coutsouradis, D. . . 628-M, 514-N, 555-Q
Cowgill, Ronald 289-A
Cox, B. 580-R
Cox, F. G. 148-K
Cox, G. J. 243-J
Cox, Russell S. 143-L, 118-Q
Crabtree, E. H. 5-C
Craft, W. H. 473-L
Craggs, H. R. 10-T
Craik, D. J. 139-M
Cramer, E. M. 41-M, 623-M
Cramer, F. B. 337-R
Cramer, R. E. 1472-Q, 1473-Q, 1474-Q
Crane, Theodroe H. 531-K
Cravens, C. W. 284-W
Cremer, G. D. 78-K, 659-K
Crimer, D. 452-P
Crisan, Fr. 584-N
Crisan, I. 111-C
Criscuold, E. L. 222-S, 439-S
Critchley, J. K. 672-M
Crites, G. Jewett 226-W, 302-W
Crocker, A. J. 553-R
Croft, George T. 366-P
Croft, W. J. 142-P
Crofts, T. I. M. 324-P
Croitonu, N. 353-P
Cromer, Don T. . . . 146-M, 147-M, 655-M
Cronemeyer, Donald C. 106-P
Croom, P. B. 548-E
Crosby, V. A. 107-T
Croscha, H. 118-T
Crossland, B. 1262-Q
Crossley, F. A. 213-A
Crosta, T. W. 369-D
Croswell, A. M. 477-K
Crouse, Howard E. 56-J, 158-J

Croutzeilles, M. 420-K, 696-M
Crowell, C. R. 652-P
Crowley, J. E. 135-B, 686-L
Croydon, S. 274-T
Crucianu, E. 88-P
Crump, R. E. 610-K, 283-Q
Cruse, K. 421-N
Crussard, C. . . . 52-M, 1468-Q, 1469-Q
Crystal, H. 343-L
Csabalik, Gyula 138-D
Csepiga, Z. 163-N
Csokan, P. 337-L,
. . . . . 338-L, 461-L, 478-L
Cuff, Frank B., Jr. 327-M
Cullen, O. E. 35-J, 38-J,
. . . . . 94-J, 184-J, 264-W
Cullity, B. D. 245-M, 311-M,
. . . . . 467-M, 519-M, 731-Q
Cummings, H. N. 24-Q,
. . . . . 339-Q, 952-Q, 1139-Q
Cunha, Octacilio. 35-A
Cunningham, George W. 720-L
Cunningham, J. W. 323-C, 1170-Q
Cunningham, R. W. 541-P
Curley, William R. 96-R
Curran, D. R. 424-Q
Currie, C. S., Jr. 85-G
Currie, D. H. 83-G
Curtis, G. C. 629-P
Curtis, Orlie L., Jr. 567-P
Cuscoleca, O. 186-D, 435-D, 508-D
Cuthbertson, F. A. 2-G
Cuthill, John R. 433-Q
Czarnecki, Roman 357-N
Czeh, Miklos 187-J
Czeke, Arisztid 123-W
Czerski, Lucjan 155-N, 51-R
Czesany, G. 134-K
Czikel, Joseph 267-E, 278-E
Czokan, P. 394-L
Czyzewski, H. 976-Q

D

Daane, A. H. 293-M, 294-M, 391-P
Dabel, Fernand 1165-Q
Dabosi, F. 567-Q
Dadswell, C. J. 36-E, 430-E
Daermann, H. J. 541-D
d'Agostino, Renato 396-S
Dahl, Otto 268-J, 493-N
Dahl, Winfrid. 50-F
Dahlman, Helmut 649-L
Dahlstrom, D. A. 118-C
Dahms, H. 509-K
Dainelli, L. 154-F
Dale, Chalmers 39-H
Dale, J. J. 531-L
Daley, Daniel M., Jr. 301-T
Dallas, N. S. 58-H
Daly, J. J., Jr. 669-R
Damask, A. C. 68-N
D'Amato, R. 687-Q
Damiano, Victor V. 206-M, 303-M
Dan, G. 5-H, 155-H
d'Ancona, P. L. 295-S
Danek, G. J., Jr. 213-Q
Danich, V. I. 484-D
Daniel, E. 423-P
Daniels, A. 41-S, 420-S
Daniels, C. M. 303-T
Daniels, Harold R. 400-G
Daniels, R. D. 304-Q
Daniel-Szabo, Jura J. 511-P
Danilov, T. L. 267-Q
Danilov, Yu. S. 1083-Q
Danilova, G. P. 700-M
Danis, Francois 321-E, 399-E
Danishevskii, S. K. 31-X
Danner, George E. 306-S
Dannewald, M. 458-D
Danon, J. 161-C
D'Appolonia, E. 1187-Q
Darby, J. B., Jr. 13-N, 77-N
Darken, L. S. 94-D, 418-N, 515-N
Darmann, Hans-Jurgen 357-D
Darras, R. 611-P, 1237-Q,
. . . . . 275-R, 699-R, 701-R, 793-R
Das, B. N. 649-Q
Das, P. P. 427-N
D'Asaro, L. A. 204-M
Dasarathy, C. 589-N
Dascalu, Silvia. 63-D, 255-D
Das Gupta, S. C. 587-N, 704-R
Dash, William C. 30-N
Dashevskii, Ya. V. 352-C
da Silva Pinto, Mario 89-A, 91-A
Dassetto, G. 112-T
Datsko, J. 1416-Q
Datsko, O. I. 629-Q
Dauberman, W. H. 53-B
Daubersy, J. 30-D, 196-D
Daubertes, C. 297-Q
Daumas, Robert. 674-N
Dautov, P. A. 374-P
Davenport, W. H. 177-R
David. 352-P
Davidenkov, N. N. 490-M
Davidson, Leon 328-T
Davies, Emrys. 518-D
Davies, L. W. 295-C
Davies, M. W. 52-L
Davies, Morgan H. 87-L, 364-L
Davies, Norman H. 259-J

Davies, P. W. 330-Q
Davies, Robert. 1199-Q, 1217-Q
Davis, C. M., Jr. 362-P, 18-S
Davis, E. A. 930-Q, 1135-Q
Davis, G. L. 2-N, 16-N, 104-N
Davis, Hubert W. 63-A
Davis, P. F. 330-P
Davis, R. A. 730-L
Davis, R. S. 250-M, 505-N
Davis, R. T., Jr. 93-N
Davis, Theodore F. 284-A
Davison, W. J. 36-F
Davydenko, I. D. 438-G
Dawe, Allen S. 767-L
Dawe, D. W. 19-R
Dawihl, Walther 135-T
Dawson, J. W. 161-J
Dawson, James K. 457-K
Dawson, W. R. 369-R
Day, Edward A. 357-E, 507-E
Day, M. F. 435-Q
Day, M. K. B. 566-M
Dayal, P. 259-N
Dayton, Russell W. 394-A
Deacon, A. J. 213-D
Deal, Bruce E. 1003-Q
Dean, John A. 13-S
Dearden, W. H. 1262-Q
Deardorff, D. K. 638-N
Dearing, B. E. 93-C
De Beaulieu, C. 265-N
De Blois, R. W. 53-P
de Borde, Be. 316-T
Deboute, Pierre 265-L, 382-L
De Buyer, R. 587-L
Debyser, J. 318-R, 380-R
Dechaene, R. 37-T
Dechaux, G. 820-R
Decker, A. 30-D, 112-D,
. . . . . 142-D, 153-D, 196-D, 242-D
Decker, R. F. 893-Q, 1049-Q
De Clippeleir, K. 349-S
Decroly, Claude 84-C, 159-C
de Destaillats, L. H. 408-N
Dedman, Haywood E. 726-Q
Deev, A. N. 229-M
Deffenbaugh, J. F. 386-K
de Fouquet, J. 321-Q, 1464-Q
Defrain, Andre. 489-M
Defranoux, J. M. 84-R, 613-R
de Fremery, D. A. 339-C,
. . . . . 145-G, 326-G
De Fromont, M. 471-M
Degaltsev, T. I. 83-M
Degeiso, Richard C. 354-C
Degen, Louis R. . . . 29-G, 208-G, 352-G
Degina, F. E. 660-N
Degnan, T. F. 540-R
De Groat, George H. 318-G, 413-K
de Groot, D. G. 257-L
Deguchi, Kiyoji 676-M
Dehais, P. 263-L
Dehlinger, Ulrich 414-N,
. . . . . 491-N, 705-Q, 745-Q
Dehne, W. 98-A
Dehnke, W. 318-N
Deibel, Charles 80-H, 162-H
de Jager, W. G. R. 292-P,
. . . . . 319-Q, 616-Q, 330-T
de Jong, Jan 411-L
De Jong, M. 351-N
Dekanovsky, Alexander 72-D
de Keyser, P. 198-A
Dekhtiar, I. Ia. 231-M, 91-N
Dekhtyar, M. V. 419-P
de Klerk, J. 611-Q
de Lacerda, L. A. 336-E
Delahay, Paul 473-R
Delaplace, Jean 155-J
Delatour, Gabriel 425-A
Delbart, G. 125-Q
de Leiris, H. 802-L, 461-Q
De Lorenzo, John F. 585-K
Delgrosso, Eugene 737-Q
Delimarsky, Yu. K. 212-P
Delves, R. 20-P
Demarneffe, P. 493-K
Dementev, V. M. 219-S
Demin, G. I. 155-W
Demin, M. P. 485-E
de Moraes, G. Soares 491-A
Dempster, N. S. 630-R, 797-R
Demvikhanov, R. A. 218-P
Dem'yanchuk, A. S. 277-S
Dennison, J. P. 330-Q
De Nobel, J. 317-P, 322-P, 336-P
Den Tandi, Claude 84-C
de Paulin, J. J. Meynis 717-K
Depken, Hjalmar 291-C
Depyagin, B. V. 108-M
de Raemy, Ph. 256-W
Derfel, A. G. 441-D
Derge, G. 84-D, 563-D
Dergunov, E. P. 418-L
Derny, Robert 66-G
de Robert, J. 50-B, 51-B
Derot, S. 46-D, 418-D
Deryabina, V. I. 992-Q
Desai, M. N. 349-R
Desai, S. C. 638-Q
Desaussure, G. 268-N
Desesa, M. A. 203-S
Desestret, A. 1283-Q
Desherault, Jean-Jacques 213-E

DeShong, J. A. 52-S
Deshpande, R. C. 1092-Q
DeSorbo, W. 243-M, 686-N
de Souza, Francisco Jose Pinto. . . 88-A
Dessart, H. 682-Q
Destable, Pierre 214-E
de Sterke, A. 337-S, 338-S, 452-S
de Strasser, Victor E. 124-K
de Strycker, Robert 463-Q
de Sy, Albert . . . . . 200-D, 316-D, ... 421-E, 485-N, 291-P, ... 343-P, 882-Q, 971-Q
Detering, Karl 552-P
Detrez, Pierre. 132-E
Dettela, Hugo. 339-E, 340-E
Dettner, Heinz W. . . . . 581-L, ... 144-R, 463-R
Deubel, Georg 341-K
Deutsch, G. C. 11-H, 251-T
DeVan, J. H. 7-T
Develay, R. . . . . 420-K, 84-Q, ... 123-Q, 703-Q, 914-Q, 972-Q
Devengi, A. 353-P
Devenyi, Gyorgy. 57-F
Devenyi, Janos. 158-D
Deverall, John E. 384-P
de Villemeur, Y. 50-J
de Vitry, Raoul 135-A
Dewees, N. B. 539-Q
Dews, J. W. 114-N
Dey, S. 259-N
de Zoubov, N. . . . . 321-P, ... 503-P, 86-R, 88-R
Dharmarajan, S. 724-Q
Dhosi, Joseph M. 418-Q
Dias Veloso, Paulo 490-A
Dick, W. 678-D
Dickens, Peter. 84-A, 125-B, 435-S
Dickenscheid, Werner 280-N, 124-Q
Dickerson, Ronald F. . . 193-C, 73-M, ... 236-M, 295-M, 449-P, 191-T
Dickey, J. E. 400-N
Dickinson, James M. 438-W
Dickinson, Thomas A. . . . . 243-G, ... 399-G, 218-L
Dickinson, William A. 440-W
Didchenko, R. 274-C
Diehl, E. K. 765-R
Diehl, W. S. 293-S
Diener, Arnulf 287-D, 682-D
Diener, H. C., Jr. 266-D
Dienes, G. J. . . . . 68-N, ... 260-N, 648-N, 12-R
Dies, K. 1268-Q
Diestel, Paul 42-W, 315-W
Dietrich, Isolde 472-R
Dietze, H. D. 141-B, 472-P
Dietze, Seweryn 116-C
Diev, N. P. 389-C
Diffin, W. F. 160-Q
Dijkstra, L. J. 11-C
Dikshtein, E. I. 299-D
Dill, Gilbert D. 285-L
Dillon, I. G. 212-A
Dillon, R. L. 159-R
Diman, William C. 227-W
Dimitrov, O. 332-N, 468-N
Dimov, B. K. 491-D
Dinkel, Charles 733-R
Dinnik, A. A. 166-F
Dinu, Ion. 130-A
Diomidovskii, D. A. 370-C
Dioszegi, Daniel. 56-F
Di Russo, E. 131-M, 714-Q
Dischinger, F. W. 75-E
Ditsman, S. A. 228-M
Dittmar, C. B. 21-Q
Dix, E. H., Jr. 245-R
Dixon, C. E. 582-N
Dmitrieva, V. S. 361-S
Doane, D. V. 601-Q
Dobbener, Raymund 559-M, 360-P
Dobias, Bohuslav 117-B
Dobkina, B. M. 133-S
Dobovisek, Bogomir 58-B
Dobrer, V. K. 847-Q
Dobrodeev, A. C. 578-L
Dobrokhotov, G. N. 425-C
Dobrokhotov, N. N. 206-E
Dobrucki, Wladyslaw. 30-W
Dodin, J. L. 19-E
Dogramadzhi, M. F. 431-W
Doherty, P. E. 250-M
Doi, Toshio. 667-N, 668-N
Doi, Yasuhiro 173-M
Doig, J. R., Jr. . . . 262-M, 296-N, 511-N
Dolan, Thomas J. . . . . 342-Q, 497-Q, ... 498-Q, 532-Q, 1138-Q
Doldon, R. 334-Q, 1042-Q
Doleshil, M. 29-B
Dolezal, H. 125-C
Dolginova, M. E. 659-D
Dol'nikov, A. E. 235-P
Domanowski, Rudolf R. 55-B, 56-B
Domcharev, N. I. 387-E
Domish, R. F. 467-R
Domnikov, Larissa 458-L, 633-L
Domony, Andras. 338-L, 461-L
Domorazek, J. 334-G, 624-R
Domotenko, N. T. 88-Q
Domsa, A. 67-H, 109-H
Donahue, D. Joseph. 474-L
Donahur, G. F. 99-R
Donaldson, A. D. 144-Q

Donaldson, Harry M. 244-A
Donchenko, P. A. 416-C
Donchenko, V. F. 228-K
Doncourt, Marcel 302-L
Donelan, J. A. 375-K, 418-K
Doneux, G. 107-K
Donev, L. 824-R
Donohue, Jerry 651-M
Donovan, B. 342-P
Donovan, M. 341-W
Donskoi, O. V. 378-C
Donth, H. 676-Q
Dontsov, S. N. 283-F
Dooley, Paul J. 147-L
Doremus, R. H. 61-M, 454-N
Dorfel, M. 88-G
Dorigo, O. 114-J
Dormsjo, T. Olaf 335-D
Dorn, J. E. 147-Q, 185-Q,
. . . . . 500-Q, 772-Q, 1220-Q
Dorner, S. 148-L
Dorokhov, V. V. 218-P
Doronin, V. M. 183-Q
Dorschu, K. E. 620-Q
Dorsi, D. 132-C
Dortmund, A. G. 181-W
Dosier, P. 51-M
Doskar, J. 452-E
Dostal, Jan 385-S
Doty, W. D. 362-K
Douglas, D. A. 105-N, 163-Q,
. . . . . 179-Q, 230-Q, 231-Q,
. . . . . 468-Q, 679-Q, 1030-Q,
. . . . . 1059-Q, 1120-Q, 1426-Q, 7-T
Douglas, Edward A. 265-P
Douglas, Thomas B. 17-P
Douglass, D. L. 680-P
Douglass, R. W. . .492-A, 337-M, 841-Q
Dovbischchenko, I. V. 272-K
Dowd, J. 665-K
Downey, R. C. 215-T
Doyle, Margaret V. 267-N, 508-N
Drabble, J. R. 19-P
Drachmann, Jorgen. 117-E, 406-E
Dragan, I. 102-F, 172-F
Dragan, N. 510-Q, 1320-Q
Draganov, Samuel M. 156-L
Drain, L. E. 428-P
Draley, J. E. 452-R, 686-R
Drapal, Stanislav 148-M,
. . . . . 422-N, 535-N
Draper, A. 264-F
Draper, J. H. M. 1280-Q
Dravdyuk, N. F. 518-N
Dravnieks, A. 60-R
Dregan, N. 494-Q
Dreher, G. K. 287-A
Dreher, M. 17-L
Drennen, David C. 850-Q
Drevermann, Albrecht. 325-D,
. . . . . 357-D, 479-D, 541-D
Driesner, A. R. 81-Q
Drimer, D. 105-P, 287-P
Driscoll, W. J. 349-W
Drits, M. E. 151-M, 246-Q
Driver, Thomas W. 322-G
Drobchenko, A. T. 400-C
Drobinin, Ya. I. 655-D
Droegkamp, R. E. 246-K
Droscha, H. 101-K
Drossback, P. 232-C
Drouzy, M. 1014-Q
Drozd, V. G. 179-F
Drozdovskii, V. A. 751-Q
Drucker, D. C. 1180-Q
Drumm, H. 290-K
Drutowski, Richard C. . .1200-Q, 1436-Q
Druyan, M. A. 361-D
Druzhinin, V. V. 182-P, 429-P
Duben, Zdenek 31-K
Dubina, Yu. G. 441-D
Dubois, Ch. 236-K
Du Bois, Wilbur 296-Q
Dubrov, N. F. 255-M, 211-P
Dubrovin, G. A. 57-W
Dubrovin, K. P. 518-N, 592-N, 52-P
Dubrovskii, Yu. A. 547-D, 548-D
Dubuisson, J. 63-H
Duby, J. 819-Q
Duckworth, Winston H. 395-A,
. . . . . 782-L, 226-T
Dudareva, I. M. 239-L
Dudko, D. A. 305-D, 306-K, 520-K
Dudley, D. W. 160-Q
Dudnik, A. A. 232-T
Dufek, Rudolf. 394-S
Dufek, Vladimir 550-M
Duffek, Edward F. 701-L
Duflot, Jean. 46-D, 418-D, 412-N
Dugan, John. 10-J
Dugdale, D. S. 595-Q, 742-Q
Dukel'skii, V. M. 110-M
Dulamita, T. 105-P, 287-P, 452-P
Dulis, E. J. 417-Q, 1164-Q, 1189-Q
Dumitrescu, Traian 130-A,
. . . . . 247-E, 319-T
Dumond, T. C. 386-G
Dun, Yan. 360-D
Dunham, B. M. 397-W
Dunham, W. W., Jr. 245-C
Dunleavy, J. G. 279-F, 850-Q
Dunlop, A. 229-E
Dunn, C. G. 188-M,
. . . . . .417-M, 464-N, 495-P

Dunn, F. 81-W, 82-W
Dunn, L. M. 544-A
Dunn, M. B. 308-T
Dunn, W. H. 516-E
Dunning, D. N. 402-P, 295-T
Dunnington, B. W. 45-T
Dunstan, H. R. 65-B, 126-C
Dupernell, George 550-L
Dupouy, J. M. 558-N
Dupraw, William A. 96-C
Dupuis, Raoul 508-A
Du Rose, A. H. 316-R
Durrer, R. 373-D, 437-D
Durrschnabel, Wolfgang. 758-Q
Dusek, Jan 514-P
Dutton, David. 94-P
Dutzi, J. V. 120-Q
Duwell, Ernest J. 361-G, 55-M
Dvorak, Antonin 202-C
Dvorchik, I. A. 114-S
Dvorin, Robert. 403-L
Dwgach, R. E. 232-S
Dwight, A. E. 346-M
Dwyer, Arthur S. 216-Q
Dwyer, O. E. 72-A
D'yachenko, S. S. 275-N
D'yachkov, B. I. 391-D
D'yakov, G. P. 157-P, 201-P
Dyck, Rudolph 285-S, 442-S
Dyer, H. N. 367-G
Dyer, Lawrence D. 1205-Q
Dylgerov, V. D. 68-P
Dyrkacz, W. W. 251-C, 343-D
Dyson, B. F. 979-Q
Dytrt, Joseph F. 434-L
Dzheru, N. 88-P
Dzliev, I. I. 445-C
Dzya-Min-Guan 266-F
Dzykovich, I. Ya. 557-M

E

Eade, G. A. 299-M
Eagan, Thomas E. 7-A
Eager, R. L. 167-S
Eash, D. T. 607-M
Eaves, T. R. 14-A
Eberhard, Friedrich. 62-J
Eberius, E. 681-R
Eberle, F. 590-N
Eberly, W. S. 327-P
Eberspacher, Otto 310-S
Eberspaecher, Heinz. 33-F
Ebert, Rolf 114-D, 202-D
Ebert, Werner 256-P
Eberts, R. E. 494-P
Ebling, Hilmer F. 551-R, 617-R
Ebner, K. 657-N
Ebner, M. L. 1094-Q
Eckart, F. 44-C
Eckhard, Siegfried . . . . . 32-S, 57-S, ... 248-S, 283-S, 422-S
Eckstein, Hans Joachim. . . 687-D, 413-N
Eddy, W. Paul 145-T
Ede, Bella. 1478-Q
Edeleau, C. 38-R
Edelman, R. E. 212-W
Edge, R. A. 821-L
Edling, S. 656-D
Edstrom, John Olaf. 11-B, 145-B
Edward, J. 452-L
Edwards, Eugene H. 220-T
Edwards, J. A. . . . . 97-B, 21-D, ... 222-L, 798-L
Edwards, K. N. 517-R
Edwards, R. M. 27-C
Edziev, S. S. 140-B
Efimov, L. M. 83-D
Efimov, P. N. 171-N
Efroimovich, Yu. E. 320-W
Efros, I. A. 294-R
Egan, E. J., Jr. 160-T
Egan, J. J. 620-P
Eggers, Hans. 224-M
Eggleston, D. M. 78-G, 389-G
Egorov, S. V. 306-K
Egre, P. 713-Q, 168-T, 233-T
Egri, L. 197-S
Ehara, Saburo 100-L
Ehrenberg, H. 355-K
Ehrlich, R. P. 149-C
Eichelberger, T. W. 1210-Q
Eichen, E. 488-N
Eichenberg, J. D. 242-T
Eichhorn, K. 49-T
Eichner, Hans 577-A
Eickhoff, Arnold J. 438-L
Eiduk, Yu. A. 173-H
Eike, E. F. 198-T
Eilertsen, Donald E. 62-A
Einspruch, N. G. 935-Q, 1486-Q
Eiro, Olavi 90-K, 188-K, 208-K
Eisele, F. 290-K
Eisen, F. H. 693-P
Eisenberg, G. L. 1305-Q
Eisenberg, P. H. 817-R
Eisenbrown, C. M. 422-R
Eisenhauer, J. J. 1028-Q
Eisenkolb, Friedrich. 9-H, 62-H
Eisenreich, H. 156-C
Eisinger, Joseph 313-P
Eisler, L. 573-L
Eisner, Robert L. 30-M
Ek, C. 258-A

Ek, Harold C. 34-X
Ekamasov, I. Ya. 104-M
Ekhina, E. V. 389-S
Ekvali, J. C. 312-T
Elagin, V. I. 389-S
Eland, W. 117-A
Elbaum, C. 471-N, 1169-Q
Elbeih, I. I. M. 11-S
El'bert, S. A. 66-E
Elcock, B. W. 158-N
Eldred, V. W. . . . 412-P, 629-P, 1318-Q
Elenevskii, D. C. 569-Q
Eleonskii, V. M. 202-P
Elford, M. T. 48-P, 604-P
El-Gendi, S. 393-L
Elghozl, Claude 652-K
Elin, L. V. 652-N
Elinson, S. V. 69-S
Eliseev, S. A. 133-N, 613-N
Eliutina, V. 222-M
Elizondo, Y. J. 411-A
El-Khatib, M. M. 565-P,
. . . . . 580-P, 585-P, 229-R
Elkind, M. J. 56-X
Ellinger, F. H. 623-M
Elliot, J. E. 53-H
Elliott, E. 294-A, 326-A
Elliott, John F. 473-A,
. . . . . 85-D, 140-D, 677-P
Elliott, Rodney P. 605-M
Ellis, C. E. 401-P
Ellis, D. A. 20-C, 148-C
Ellis, G. C. 38-A, 3-C, 126-H,
. . . . . 153-H, 464-Q, 1521-Q, 111-T
Ellis, W. C. 18-N
Ellis, W. R. 236-A
Ellman, C. 190-T
Ells, C. E. 501-P
Ellwood, E. C. 396-E
Elser, F. 277-L
Elssner, G. 622-L, 819-L, 314-S
Elston, Delmer L. 427-L
Elyasherg, M. E. 120-G
El'yashev, M. A. 644-Q
Elyutin, V. P. 483-C, 332-J
Elze, J. 79-L, 114-L, 569-L, 697-L
Em, A. P. 585-D
Emar'yarhehko, O. V. 140-P
Emel'ianenko, O. V. 280-P
Emel'lanov, V. S. 98-M
Emelyanenko, G. A. 63-L, 235-L
Emel'yanov, N. P. 63-K, 141-L
Emel'yanov, V. P. 362-W
Emelyanov, V. S. 1277-Q, 695-R
Emerg, J. F. 208-S
Emerick, H. B. 455-D, 96-J
Emery, Lawrence E. 152-J
Emery, P. 49-B
Emets, L. K. 442-D
Emhardt, F. W. 40-R
Emicke, O. 23-F
Eminger, Dzenek 318-Q
Eminger, Z. 59-D, 1149-Q
Emley, F. 71-E, 80-H, 162-H
Emlin, B. I. 160-S
Emmanuel, George N. 307-T
Emmett, R. C. 118-C
Emod, Gyula 199-C, 162-G
Emyashev, A. V. 478-C, 540-D
Ence, E. 763-Q, 1132-Q
Ende, H. 499-D
Enderby, J. A. 629-P
Endo, Kichiro 253-Q
Enekes, Sandor 281-N
Engel, G. T. 394-C
Engelhardt, W. 15-F, 439-Q
Engell, Hans-Jurgen 36-R,
. . . . . 471-R, 499-R, 601-R
Englander, M. 1288-Q, 139-T
Engle, G. B. 433-P
Engle, J. P. 246-R
Engle, L. F. 766-R
Engler, Gerd 65-E
Engler, S. 266-E
English, J. L. 509-R
Enomoto, N. 1186-Q
Enous, R. 144-K
Entin, R. I. 77-J
Entwistle, K. M. 165-J,
. . . . . 401-Q, 1157-Q, 1339-Q
Epelboin, Israel 489-M
Epifanov, G. I. 829-Q
Epner, Elliot J. 409-G
Eppelsheimer, D. S. 440-N
Epron, Pierre 474-D
Epstein, G. 592-K
Erashov, A. F. 291-S
Erbe, J. Raymond. 266-D
Erbin, E. F. 223-Q
Erck, Louis J. 81-B
Erdmann-Jesnitzer, Friedrich . . .
. . . . . 234-J, 435-K, 79-N,
. . . . . 201-N, 247-N, 293-N,
. . . . . 318-N, 363-N, 495-N,
. . . . . 517-N, 249-P, 479-P,
. . . . . 487-P, 90-Q, 194-Q, 800-Q
Erdmann-Jesnitzer, Habil F. . . . .
. . . . . 106-J
Eremenko, M. M. 438-G
Eremenko, V. N. 163-P, 662-P
Eremenko, V. V. 220-P
Eremina, V. P. 236-P
Ergang, R. 95-H
Ergard, N. N. 30-X

Erhard, D. D. 204-F
Erichsen, L. V. 576-R
Erko, V. F. 241-S
Erler, J. 249-C
Erling, Y. 544-N
Ermakov, S. S. . . 752-Q, 989-Q, 1313-Q
Ermakov, V. S. 229-J, 342-N
Ermakova, T. N. 434-C
Ermanok, M. Z. 245-F, 268-F
Ermanovich, H. A. 380-M
Ermolov, I. N. 84-S
Ernestus, Adolph W. 174-F
Ernst, D. W. 157-L, 580-L, 623-P
Ernst, Jacques. 86-T
Erny, Marc 134-P, 263-P
Erokhin, A. A. 655-K
Ershov, L. K. 84-K
Erskine, J. 447-L
Erusalinchik, I. G. 59-P
Ervin, Guy, Jr. 127-C
Erwall, Lars G. 43-S
Eschbach, E. A. 20-T
Escoffery, G. A. 647-P
Eshaya, R. M. 72-A
Eshelman, R. H. . . .40-L, 431-L, 24-W
Esin, O. A. 119-C, 309-C,
. . . . . 225-D, 400-D, 161-P,
. . . . . 213-P, 214-P, 601-P
Espagno, Lucien. 32-M, 368-P
Esper, Richard T. 141-R
Esquerre, R. 52-M, 823-Q
Ess, T. J. 168-W, 260-W
Essen, M. A. 439-N
Esslinger, Paul 260-M, 425-M
Estulin, V. 247-P
Etin, P. I. 83-N
Etter, Robert W. 472-L
Eugene, F. 425-G
Evans, B. R. 37-X
Evans, D. G. 3-B, 316-E
Evans, Dwight J. 467-S
Evans, E. B. 495-E
Evans, E. R. 707-L
Evans, J. L. 149-E
Evans, J. W. 769-R
Evans, N. L. 314-D
Evans, P. E. 74-H, 132-H, 133-H
Evans, P. R. V. 118-N
Evans, R. W. 175-D
Evans, W. P. 697-Q
Evdokimenko, A. I. 349-C
Everard, W. H. 76-J
Everest, A. B. 214-D, 70-J
Everett, Lyndon H. 407-R
Everhart, John L. . .290-C, 81-H, 282-Q
Everitt, Leo H. 35-J, 38-J, 94-J
Evers, D. 21-Q
Eversheim, P. 180-A
Eves, A. S. 20-J, 32-J
Evseev, A. M. 328-N
Evstaf'eva, O. N. 278-S
Evstyukhin, A. I. 98-M,
. . . . . 1277-Q, 695-R
Evteev, D. P. 239-D
Evtifeev, P. E. 223-K
Ewald, A. W. 562-P
Ewalt, R. W. 262-W
Ewertz, Hans. 470-N
Ewing, John F. 883-Q
Extermann, R. C. 374-A
Eyler, J. H. 351-K
Eyre, B. L. 463-M
Eyring, Henry 254-P
Ezhek, I. 404-M
Ezikov, I. M. 221-W

F

Faber, G. 674-Q
Fabian, Robert J. 453-A,
. . . . . 327-L, 76-R
Fabrikova, E. A. 141-S
Fabun, Don 6-X
Facaros, G. N. 442-C
Fadeev, I. G. 391-D
Fagel, J. E., Jr. 122-S
Faguet, J. 52-M
Fahlenbrach, H. 67-M, 474-P
Fahrig, R. H. 100-N
Fainborn, S. D. 69-J
Fair, W. F., Jr. 123-R
Fairlie, Jack 196-G
Fairweather, K. 339-K
Faivilevich, G. A. 427-M
Faivre, Rene 366-M
Fakidov, I. G. 185-P, 203-P
Falcheva, V. I. 516-L, 550-R
Falkenmayer, K. 146-J
Falkenmayer, Kurt 252-J
Fal'kevich, A. S. 56-K, 58-K, 204-K
Fal'kevich, E. S. 281-T
Fallin, H. Kirk. 468-S
Fan, H. Y. 557-P
Fancey, R. W. 216-T
Fannon, R. L. 170-K
Faraggi, H. 249-C
Farcas, Toma 28-J
Farchadow, A. 57-R
Fardas, M. S. 579-M
Faris, John P. 120-S, 257-S
Farkas, Otto 139-D
Farley, R. W. 377-D
Farmer, E. E. 16-B
Farmer, F. R. 292-A

Farnsworth, H. E. 95-P
Farrah, G. H. 287-S
Farrar, C. W. 408-E
Farrington, E. F. 74-D
Fassel, V. A. 29-S, 37-S, 259-S
Fatigati, C. 266-S
Faulkner, D. S. 100-K
Faulkner, G. E. 75-K, 200-K
Faulkner, L. 94-E
Faulkner, W. H. 123-J
Faulring, G. M. 654-M
Faulstich, R. 689-K
Fauquemberque, Jean 40-E
Faure, Andre. 269-N, 339-N
Faure, M. 134-D
Faust, Charles L. . . . . 396-L, ... 627-L, 822-L
Faust, J. W. 471-L
Favre, A. E. 176-F
Faye, F. H. 343-S
Fayles, R. Russell 306-D
Febve, M. 45-B
Fechete, Alexandru. 533-Q
Fedash, N. P. 152-S
Feder, D. O. 470-L
Federgreen, Nathan 27-A
Federighi, T. . . . . 58-M, ... 132-M, 301-M, 353-N
Federov, G. P. 718-P
Fedin, V. P. 179-F
Fedorchenko, I. M. . . . . 123-B, ... 111-H, 140-H, 141-P
Fedorchenko, V. A. 234-F, 175-H
Fedorov, G. B. 178-N
Fedorov, G. V. 24-P, 277-P
Fedorov, P. I. 636-M
Fedorova, C. A. 180-N
Fedorovskii, A. E. 259-Q
Fedot'ev, N. P. 830-L, 568-R
Fedotov, L. N. 420-P
Fedulova, N. I. 434-R
Feduska, Andrew 212-J
Feduska, W. 474-K, 328-P
Fefer, A. M. 230-M, 23-P, 396-P
Feicke, Walter. 197-E, 384-Q
Feige, Werner 14-J
Feinberg, I. J. 7-Q
Feisel, D. H. 510-N
Feldman, B. A. 487-D
Feldman, Cyrus 209-S
Feldmann, D. 382-G
Feldmann, H. D. . . . . 1-F, 49-F, ... 69-F, 76-F, 235-F
Felgar, R. P. 1292-Q
Felloni, L. 379-R
Fellows, John A. 7-F
Feltham, P. 43-Q
Feltner, Charles E. 1373-Q, 1374-Q
Feng, C. 1169-Q
Fenn, A. P. 201-E
Fenn, Raymond W., Jr. 955-Q, 959-Q
Fennell, J. 51-X
Fenton, G. 126-D, 128-D, 177-D
Ferdinande, V. 753-R
Ferebee, S. F. 362-P
Ferenc, V. 564-E
Ferguson, Robert R. 129-J
Ferguson, T. A. 587-K
Ferlin, H. J. 306-L
Ferorovskii, A. E. 1214-Q
Ferre, S. 430-R
Ferrier, Albert 468-P
Ferriss, D. P. 266-C
Ferro, A. 376-M, 708-P, 109-Q
Ferry, M. 101-N
Fert, Charles 525-P
Fesenko, V. V. 163-P
Few, W. E. 101-C
Feytel, C. A. 405-G
Fiala, A. 334-S, 336-S
Fiala, J. 476-D
Fickle, D. P. 76-M
Fiedler, H. C. 370-P
Fiehn, H. 35-K
Field, B. O. 389-R
Fieldhouse, A. B. 187-K
Fiksen, N. V. 6-J
Fikus, Francigszek. 38-D
Filip'ev, O. V. 490-D, 383-E
Filippi, Frank J. 225-S, 214-W
Filippov, S. I. 556-D, 616-D
Filson, Daniel H. 1212-Q
Fimov, E. A. 59-P
Finch, G. A. 101-F
Fincher, D. R. 637-R
Findley, W. N. 1-Q
Finger, W. 870-Q
Fink, Frederick W. 1-R
Finkel'shtein, B. N. 1378-Q, 1380-Q
Finlyson, D. M. 196-P
Finnern, Bruno 8-J, 198-J, 669-Q
Finnie, Iain 241-Q, 485-Q, 692-Q
Finniston, H. M. . . . 503-A, 299-T, 317-T
Fiorenza, A. 107-S
Firket, A. 243-D, 366-D
Firman, Miroslav. 382-S
Firou, I. 566-L
Firsanova 76-C
Firsonova, L. A. 307-C
Fischer, C. A. 652-L
Fischer, Gerhard . . . . . 114-C, ... 368-C, 367-Q
Fischer, Hellmuth 212-R
Fischer, Jack 335-C

Fischer, R. I. 247-K
Fischer, W. 300-E
Fischer, W. R. 457-R, 787-R
Fischer, Wilhelm Anton. . 26-D, 43-D, ... 91-D, 97-D, 145-D, ... 402-D, 677-D, 297-R
Fischer, Wolfgang 350-E
Fischgold, R. 102-F, 206-N
Fischmeister, H. F. 618-M
Fish, H. Kermit 98-W
Fisher, A. O. 514-R
Fisher, Charles E. 73-C
Fisher, E. S. 744-Q
Fisher, Frank L. 62-A
Fisher, John C. 233-M
Fisher, P. 557-P
Fisher, P. A. 434-E
Fishlock, D. J. . . . . 49-G, 23-L, ... 153-L, 242-L, 252-L, ... 279-L, 286-L, 660-L, ... 130-W, 191-W, 13-X
Fitch, I. C. 24-K
Fitzer, Erich. . . . . 23-A, ... 94-C, 184-C, 97-H
Fitzgeorge, D. 602-Q
Fitzgerald, Leo M. 1178-Q
Fitzgerald-Lee, G. . . . . 413-G, 265-J, ... 607-R, 644-R, 693-R, 810-R
Fitzsimmons, K. W. 98-W
Flach, J. 257-W
Flachbarth, C. T. 690-L
Flament, D. 269-D, 208-J, 222-J
Flanagan, T. P. 676-P
Flanary, J. R. 61-C, 65-C
Flanders, P. J. 154-J
Flankenmayer, K. 1069-Q
Fldor, Laszlo 237-Q
Fleischer, Bernard. 362-M
Fleischer, R. L. 505-N
Fleischmann, M. 331-P
Fleischmann, W. L. 142-T
Fleitman, Albert H. 1221-Q
Flemings, Merton C. . . . . 2-E, 81-E, ... 145-E, 508-E, 460-E, ... 514-E, 544-E, 575-E
Flemming, H. 101-T
Flerov, G. N. 215-P
Fletcher, J. M. 166-C
Fletcher, W. C. 128-D
Fleury, G. 503-K
Flicker, H. D. 21-F
Flinn, Richard A. . . . . 3-E, 324-E, ... 394-E, 418-E, 852-Q
Flint, G. N. 489-R
Flmament, D. 324-J
Floe, C. F. 590-Q
Floreen, Stephen 617-N
Florensova, F. R. 319-J
Florianovich, G. M. . . . . 62-R, ... 147-R, 606-R
Floridis, T. P. 620-D
Flour, Maurice 25-E
Floyd, G. L. 246-R
Flubacher, P. 425-P
Fodor, J. 356-D
Foerster, Friedrich 169-S
Foerster, Klaus 324-D
Fofanov, A. A. 381-K
Fogel', A. A. 581-E
Fogy, E. 64-F
Fokin, N. A. 423-C
Fokt, E. 105-P, 287-P, 452-P
Folberth, O. G. 153-P, 532-P
Foldyna, Vaclav 299-P
Foley, Dennis D. 165-C
Foley, Edward F., Jr. 354-L
Foley, Frank D. 828-L
Folfasinski, Marian 259-D
Folz, J. R. 68-C, 253-G
Fomichev, I. A. 272-F
Fomin, A. G. 108-K, 357-K
Fomin, G. T. 591-N
Fominykh, I. P. 51-N
Fontana, M. G. . . . . 160-R, 161-R, ... 172-R, 563-R, 647-R
Fontanese, D. J. 304-L
Foote, F. 310-A
Forbath, Robert 155-D
Forciea, J. E. 24-B
Ford, Eric 152-R, 154-R
Foreman, A. J. E. 507-M, 629-P
Foresi, M. 613-D
Forgeson, B. W. 533-R
Forichon, L. 51-B
Forlifer, William R. 59-X
Form, G. W. 313-Q, 415-Q
Forsblum, G. V. . . 376-C, 412-C, 450-C
Forsman, Ralph E. 371-W
Forster, J. A. B. 96-B
Forster, K. 685-D
Forsyth, P. J. E. 352-N, 785-Q
Fortin, B. J. 742-L
Fortino, D. 561-Q
Fortlage, A. C. 321-J
Foryst, Juliusz 36-D, 132-D, 129-S
Foskutov, F. M. 414-C
Fossen, Peer. 94-K
Foster, A. 489-P
Foster, D. L. 455-C
Foster, Ellis L. 193-C
Foster, P. K. 721-R
Fouad, M. G. 134-R
Foucher, Jean 423-W
Foulds, Andrew K., Jr. 720-L

Foulke, D. Gardner. 554-L
Foulkes, T. G. 207-T
Foulon, M. 442-E
Found, George H. 303-A
Fountain, R. W. 123-J, 1025-Q
Fourdeux, Angeline. 712-Q
Fourie, J. T. 940-Q
Fournier, R. 698-R
Fousek, R. J. 86-X
Fouts, J. M. 104-R, 105-R
Fowler, E. L. 431-G
Fowler, R. J. 32-G
Fox, H. W. 771-Q
Fox, J. C. 493-E
Fox, M. 37-M
Frackiewicz, Ryszard. 37-D
Fradette, L. B. 536-M
Fragetta, W. A. 278-K
Frahtsevitch, I. N. 641-Q
Frame, Charles P. 124-B
Francis, E. L. . . . 403-A, 404-A, 405-A
Francis, Howard T. 196-R, 669-R
Francis, R. K. 130-H
Franck, U. F. 397-R
Franco-Ferreira, E. A. 311-K
Francombe, M. H. 1-M
Franek, A. 163-M
Frank, F. C. 5-M
Frank, Guenther. 309-T
Frank, R. G. 1027-Q, 1097-Q
Frankau, A. M. 292-D
Frankel, H. E. 188-Q
Frankhouser, W. L. 351-K, 668-K
Franklin, A. W. 205-Q
Franklin, J. R. 151-L
Franklin, Thomas C. 468-C
Franks, A. 436-M
Franks, A. E. 353-C
Franks, D. E. 650-D
Franson, K. D. 1010-Q
Frantsevich, I. N. 84-N,
. . . . . 166-N, 549-N, 451-Q
Franz, Henry W. 101-B
Franz, Hermann. 748-Q
Franz, M. W. 228-C
Franzosini, P. 372-P
Frappier, E. 461-Q
Frasch, J. 455-R
Fraser, D. J. 183-J
Fratkina, G. P. 137-S
Frazier, K. S. 688-L
Frazier, Loring R. 91-T, 241-T
Frazier, R. H. 1402-Q
Frear, Clyde L. 39-E, 120-E
Freda, August . . . 311-M, 519-M, 731-Q
Fredriksson, K. A. 338-E
Freedman, R. R. 121-K
Freeman, Horace 591-D
Freeman, J. W. 302-N, 303-N,
. . . . . 69-Q, 70-Q, 314-Q,
. . . . . 685-Q, 893-Q, 1049-Q, 1437-Q
Freeman, R. R. 154-L
Freidin, L. M. 576-D
Freilikh, A. 228-N
Frenay, E. 258-A
French, A. R. 432-E, 184-R
French, E. J. 133-K
French, G. 922-Q
Freudenthal, A. M. 446-Q,
. . . . . 824-Q, 1134-Q
Frey, Samuel S. 358-L
Fricke, Horst 300-M, 438-M
Fricke, W. 201-L
Fridland, A. I. 339-W
Fridlyandera, J. H. 51-E
Fridman, I. D. 476-C
Fridman, Ya. B. 370-Q, 751-Q
Fridman, Z. G. 874-Q
Friedberg, Henry R. 590-L
Friedberg, S. A. 314-P
Friedel, J. 423-P
Friedewald, H. J. 220-G
Friedl, E. B. 391-L
Friedmann, J. B. 312-Q, 721-Q
Friedrich, H. 435-K
Friedrich, Vilem 35-W
Friemel, Wolfgang 89-H
Friess, J. E. 415-W
Friesse, J. 740-R
Friewillig, Rudolf. 385-S
Frigyes, W. 564-E
Frisch, J. 236-F
Friske, W. H. 114-F
Fritsch, A. R. 721-P
Fritz, J. F. 193-P, 361-P, 490-P
Fritz, J. S. 137-C
Fritze, Hans Werner. 572-D
Fritzlen, Glenn A. 463-A, 123-J
Fritzsche, H. 269-P, 556-P, 692-P
Frizyuk, F. P. 236-S
Froels, M. 148-L
Frohberg, Martin G. 55-N, 312-P
Frohling, Josef 107-W
Froidevauz, Henri 23-T, 24-T
Frolova, K. I. 826-R
Froment, Michel 78-L,
. . . . . 475-L, 231-R, 398-R
Frommelt, Horace 40-H
Froning, H. R. 120-R
Frost, B. R. T. 214-T
Frost, N. E. 886-Q
Frost, Paul D. 186-N, 296-N,
. . . . . 511-N, 19-Q,
. . . . . 559-Q, 591-Q, 1406-Q

Fry, H. 617-L, 760-L
Fry, O. E. 256-C
Frye, J. H. 11-R
Fuchs, Henry O. 348-Q
Fueki, Kazuo 262-R
Fugardi, J. 417-K
Fujii, Seiichi 30-R
Fujii, Takehiko 627-D, 500-E
Fujii, Yasuji 137-J
Fujiki, Y. 680-L
Fujimoto, T. 113-K
Fujisawa, O. 123-L
Fujita, E. 111-A, 49-C
Fujita, Toshio 1102-Q
Fujita, Yoshiyuki 918-Q
Fujiwara, Takeo. 1113-Q, 96-T
Fukai, Akira 522-P
Fukel'man, M. L. 211-K
Fuklev, V. A. 485-D, 560-D
Fuks, M. Ya. 10-M, 158-M, 1493-Q
Fuks, S. I. 286-T
Fukumoto, Ichiro 1458-Q, 1459-Q
Fukuoko, Hidekazu 1430-Q
Fukuroi, Tadao 664-P
Fukushima, Seitaro. 284-C, 285-C
Fuller, A. G. . . . . 42-E, 253-E, ... 462-E, 505-E, 114-N
Fuller, H. W. 441-M
Fullman, R. L. 645-N
Fulmer, Glenn E. 472-S
Fulrath, Richard M. 220-K
Fulton, J. C. 96-D
Funk, Albert G. 254-P
Funk, William H. 623-K
Funke, Paul, Jr. 51-F, 1053-Q, 44-W
Funke, V. F. 55-H, 1544-Q
Fursov, A. 278-P
Fursund, K. 287-E
Furukawa, To-Oru 1460-Q
Fushimi, Hiromu 64-B
Fuwa, Tasuku 297-D, 668-P, 684-P
Fuzei, I. M. 225-P

G

Gabler, F. 621-M
Gabriel, A. 520-E
Gabrielson, Gunnar. 225-A
Gadzala, John L. 351-G
Gage, D. G. 804-R
Gage, R. 418-G
Gahler, Arnold L. 206-S
Gaidukov, Iu. P. 65-P, 147-P
Gaidukov, M. G. 10-N
Gailly, M. 41-A
Gaines, Gordon B. 770-R
Gaines, J. M. 374-D, 387-D, 439-D
Gajdos, L. 403-G
Galaktionov, A. T. 381-K
Galatonov, A. L. 510-D
Galbrun, J. 1005-Q
Galemina, O. M. 260-J
Galetto, C. 461-E
Galey, J. 588-D
Galimberti, James M. . . . 263-G, 296-G
Galkina, O. S. 69-P
Galler, Bruno 582-L
Galley, R. 192-A, 247-A
Galli, Gianluigi 216-L, 309-L
Gallo, S. 399-R
Galloway, Edward E. 642-R
Galluser, H. 48-D
Galmiche, P. . . . . 29-H, 5-J, ... 21-J, 138-J, 618-L
Gal'nbek, A. A. 370-C
Galovatyi, R. N. 212-S
Gal'perin, E. L. 380-N
Gal'perin, F. M. 128-P
Gal'perin, M. Ya. 661-M, 605-R
Galperin, Ya. A. 103-G
Galperine, M. J. 969-Q
Gal'iserin, E. L. 223-M
Galus, Z. 269-M
Gamazov, V. P. 443-D
Gamber, E. J. 280-E
Gambles, D. 324-P
Ganow, D. C. 1095-Q
Gapchenko, M. H. 586-Q
Garber, R. I. 1498-Q
Garber, S. 608-R
Garbunov, G. V. 225-K
Garcia, C. 423-S
Garcia, Zosimo 9-K
Gardam, G. E. 166-L
Gardiner, Frank J. 11-T
Gardner, A. G. 164-S
Gardner, E. Merrill 74-F
Gardner, George W. 580-K
Gardner, H. R. 416-Q, 677-Q
Gardner, M. 314-C, 127-H
Gardner, N. R. 570-A, 24-F
Gardner, W. A. 146-T
Gardom, John 181-E
Gardonyi, Sandor 287-N
Garenskikh, A. D. 400-C
Garf, M. E. 211-Q
Garfield, Gerald. 189-G
Garin-Bonnet. 249-C
Garkusha, A. A. 338-W
Garlick, R. G. 367-N
Garnier, Henry 213-E, 379-E
Garnier, Jacques 291-T
Garnyk, G. A. 668-D
Garofalo, F. . . . 1192-Q, 1193-Q, 1370-Q

Garpinenko, M. S. 214-R
Garrett, F. B. 156-Q
Gartner, W. W. . . . 537-P, 559-P, 725-P
Garwood, A. D. 384-W
Gasik, M. I. 160-S
Gasior, E. 127-L
Gasper, Wayne L. 344-A
Gassmann, H. 204-G, 314-G
Gasson, D. B. 1-N
Gaston 180-D
Gates, John E. 449-P
Gatos, Harry C. 182-R
Gatti, Arno 644-N, 645-N
Gatto, F. 278-Q, 279-Q
Gaubert, A. 379-K
Gaule, Gerhart K. 3-H
Gault, J. L. 407-G
Gault, S. R. 212-L
Gaunt, P. 627-M, 1290-Q
Gauthron, M. 571-K
Gautier, A. 1281-Q
Gavranek, V. V. 988-Q
Gavrilin, V. I. 11-W
Gavrilov, O. T. 69-D
Gavrilov, P. D. 228-J
Gaylord, E. W. 565-Q
Gaynes, Norman I. 689-R
Gazzi, V. 105-S
Geach, G. A. 281-C,
. . . . . 137-H, 581-N, 1280-Q
Geankoplis, C. J. 174-C
Gebhardt, Erich 382-P,
. . . . . 552-P, 758-Q, 503-R
Gedgovd, K. N. 757-R
Gee, R. 839-Q
Geerlings, H. G. 575-K, 576-K
Gegner, P. J. 561-P
Geguzin, Ya. E. 48-H, 265-Q, 628-Q
Gehring, W. 205-L
Geiger, Th. 221-J
Geijer, Ernst. 417-G
Geilenkeuser, H. 333-T
Geilert, Georg 200-L
Geisel, H. 17-J
Geiselman, D. 1404-Q
Geiss, Robert H. 270-F
Geissler, K. 603-R
Gel'd, I. V. 551-P
Geld, P. V. 300-C, 122-M
Geleji, A. 59-F
Geleji, Sandor 55-F, 57-F
Geller, S. 79-M, 649-M
Geller, Yu. A. 46-J
Gelles, S. H. 98-N, 513-N
Gelling, P. J. G. 416-S
Gel'man, A. S. 401-K,
. . . . . 546-K, 548-K, 701-K
Gelok, J. 255-G
Gel'perin, I. B. 371-E
Geltman, G. L. 719-L
Gemes, Ferenc 273-D, 337-D
Geminov, N. N. 1362-Q
Gemmill, M. G. 455-Q
Genco, J. I. 95-N
Geneidy, Ahmad 741-L
Generson, I. G. 391-Q
Genkin, I. Z. 544-K
Gennone, R. J. 338-M
Gensamer, Maxwell 405-Q
Gensch, C. Ilschner 689-M
Genty, B. 186-J
Genwo, R. 241-W
Genzsch, Erwin O. 384-G
George, D. R. 144-C
George, H. P. 75-R
Georges, J. P. 460-Q, 822-Q
Gerard, George 42-Q
Gerard, Jean 159-C
Gerashutina, L. I. 482-R
Gerasimenko, I. N. 1098-Q
Gerasimof, G. I. 220-W
Gerasimoff, Peter 97-H
Gerasimov, A. D. 104-C
Gerasimov, A. G. 14-B, 119-B
Gerasimov, V. V. 21-R
Gerasimov, Ya. I. 714-M,
. . . . . 405-P, 480-P
Gerbeaux, H. 198-K, 676-K, 204-L
Gerber, M. 1468-Q
Gerdom, Karl Heinz 571-D, 388-S
Gerds, Arnold F. 360-G,
. . . . . 325-N, 559-N
Gerken, J. M. 371-K, 694-K
Gerkhadt, L. 66-S
Gerlach, M. 249-P
Gerland, J. 697-M
Germagnoli, E. 440-M
Gerold, Volkmar 300-M, 438-M
Gerrlings, H. G. 364-K
Gerstenberg, D. 295-P, 615-P
Gerstenberger, Gunther. 9-W
Gertman, Yu. M. 551-P
Gertsman, S. L. 299-A, 297-E
Gertsriken, S. D. 309-M,
. . . . . 495-M, 109-N, 371-N
Gerty, J. M. 542-N
Gertz, Gerhard 198-E, 437-E
Gesell, Waldemar. 298-W
Getsov, L. B. 272-Q
Getz, Ralph W. 319-K
Ghaly, H. A. 248-P
Gharpurey, M. K. 9-M
Gherard, Dina 339-R
Gherst, R. H. 634-D

Ghisolfi, G. 83-R
Ghosh, S. 135-M
Gianasso, G. 332-D
Giancola, John R. 599-R
Gibbon, R. B. 129-H
Gibbons, D. F. 18-N, 49-P
Gibeau, Andre 436-E
Gibrat, R. 472-D
Gibson, E. D. 606-M
Gibson, John A. 520-P
Giddings, J. Calvin 254-P
Gideon, Donald. . . . 244-G, 245-G, 247-G
Giemza, Charles J. 646-M
Giertsen, Sigurd B. 314-L
Giessen, Bill 424-M
Giessler, Klus 190-N
Gifkins, R. C. 289-N
Gilbert, G. N. J. 375-Q,
. . . . . 1124-Q, 362-R
Gilbert, H. L. 406-A, 77-C
Gilbert, L. D. 69-N
Gilbey, D. M. 1160-Q
Gilbraith, Allen C. 287-K,
. . . . . 661-L, 578-Q, 1275-Q
Gilchrist, C. W. 497-E
Giles, G. C. 82-F
Gill, D. G. 321-G
Gill, D. S. 440-N
Gill, E. T. 533-Q
Gill, G. M. 241-D
Gill, H. 230-F
Gillemot, L. 662-Q
Gilles, Josef Wilhelm 171-A
Gillespie, R. H. 461-A,
. . . . . 563-A, 405-D, 486-D
Gilliand, A. 123-T, 126-T
Gilliland, Harry J. 142-J
Gillings, D. W. 167-D
Gilman, J. J. 353-M
Gilman, T. P. 10-H
Gilroy, P. E. 699-L
Ginberg, A. M. 721-L, 436-P
Gindin, I. A. 69-N
Ginsburg, H. 447-Q, 270-S
Ginsburg, N. G. 784-R
Gintsberg, M. A. 33-B
Ginzburg, N. I. 234-P
Ginzburg, S. K. 281-J
Ginzburg, V. I. 42-X
Gioseffi, N. J. 751-R
Girard, F. 108-Q, 462-Q, 711-Q
Giron, Victor S. 549-P
Girouard, A. J. 235-K
Githmann, K. 355-A
Gitlevich, A. D. 62-W
Gitman, E. B. 120-C
Gittus, J. H. 450-E
Givargizov, E. I. 231-P
Gjeljajev, A. I. 138-C
Gjermundsen, K. 9-S
Gjostein, N. A. 426-M
Gladishevskii, E. T. 457-M
Gladkikh, L. I. 1493-Q
Gladkov, N. A. 42-B, 476-S
Gladkovskii, V. A. 750-Q
Gladstein, L. I. 262-Q, 1451-Q
Gladushevsky, E. I. 180-M
Gladys, Erich 115-F
Gladyshenskii, E. I. 590-M
Glaesener, Ernest 182-W
Glaeser, W. A. 337-T
Glagolev, N. I. 829-Q
Glaser, A. I. 167-P
Glaser, Milton A. 439-L
Glass, J. J. 460-L
Glasunov, S. G. 260-Q
Glatter, J. 351-K
Glatz, Bohumil. 37-F
Glaubitz, Heinz 121-T
Glavez, M. J. 291-F
Glazer, A. A. 107-N
Glazov, A. N. 160-W
Glazov, V. M. 167-M, 196-M,
. . . . . 89-N, 139-N, 600-P
Glazova, A. I. 161-N
Glazunov, E. E. 1305-Q
Glazunov, S. G. 1543-Q
Gleeson, W. C. 109-L
Glen, J. 54-N, 220-Q
Glenny, E. 910-Q, 1039-Q
Gleszer, Kenneth M. 382-W
Glick, W. W. 248-E, 250-E
Glicksman, R. 239-R
Glikman, L. A. 847-Q, 992-Q
Glinkov, G. M. 492-D, 618-D
Glinkov, M. A. 492-D, 155-W, 189-W
Glisksman, M. 176-P
Glodyani, A. 470-P
Glossop, Am. B. 235-M
Glozov, V. M. 319-N
Gluberson, M. E. 62-X
Gluck, J. V. 314-Q, 1437-Q
Glukhanov, N. P. 203-K
Glushkova, M. A. 474-C
Glyaev, A. P. 254-N
Gnezdilov, K. E. 274-W
Gnezdov, V. I. 182-S
Goad, P. W. 247-L
Gobbels, P. 827-L
Gobeli, G. W. 93-P
Gobin, Pierre 1090-Q
Godard, H. P. 659-L, 712-R
Godeaux, P. 170-N
Godfrey, G. B. 280-T

Godin, Iu. G. 98-M, 1277-Q
Godula, Robert. 117-C
Goepfert, G. J. 229-Q
Goering, H. L. 268-C, 95-N, 97-P
Goering, William A. 244-D
Goeschel, Walter 403-E
Goetzel, Claus G. 25-H,
. . . . . 71-H, 84-H, 142-H
Goffart, J. 152-E
Gofman, Yu. M. 446-S
Gofner, A. M. 66-Q
Gohn, G. R. 961-Q
Golan, Simcha 515-R
Gold, A. V. 50-P
Goldberg, David C. 467-L
Goldblatt, Alan. 429-S
Goldelenok, E. G. 450-C
Golden, J. 457-Q, 1337-Q
Goldenberg, A. A. 130-Q
Gol'denberg, L. I. 119-D, 83-S
Goldenberg, M. 75-E
Goldhoff, R. M. 228-Q, 633-Q
Goldman, A. 710-P
Goldman, J. E. 314-P
Goldman, K. M. 40-M
Goldschmidt, H. J. 355-R
Goldschtein, L. Ya. 10-M, 158-M
Gol'dshtein, M. I. 184-Q
Gol'dshtein, N. L. 72-B
Goldshtein, Ya. E. 256-M
Goldsmid, H. J. 20-P
Goldstein, S. 537-P
Golgotiu, Tiberiu 28-J
Golianov, V. M. 518-N, 52-P
Golik, A. Z. 171-P, 437-P
Golikov, V. M. 176-N, 671-N
Gollmick, Hans Joachim 421-K
Gololdbov, D. I. 117-F
Golomazov, F. I. 286-J
Golovein, P. V. 551-K
Golovin, S. Ya. 322-E, 1243-Q
Golovkin, V. S. 710-M
Golubev, N. P. 345-T
Golubkov, A. I. 574-Q
Gomer, Robert. 35-P
Gomez, Mario P. 560-N
Gomiscek, Serge J. 243-C, 371-S
Goncharenko, N. I. 875-Q
Gondi, P. 444-N
Gondolf, Ewald G. 203-N
Gonzalez, Daniele. 271-N
Gonzalez, R. E. 179-L
Good, P. C. 86-C
Good, R. C., Jr. 146-Q
Goode, J. H. 61-C, 65-C
Goode, W. Douglas, Jr. . . . 421-M, 583-N
Goodfellow, G. B. 609-K, 656-K
Goodman, Eli I. 442-Q
Goodman, Theodore R. 591-P
Goodwin, C. L. 397-E
Goodwin, Harry B. 152-F,
. . . . . 175-F, 198-F, 224-F
Goodwin, J. G. 163-F,
. . . . . 1264-Q, 343-R, 660-R
Goodwin, T. C., Jr. 529-P
Goodzeit, C. L. 1201-Q
Goorissen, Jan. 366-N
Goossens, H. 44-N
Gorbach, V. G. 111-N, 134-N
Gorbachev, A. F. 118-D
Gorbanskii, V. V. 81-K
Gorbatenko, V. E. 780-L
Gorbunov, A. M. 388-C
Gorbunova, K. M. 57-M,
. . . . . 343-N, 428-R
Gorczyca, Stanislaw 20-N
Gordiakova, G. N. 232-P
Gordon, D. I. 528-P
Gordon, H. E. Zentler. 555-L
Gordon, I. Z. 1233-Q
Gordon, Mack 323-W
Gordon, Paul. 509-N, 516-N
Gordon, R. B. 543-Q
Gordon, W. A. 29-S
Gordov, A. N. 30-X
Gore, J. K. 449-L, 460-L
Gorelik, S. S. 610-M, 577-N, 630-N
Gorezko, P. A. 396-Q
Gorgen, Robert 502-D
Gorina, A. P. 721-L
Gorlach, I. A. 255-M
Gorlich, H. K. 44-N
Gorling, P. 72-R
Goroshchenko, Ya. G. 475-C
Gorshkov, A. A. 329-Q
Gorsuch, Paul D. 416-M
Gorum, A. E. 770-Q
Gorup, Miran. 398-D
Goryunova, N. A. 102-M,
. . . . . 103-M, 111-M
Gospodarevskii, V. I. 230-N, 434-N
Goss, Norman 41-C
Gosse, J. 42-F
Gossett, R. E. 535-E
Gostev, K. I. 673-D
Goswami, A. 76-N, 604-N, 95-Q
Gotal'skii, Yu. N. 103-K
Goto, Hiderhiro 400-S,
. . . . . 454-S, 455-S
Goto, Ken'ichi 755-R
Gotsch, L. P. 198-T
Gotthard, Csizi 334-C
Gottwald, Heinrich 171-F
Gottwalda, K. 37-F

Gotzl, F. 12-L, 29-L, 696-L
Gould, J. V. 223-G,
. . . . . 242-G, 286-G, 342-G
Goulding, C. W. 219-M, 257-M
Gourceaux, Marcel. 716-P
Gourd, L. M. 240-K
Goureau, J. 13-D, 3-F
Goureaux, G. 303-P, 307-P, 524-P
Gouskov, Leone 483-R, 752-R
Gouwens, P. 250-F
Gouwens, Paul R. 424-W
Goux, Claude. 367-M, 651-N
Govorkov, V. G. 1219-Q
Govorov, V. P. 373-C
Gowbev, N. S. 655-D
Grabin, V. F. 272-M
Grable, G. B. 477-K
Grabovsky, R. 289-S
Grace, R. E. 500-N, 199-R
Gracheva, A. P. 610-N
Graddy, J. C. 552-Q
Gradusov, G. N. 800-R
Graef, R. 184-D
Graefen, H. 507-R
Graf, Hans 55-N, 312-P
Graf, Ludwig. 2-R, 133-R
Graf, R. 524-N
Grafas, N. I. 501-E
Grafenauer, Stanko. 204-A
Graff, H. F. 364-P
Graff, R. A. 333-R
Graft, W. H. 435-P
Graham, L. W. 87-N,
. . . . . 291-N, 388-N, 390-N
Graham, N. A. 743-R
Graichen, Rudolf 401-E
Grainger, G. 602-L
Grainger, H. B. 759-Q
Grainger, L. 503-A
Grakhov, L. K. 485-D, 560-D
Grall, L. 116-R, 117-R, 698-R
Grall, M. 38-X
Gran', N. I. 427-C
Gran, T. V. 375-C
Granata, S. 440-M
Grand, J. A. 261-P, 608-P
Grandpierre, Maurice C. M. 180-T
Granger, C. O. 87-S
Granger, G. J. 34-G
Granniss, D. S. 109-G
Granovskaya, A. A. 105-M
Granquist, D. P. 20-T
Grant, H. C. 538-E
Grant, N. J. 50-H, 327-M,
. . . . . 572-M, 406-Q, 409-Q,
. . . . . 684-Q, 1061-Q, 1095-Q, 572-R
Gratsianskii, N. N. 566-R
Grau, Vicente Massuet 104-L
Graue, Georg. 57-S
Gravel, L. 742-L
Gray, D. L. 198-N, 937-Q
Gray, H. P. 229-E
Grazen, A. E. 159-L
Grazhdankina, N. P. 185-P
Greathouse, W. D. 640-R
Greaves, Melvin J. 167-A
Grebenik, V. M. 352-C
Grebennikov, R. V. 694-R
Grebenshchenkova, A. Z. 539-L
Grebeshkova, I. D. 1359-Q
Grecnnyi, Ya. 164-N
Gree, R. E., Jr. 501-N
Greebler, P. 40-P
Green, F. G. 25-A
Green, Frank A. 57-C
Green, H. 362-S
Green, H. H. 535-E
Green, P. 171-L
Green, R. 514-E, 3-M
Green, William L. 664-Q
Greenberg, E. 212-A
Greenberger, J. I. 105-F
Greenblatt, J. H. 438-P,
. . . . . 258-R, 560-R, 677-R
Greenburg, Joel 288-P
Greene, H. H. 685-L
Greene, N. D. 160-R, 161-R,
. . . . . .172-R, 647-R, 69-X
Greenfield, P. 291-M
Greenlee, Roy W. 246-G
Greenough, G. B. 1318-Q, 1520-Q
Greenspan, Jacob. 608-M,
. . . . . 336-Q, 425-Q
Greenspoon, Gertrude N. 61-A
Greenwood, G. W. 507-M,
. . . . . 168-N, 1317-Q
Greenwood, Neill 143-Q
Greenwood, Ronald. 391-E
Gregg, J. F. 122-E, 189-Q
Gregg, S. J. 299-R
Gregor, Vladimir. 575-Q
Gregoraszczuk, Miroslaw 434-W
Gregory, E. 294-J, 1330-Q
Gregory, Edwin 163-A, 244-F,
. . . . . 251-J, 287-J, 289-J,
. . . . . 62-M, 114-Q, 726-R, 258-S
Gregory, Eric 76-H
Greig, D. 196-P
Grenier, G. 26-K, 175-W
Greulich, Erich 361-N
Greutert, H. 27-T
Grewen, Johanna 170-M
Gridnev, V. N. . . . 299-J, 195-N, 345-N
Grien, W. 332-T

Griest, A. J. 511-N, 559-Q, 1406-Q
Griffin, E. 1249-Q
Griffith, W. L. 56-A
Griffiths, P. M. 139-M
Griffore, L. M. 172-W
Griggs, B. 772-L
Grigor'ev, A. T. 175-M, 355-M
Grigor'ev, E. P. 221-P
Grigor'ev, T. 322-N
Grigorev, V. P. 135-R
Grigor'eva, G. M. 1358-Q
Grigoriu, L. 17-A, 24-C
Grigorovich, V. K. 946-Q, 1276-Q
Grigorovici, R. 353-P
Grilikhes, S. Ya. 568-R
Grim, R. E. 395-E
Grimes, William F. 119-S
Grimmer, F. D. 68-X
Grimsley, J. D. 7-Q
Grinberg, M. L. 43-X
Grinberg, N. A. 523-K
Grinberg, S. A. 34-F
Grinchar, I. A. 104-M
Grindrod, J. 262-D, 264-D,
. . . . . 144-G, 453-L, 39-R
Grin'ko, A. M. . . . 288-C, 289-C, 362-C
Grinthal, R. D. 2-X
Grishin, M. A. 706-K
Grison, E. 318-C
Griswold, R. F. 968-Q
Grix, H. H. 19-G
Grjotheim, K. 275-C
Grobecker, D. W. 8-K,
. . . . . 460-K, 1089-Q
Grobholz, R. K. 813-L
Grocock, R. W. A. 626-K
Groenegress, H. W. 145-J
Grohmann, H. 679-D
Gromov, M. A. 149-S
Gromov, N. P. 276-M
Gronegress, H. W. 274-J
Groot, C. 247-R
Gropp, A. H. 66-R
Gross, H. 38-G, 142-G, 31-W
Gross, J. H. 621-Q, 625-Q
Gross, P. 586-P
Gross, Robert C. 692-K
Grosse, Walter 171-F
Grosse-Wordemann, Joseph 202-N
Grossfuss, Eberhard. 261-S
Grossi, Oscar 326-K,
. . . . . 340-K, 533-K, 368-M
Grosskreutz, J. C. 439-M
Grossmann, Hans 270-E
Grossmann, Hermann 504-L
Grosvenor, George 288-W
Groth, Willis 508-K
Grotheer, Morris P. 130-S
Grotke, G. E. 362-K
Grover, Horace 244-G, 245-G,
. . . . . 247-G, 349-Q, 353-Q
Groves, N. D. 422-R
Groves, Wilson T. 132-J
Grozier, J. D. 163-F, 660-R
Gruber, H. 38-C, 229-C
Grubitsch, H. 443-R, 521-R
Gruder, Edgar 6-W
Gruettner, S. 710-L
Gruhl, W. 55-R
Grum-Grshimailo, H. V. 85-N
Grumbles, M. A. 650-R
Grunbaum, E. 59-N
Grunberg, R. 333-W
Grundev, A. P. 166-F
Gruner, Charles T. 50-A
Grunwald, Jean J. 712-L
Grusin, P. L. 408-D
Gruss, Heinrich. 444-D
Gruzensky, Paul M. 744-R
Gruzensky, W. G. 394-C
Gruzin, P. L. 178-N
Gruzinov, V. K. 569-D
Gruzov, S. G. 102-G
Gryasanova, A. S. 558-R
Gschneidner, K., Jr. 293-M
Gualandi, D. 529-M, 714-Q
Guard, R. W. 275-M, 675-M,
. . . . . 647-N, 408-Q, 501-Q, 1208-Q
Guare, C. J. 627-R
Guba, F. 683-M
Gubchevskii, P. V. 219-E
Gubin, A. I. 165-K
Guder, Ernst 336-T
Gudkov, T. I. 49-N, 381-N
Gudtsov, N. T. 1381-Q
Guedeu, J. L. 66-G
Gueissaz, E. 255-W
Guenther, Fritz 397-N
Guertler, William. 60-M, 537-M,
. . . . . 538-M, 539-M, 540-M,
. . . . . 541-M, 542-M, 543-M
Gueussier, A. 276-Q, 277-Q,
. . . . . 784-Q, 1535-Q, 1536-Q
Gugan, D. 116-P
Guiaux, P. 1055-Q
Guilhaudis, Andre. 200-R, 253-R
Guimaraes, C. 336-E
Guinard, Charles 272-A, 202-T
Guinard, P. 54-B
Guinier, A. 432-M, 524-N
Gulajew, A. P. 34-M
Gulalo, Yu. D. 268-K
Gulbransen, E. A. 44-M,
. . . . . 400-R, 728-R

Gulkova, A. A. 1282-Q
Gulley, Lyle F. 112-J
Gulotti, D. 488-N
Gul'tyai, I. I. 510-D, 601-D
Gulunov, V. S. 221-W
Gulyaev, A. P. 47-J, 270-J,
. . . . . 252-N, 571-N, 492-Q, 1233-Q
Gulyaev, V. N. 270-Q
Gulyaeva, E. I. 391-C
Gulyanitskii, B. S. 562-A
Gumbel, E. J. 172-Q, 824-Q
Gummeson, P. Ulf 386-D,
. . . . . 174-H, 139-J
Gunin, I. V. 1054-Q
Gunn, J. B. 576-P
Gunow, R. F. 217-J
Gunther, Frank W. 89-M,
. . . . . 242-M, 273-M
Gunther, H. 20-K
Gunther, Phillip 123-F
Gunther, W. 45-L
Gunzel, F. H., Jr. 151-P
Guon, J. 253-G
Gupalo, I. P. 413-C, 452-C
Gupta, D. 768-Q
Gurbaxani, Gobind 1267-Q
Gur'ev, A. V. 328-Q
Gurev, Harold S. 506-N
Gur'ev, S. D. 158-S
Gurevich, M. A. 117-M, 120-M
Gurevich, S. E. 526-Q, 1311-Q
Gurevich, Yu. G. 511-D
Gurinsky, David H. 114-R
Gurklis, J. A. 396-L
Gurland, J. 148-H, 1223-Q
Gurnea, R. F. 21-K
Gurner, P. 401-G
Gurnham, Fred C. 50-A
Gurov, K. P. 228-M, 138-N
Gurski 193-D
Gurvich, L. V. 240-P
Gurvich, L. Ya. 557-R
Gusack, J. 955-Q
Gusev, V. V. 313-W
Guseva, L. N. 662-M, 366-Q
Gusinskaya, S. A. 432-S
Guterman, M. B. 630-N
Guterman, S. G. 219-E
Guthrie, G. L. 314-P, 371-P
Gutkin, T. I. 218-P
Gutzeit, G. 752-L, 816-L
Guy, A. G. 276-A,
. . . . . 141-M, 298-N, 1404-Q
Guyer, H. 99-S
Guyon, E. 432-M
Guyot, J. 50-G
Gvelesiani, G. G. 2-C, 301-C
Gwathmey, Allan T. 1205-Q
Gyn, Li. 82-S

H

Haag, Rene 59-G
Haarmann, R. 121-L, 476-L
Haas, W. 489-E
Habraken, L. 628-M, 514-N, 555-Q
Habrcetl, Miloslav 321-S
Hach, Rudi 149-W
Hache, A. 54-R, 318-R,
. . . . . 380-R, 488-R, 818-R
Hacker, W. 447-R
Hackerman, Norman 378-P,
. . . . . 190-R, 359-R, 718-R
Hackman, R. L. 476-K
Hadacek, Bohuslav 17-B
Hadamovsky, H. 517-N
Hadley, R. L. 541-R
Haefling, J. F. 391-P
Haefner, K. 1190-Q
Haehl, Wolf-Dieter 348-M
Haensel, Georg 233-E
Haertlein, John 170-H
Haessner, Frank 201-M, 318-M
Hafer, R. F. 182-L
Haftel, M. 346-L
Hagel, W. C. 186-Q
Hagerup-Jenssen, H. 244-C
Hagins, J. E. 320-G
Hagiwara, Iwao 663-N
Hagtingius, T. 208-A
Hague, Wilber E. 357-L
Hagyard, T. 571-R
Hahn, G. 336-L
Hahn, G. T. 1325-Q
Hahn, R. S. 296-G
Hahn, Rolf. 380-P, 387-P
Haidt, Herman 122-T
Hainman, B. Y. 67-B
Hains, H. 199-Q
Haisen, L. W. 177-E
Hajdu, Lajos 126-E
Hajko, Vladimir 511-P
Hajto, Nandor 334-E, 238-Q
Hajzler, Oldrich. 300-K, 427-K
Hale, K. F. 322-M, 390-M
Hale, M. E. 441-M
Hales, R. L. 937-Q
Haley, H. E. 318-A, 173-G
Halfacre, G. F. 326-C
Hall, A. M. 279-F,
. . . . . 1086-Q, 1343-Q, 1344-Q
Hall, Charles F. 427-L
Hall, D. B. 8-T
Hall, E. O. 156-M, 598-M

Hall, Fred T. 228-W
Hall, H. G. 15-A
Hall, Henry S. 420-W
Hall, Nathaniel. 162-L
Hall, R. C. 5-P, 448-P
Hall, W. J. 690-P, 612-Q
Haller, J. E. 323-E
Haller, John 364-A, 83-H, 156-H
Halliday, I. M. D. 191-D, 240-D
Halling, J. 142-F
Hallsworth, H. B. 480-E
Hallwood, S. W. 68-Q
Halpern, J. 814-R
Halstrom, H. L. 664-R
Halteman, E. K. 231-N
Halverstadt, Robert D. 419-G
Ham, Frank S. 48-N
Ham, John L. 124-C,
. . . . . 220-C, 288-J, 145-Q
Ham, R. K. 283-M
Hamann, S. D. 130-P
Hamano, Yoshiteru. 350-R
Hambleton, G. E. 559-P
Hambrock, Kenneth O. 37-C
Hamel, F. B. 884-Q
Hamer, R. D. 171-C
Hamerak, M. 8-R
Hamilton, D. R. 96-N
Hamilton, James A. 121-C
Hamilton, W. A. 492-E
Hammer, Alvin N. 265-S
Hammer, Ferenc 123-W
Hammer, Peter 79-N
Hammer, Rudolf. 40-D, 419-D
Hammond, C. M. 418-E
Hammond, Rolt 201-W
Hampel, Clifford A. 65-R
Hamrin, B. 107-G
Hamstead, A. C. 310-R
Hancher, C. W. 154-C
Hancock, E. J. 131-C
Hancock, G. L. 351-E
Hancock, N. H. 51-X
Hancock, P. 113-R, 594-R
Hancock, P. F. 18-J
Hancock, R. A. 7-D
Handler, Paul 544-P
Handova, C. W. 426-K, 297-L
Handwerk, William B. . . . 111-K, 483-K
Haney, David C. 17-W
Hanks, Charles W. 134-C, 441-C
Hanks, G. S. 148-F, 669-K, 253-W
Hann, E. K. 1210-Q
Hanna, R. E., Jr. 143-R
Hannah, James F. 303-L
Hanne, E. A. 517-D
Hansen, D. H. 859-Q
Hansen, Michael. 250-D
Hansen, Norman G. 576-Q
Hanson, Richard L. 453-E
Hantos, Rezso 298-A
Hara, Kenjiroh. 213-J, 214-J
Harada, Hideki. 621-N
Harada, Taneomi 64-B
Harada, U. 366-E
Harada, Yoshio 507-L, 508-L
Harder, D. S. 93-E
Harders, F. 18-D, 286-D, 426-D
Hardie, D. 642-M
Harding, A. G. 355-N, 250-P
Harding, A. R. 406-M
Hardrath, Herbert F. 71-Q
Hardy, H. K. 1319-Q
Hardy, L. E. 70-R
Harer, Alfred 57-G
Hargitay, Sandor 111-W
Hargreaves, M. E. 24-M, 136-N
Hargrove, R. M. 496-K
Harimoto, Hiromitu 112-R
Harker, W. H. 40-P
Harkness, A. L. 623-N
Harman, T. C. 95-N, 97-P
Harmon, Benjamin G. 94-L
Harms, W. O. 230-Q, 679-Q
Harnik, E. 540-P
Harper, D. D. 77-C
Harper, M. E. 268-W, 48-X
Harper, R. L. 13-H, 79-H
Harper, W. A. 202-G
Harpula, J. 557-E
Harr, R. 510-A
Harr, R. E. 687-L
Harrah, L. A. 22-S
Harrick, N. J. 543-P
Harries, D. R. 802-Q,
. . . . . 1284-Q, 1516-Q
Harriman, J. M. 40-P
Harrington, Charles D. 260-C
Harrington, D. A. 423-L
Harris, B. 206-C
Harris, Charles O. 144-F
Harris, G. T. 10-D,
. . . . . 156-D, 261-D, 321-D
Harris, H. 67-Q, 301-Q
Harris, J. E. 1280-Q
Harris, K. G. 299-W
Harris, Victor 392-C
Harris, W. 811-R
Harris, W. B. 127-A, 296-A
Harris, William J., Jr. 589-Q
Harrison, J. L. 301-D,
. . . . . 350-D, 434-D, 593-D
Harrison, P. L. 705-P
Harrison, V. 356-W

Hartbower, C. E. . . . . .180-Q, ... 1241-Q, 301-T
Hartenstein, Robert 196-W
Hartleif, Gerhard 434-S
Hartley, C. S. 1372-Q
Hartley, W. D. 350-W
Hartman, M. B. 424-E
Hartman, R. J. 550-Q
Hartmann, Dieter 230-E
Hartmann, E. C. 344-Q
Hartmann, Helmut 309-S
Hartree, O. P. 1280-Q
Harumato, Isao 917-Q
Harvay, G. 297-N
Harvey, R. F. 71-J
Harvey, Walter W. 182-R
Harvie, Robert E. 1146-Q
Harwood, Julius J. . . . . 648-P, ... 830-Q, 924-Q, 1026-Q
Hasebe, Shigeo. 379-Q
Hasegawa, Takeomi 919-Q
Hasegawa, Taro . . . . . .30-Q, 1369-Q, ... 1376-Q, 1393-Q, 1399-Q, 1449-Q
Hashimoto, Jun-Itiro. 173-Q
Hashimoto, Kenji 23-E
Hashimoto, T. 33-R
Hashimoto, Yasuo. 789-R
Hashino, Tomoyasu. 459-C
Hasil, Frantisek. 233-J
Hasimoto, Hidefumi 21-W
Haskell, L. G. 311-R
Hasler, M. F. 275-S
Hasnip, E. A. 148-W
Hass, George. 686-M
Hatcher, Allen P. 11-C
Hatt, B. A. 647-M
Haucke, M. 454-M
Haufe, W. 312-G, 173-J
Hauptmann, A. 117-R
Hausner, Henry H. . . . . 158-A, 18-H, ... 23-H, 28-H, 43-H, 107-H, 81-M
Hauth, Charles R. 338-D, 278-W
Hauttmann, Alexander. 288-L
Hauttmann, Hubert 390-D, 704-Q
Havel, Vladimir 444-M
Havelka, Miloslav. 79-A
Havlicek, Frantisek 459-N
Havlik, J. 1123-Q
Hawkes, F. C. 710-Q
Hawkes, G. A. 477-Q
Hawkes, Paul E. 34-X
Hawking, J. E. 190-G, 414-G
Hawkins, J. 526-L
Hawkins, W. A. 255-J, 296-J
Hawley, R. W. 666-R
Haworth, C. W. 328-M, 80-X
Hay, W. S. 172-K
Hayakawa, Yasumasa 414-R
Hayama, F. 1077-Q
Hayami, Ryozo. 348-L
Hayashi, Etsuo. 137-J
Hayashi, T. 35-B
Hayashi, Tadao 413-L
Hayashi, Teiichi. 32-L
Haycock, E. W. 645-R, 747-R
Hayden, R. W. 68-Q
Hayden, Wayne. 169-N
Hayes, W. C. 326-N
Hayfield, P. C. S. 286-M
Haygood, A. J. 113-W
Hayhurst, C. J. W. 43-E
Hayles, W. J. 29-S
Haynes, Harold 506-E
Haynes, R. 400-Q
Hayter, S. W. 256-C
Hazen, H. L. 17-C
Hazzard, Charles 269-W
Hdrzdil, F. 135-Q
Head, A. K. 386-M
Heady, H. H. 36-S
Heal, T. J. 1279-Q, 1517-Q
Heard, F. P. 57-J
Heater, John N. 179-G
Heath, D. J. 419-K
Heavens, O. S. 331-M, 473-M
Hebberling, Hans 563-L, 354-R
Hebel, L. C. 456-P
Hebrant, F. 681-Q
Heckman, G. R. 254-A
Hecquet, R. 455-E
Hedden, Kurt 130-C
Hedges, E. S. 188-L, 428-L
Hedley, C. S. 626-D
Hedrick, John A. 151-G
Hegedus, Zoltan 1071-Q
Heginbotham, W. B. 244-K, 1363-Q
Hegmann, W. 392-G, 410-K, 500-K
Hehemann, R. F. 93-A, 488-A, 31-J
Heid, T. L. 187-T
Heidenreich, Arthur C. 15-G
Heidenreich, R. D. 485-M, 496-P
Heidrich, Hilda V. 29-A
Heilig, Charles E., Jr. 645-K
Heiligenstaedt, Werner 135-W
Heim, Arthur I. 9-A
Heimerdinger, Richard E. 405-R
Heimerl, George J. 502-Q
Heimerl, Josef. 177-W
Hein, Hans 577-A
Hein, Klaus 115-C
Heinasen, J. 285-R
Heine, Hans J. 515-Q, 1036-Q
Heine, R. W. 355-E
Heine, V. 209-M, 239-M

Heinen, L. 144-D
Heiner, H. 1206-Q
Heinrich, Robert 324-D
Heintze, G. 373-D, 437-D
Heischkeil, Werner. 256-D, 121-W
Heister, W. 473-P
Hejnar, Tadeusz. 633-D
Helander, Frank G. 178-G
Held, Rolf 101-E
Hellawell, A. 497-N
Heller, Paul A. 215-E
Heller, William R. 241-Q, 485-Q
Hempel, M. 130-F, 48-Q, 775-Q
Henderson, H. E. 540-E
Henderson, J. . . . . 40-Q, ... 598-Q, 794-Q, 876-Q
Hendricks, P. L. 566-Q, 1037-Q
Hendrickson, L. G. 24-B
Hendus, H. 51-H
Henke, Georg. 322-D
Henley, V. F. 190-L
Hennig, G. R. 12-R
Hennion, J. 210-K
Henon, Guy 194-D
Henriksen, E. K. 138-G
Henriksson, S. T. 283-C
Henry, G. 52-M, 1468-Q
Henry, Jean Marie 51-M
Henry, Jules J. 302-A
Henry, R. C. 539-R
Henschen, H. C. 419-W
Hense, L. 155-K
Hensel, Arno 498-E
Hentrich, R. 685-D
Hentze, H. 314-J
Henzel, J. G. 297-N
Herb, Charles O. 325-G
Herbenar, A. W. 254-A
Herendi, Rezso 237-Q
Herenguel, J. . . . . 14-F, 63-F, ... 257-F, 218-N, 1465-Q, ... 111-R, 593-R, 698-R
Herfurth, Klaus 345-E
Herkenhoff, Karl 33-S
Herlihy, F. B. 543-E
Herman, M. . . . . 206-M, ... 303-M, 146-Q, 698-Q
Hermann, O. C. 27-G
Hermoch, Vladimir. 460-N
Herold, Albert 538-N
Heron, P. N. 325-R
Herpin, Andre 715-P
Herrman, Robert 82-E
Herrmann, C. 95-W
Herrmann, E. 666-L
Herrmann, Robert H. . . 101-A, 105-E, ... 106-E, 107-E, 258-E, 496-E
Hertz, Jean 468-R
Hertzricken, S. D. 377-M, 496-M
Herz, William H. 362-L
Herzfeld, W. 375-G
Herzog, E. 220-N, 653-R, 819-R
Herzog, R. 53-F, 78-G, 389-G
Hesketh-Jones, R. C. 170-K
Hess, E. F. 459-K
Hess, Ernst Gunter. 483-M, 308-P
Hess, T. D. 288-W
Hess, Walter 322-D, 552-R
Hesse, Claude 547-L
Hetherington, James S. . . . 265-C, 304-C
Hettel, Henry J. 37-S
Heubner, Ulrich. 52-J
Heumann, Theo . . . . . 452-M, ... 460-M, 202-N, 554-P
Heusler, H. 1413-Q
Heuvers, A. 349-E
Heuze, Bernard 274-R
Heverly, Lance F. 334-R
Hewaidy, I. F. 124-S
Heyer, Robert H. 237-M
Heymer, G. 415-N
Heynert, Gerhard. . . 126-B, 39-D, 420-D
Heys, J. D. 122-F
Hiatt, William C. 143-J
Hibbard, W. R., Jr. . . . . 624-P, ... 408-Q, 1409-Q
Hibbs, R. F. 56-A
Hickel, Franz 348-E
Hicklin, Walter H. 338-P
Hida, Namiteru 14-Q
Hidalgo, A. Revuelta 383-L
Higgins, Carter C. 737-L
Higgins, I. R. 150-C
Higgins, R. I. 620-R, 367-W
Higgins, R. S. 316-E
Higgins, W. F. 129-R
Hiki, Yosio 105-Q, 1179-Q
Hill, B. M. 284-R
Hill, Clyde S. 341-G, 542-K
Hill, F. B. 72-A
Hill, F. J. 256-C
Hill, H. N. 197-J, 240-J
Hill, M. L. 1173-Q
Hill, Preston L. 58-A
Hill, R. M. 488-L, 21-P, 202-Q
Hiller, A. E. 762-R
Hillert, M. 625-N
Hilliard, J. E. 684-M, 216-N
Hilliard, R. K. 390-R
Hillnhagen. 48-Q
Hilterhaus, Wilhelm 41-W, 314-W
Hilty, D. C. . . . . 461-A, 563-A, ... 387-D, 405-D, 486-D
Hiltz, R. H., Jr. . . . 337-M, 162-N, 459-Q

Himes, R. C. 268-C
Hinchcliffe, C. 595-R
Hinde 558-K
Hinde, J. 76-K, 725-R
Hinds, G. W. 73-D
Hindson, R. D. 100-F
Hine, I. 607-P
Hines, J. G. 53-R, 319-R
Hinkfoth, Rolf 136-G, 84-X, 85-X
Hinsley, J. F. 632-P, 638-P
Hinton, V. 331-M, 473-M
Hinze, R. A. 263-R
Hirabayashi, Makoto . . . . . 217-N, ... 261-N, 292-N
Hirabayashi, Yoshihiro 23-C
Hirahara, Eiji 152-P
Hirakis, E. C. 621-R
Hirayama, Chikara 1168-Q
Hirayama, T. 200-J
Hirone, Tokutaro 103-Q
Hirose, Syoukichi 250-G
Hirsch, Harold H. . . . 17-H, 42-H, 76-T
Hirsch, Lajos 330-A
Hirsch, P. B. 59-M, 378-M, 597-M
Hirst, Charles 162-T
Hirtage, R. J. 79-C
Hirth, J. P. 5-M
Hisamatsu, Yoshihiro 262-C, 597-P
Hisatsune, Chuyo 146-W
Hitomi, Katsundo 11-G, 46-G
Hitt, W. C. 247-S
Hivert, A. 29-H
Hiyama, Shinji 245-J
Hoar, T. P. . . . . 54-L, 775-L, 53-R, ... 119-R, 319-R, 327-R
Hoare, W. E. 440-E, 546-E
Hobson, J. D. 290-N, 391-N
Hobson, R. A. 9-B, 126-C
Hobstetter, J. N. 480-M
Hoch, Alois 196-L
Hochmann, J. 1283-Q, 493-R
Hochschild, Richard 163-S
Hockett, J. E. 149-F, 217-F
Hocking, L. N. 504-E
Hoderny, Bronislaw . . . . . 19-F, ... 242-F, 867-Q
Hodge, A. L. 11-D, 73-D
Hodge, Edwin S. 319-K
Hodge, J. M. 1402-Q
Hodge, Webster 455-A
Hodgson, J. N. 424-P
Hodgson, K. V. 184-L, 16-R
Hodnapp, W. L. 85-P
Hoefer, H. W. 214-K
Hoekstra, John J. 738-L
Hofe, H. 690-K
Hoff, Hubert . 323-D, 478-D, 68-J, 367-Q
Hoffert, F. D. 131-D, 263-D
Hoffman, E. E. 859-Q, 80-R
Hoffman, Fred C. 346-G
Hoffman, G. 84-J
Hoffman, R. E. 455-N
Hoffman, William E. 579-Q
Hoffmann, Alfred . . 402-D, 677-D, 297-R
Hoffmann, Mermann 363-K
Hoffmeister, Horst 113-E
Hofman, Albert 189-K
Hofman, Erich E. 463-D
Hofman, W. 1250-Q
Hofmann, Gernot 394-M
Hofmann, Wilhelm 382-K, 309-S
Hofmeister, Hans 95-W
Hofstatter, Alfred F. 253-F
Hogg, H. A. C. 174-G
Hohmann, A. 31-E, 190-E, 209-W
Hohmann, E. A. 361-E
Hohn, Hans . . . . . 23-A, ... 99-C, 184-C, 334-C
Hokby, Bengt 302-T
Hoke, J. 590-N
Holcroft, Walter H. 64-W
Holden, A. N. 570-N
Holden, F. C. . . . . 492-A, ... 153-M, 841-Q, 1128-Q
Holden, H. A. 223-L
Holden, J. 456-N
Holden, R. B. 48-C
Holladay, J. W. 275-Q
Holland, L. 673-N
Hollander, Egon F. 497-K
Holliday, R. W. 66-A
Hollo, M. 683-M
Hollo, Tiborne 80-B, 106-B
Hollomon, J. Herbert 185-A
Holloway, W., Jr. 133-F
Hollweger, Franz 89-W
Holm, Albert E. 297-G
Holm, Ove Falck 226-Q, 1020-Q
Holm, Ragnar 450-P
Holmberg, M. E. 1338-Q, 651-R
Holmes, D. K. 6-P, 683-Q
Holmes, E. 377-K
Holmes, E. L. 288-N, 457-N, 578-N
Holmes, John R. 700-P
Holmes, K. D. 964-Q
Holmes, P. J. 382-M
Holmgren, John D. 392-C
Holms, A. G. 1435-Q, 356-S
Holn, H. 94-C
Holoubek, F. 203-J
Holsinger, Fred J. 303-R
Holst, Rudolf 157-C
Holster, I. D., Jr. 643-K
Holt, D. B. 1501-Q

Holt, M. L. 157-L
Holt, R. E. 388-K, 1227-Q
Holtzman, A. H. 304-M
Holzworth, M. Lavern 207-R
Homes, Georges A. 1079-Q, 80-S
Homma, Eturo 631-D
Homma, Masao . . . 184-E, 386-Q, 895-Q
Homma, Tsuneo 627-Q, 1034-Q
Honda, Kozo . . . 94-Q, 116-Q, 788-Q, ... 791-Q, 889-Q, 1531-Q, 1533-Q
Honda, Ryukichi 1100-Q, 1242-Q
Honegger, H. H. 976-Q
Honeyman, R. N. 7-H
Hong-Jang, Wan 373-S
Honig, J. M. 401-N
Honma, Toshio 474-M
Honma, U. 447-E, 448-E, 1335-Q
Hood, J. E. 290-W
Hook, Robert T. 149-A
Hooker, R. P. 1-A
Hooper, R. B. 19-Q
Hoover, Helen 134-J
Hopkin, L. M. T. 1159-Q
Hopkins, Walter E., Jr. 141-R
Hopkinson, B. E. 357-R
Hoppin, G. S. 359-K, 613-K, 626-Q
Horak, F. V. 392-W
Horak, Otto 77-K
Horalek, Vratislav 148-M
Horeis, S. 369-Q
Horejs, Slavimir 1078-Q
Hori, Kazuhiko. 23-C
Hori, Shigenori 284-F
Horiguchi, Sadao 808-L
Horiguchi, Yasuhiro 110-Q
Horn, F. H. 393-C
Hornauer, H. 28-F, 219-G
Hornbogen, Erhard 125-J
Horne, R. A. 334-P
Horrell, H. G. 153-A
Horsford, Anne 27-P
Horsting, C. W. 235-T
Horstmann, Dietrich . . . 22-L, 121-L, ... 167-L, 437-L, 601-L
Hort, Percy. 93-R
Horvath, Aurel. 679-N, 138-S
Horvath, Drzoltan. 69-C
Horvath, J. 780-R
Horvath, Laslo. 105-B
Horvath, S. 677-K
Horvath, Stefan 238-W
Horvath, Zoltan . . . . . 173-A, ... 255-C, 612-L, 667-P
Horvay, G. 475-N
Horvick, Ernest W. 553-L, 285-T
Hosford, William C. 372-L
Hoshi, H. 82-L
Hosoi, Yoshikazu . . . . . 179-M, ... 181-M, 228-M, 388-Q
Hosoi, Yuzo. 1105-Q
Hottenroth, B. 359-L
Houdek, J. 1151-Q
Houdremont, E. 67-M
Houk, William W. 342-S
Houl, V. 544-N
Houldcroft, P. T. 327-K, 71-S
Hoult, F. H. 172-E
House, H. S. 218-S
Houseman, D. H. 554-E
Houska, C. R. 631-N, 632-N
Houyvet, A. 63-H
Hovgard, N. A. 165-S
Hovorka, Frank 414-L
Howard, A. M. 459-L
Howard, E. D. 173-E, 241-E
Howard, J. C. 117-W
Howe, J. P. 299-T, 115-W
Howell, Edward S. 98-B
Howell, F. M. 344-Q
Howell, I. J. 531-L
Howells, N. C. 464-E, 571-E
Howerton, H. K. 60-X
Howery, J. A. 289-K
Howes, R. B. 410-A
Hoy, J. K. 83-X
Hoyle, G. 300-Q
Hrabakova-Zvonickova, Alena. . . . 471-P
Hrabovec, Anton. 47-K, 540-K
Hrbal, Pavel 538-K
Hrbek, Anton. 567-M, 300-P
Hrivnak, Ivan. 466-M, 213-N, 620-N
Hrivnakova, Dasa 504-M
Hruby, Jiri 17-B
Hsiang-Hua, Shao 181-F
Hsiao, C. M. 417-Q, 1189-Q
Hu, Hsun. 306-N
Hu, L. W. 217-Q, 1218-Q
Huang, S. J. 23-M
Huang, Yen-Chien. 693-M
Hubackova, Helena 498-M
Huber, Franz. 274-P
Huber, Melle A. 218-N
Huber, R. W. 230-C, 231-C
Hubner, Roland 212-F
Hudgins, Charles M., Jr. 473-R
Hudson, Donald E. 243-P
Hudson, F. 122-E, 189-Q
Hudson, R. M. 561-N, 308-R
Hudson, S. B. 8-B
Huetter, L. 37-E
Huetter, Leo J. 506-M, 365-N
Huffadine, J. B. 128-H
Hufton, W. G. 64-G
Hug, H. 233-N

Hughel, T. J. 542-N
Hughes, G. 547-M
Hughes, H. L. 277-G
Hughes, I. C. H. . . . . 35-E, 253-E, ... 168-R, 189-R, 295-R, 312-R
Hughes, R. G. 259-L
Hugli, Fritz. 743-R
Hugo, J. P. 183-M, 670-M, 64-R
Hugo, M. 220-N
Hugony, Eugenio. 409-A
Hull, D. . . . . 99-Q, 655-Q, ... 656-Q, 855-Q, ...858-Q, 1225-Q, 1514-Q
Hull, F. C. 635-Q
Hull, W. G. 266-G
Hulm, J. K. 99-P
Hultgren, R. 255-P, 339-P, 590-P
Hum, D. M. 345-P
Hume-Rothery, W. 299-M, 768-M
Hummitzsch, W. . . . . .123-K, ... 153-K, 202-K, 318-K
Humphries, E. 46-S
Hundt, Eberhard. 271-T
Hunsicker, H. Y. 397-E
Hunt, A. L. 726-P
Hunt, B. G. 237-C
Hunt, Charles D'A. 134-C, 441-C
Hunt, J. B. 380-Q
Hunt, John R. 14-D
Hunt, William Dudley, Jr. 59-T
Hunter, L. P. 418-M
Hunter, S. C. 839-Q
Huntington, J. S. 312-D
Hunziker, E. W. 388-D
Huppert, P. A. 719-L
Huppertz, P. A. 546-R
Hurd, B. G. 259-S
Hure, J. . . . . .115-R, 116-R, ... 117-R, 663-L, 698-R
Hurford, W. J. 5-T
Hurle, D. T. J. 659-M
Hurlen, Tor. 665-M, 678-R
Hurst, John. 150-L
Hurusawa, K. 402-M
Hurwitz, J. K. 303-S
Husarek, V. 76-S, 406-S
Husband, R. M. 740-R
Huschke, E. G., Jr. 691-K
Husemann, E. W. 8-A
Huser, Karl Heinz 151-W
Husock, B. 100-R
Hussein, M. Kamal. 257-R
Husson, G. 318-D
Hutchings, J. 1-Q
Hutchings, P. E. 331-W
Hutchinson, F. 117-P
Hutson, G. A. 97-G
Hutter, Leo J. 424-L, 372-M
Huttl, John B. 127-B
Hutton, D. S. 577-M
Hyatt, Barry 678-P
Hyatt, E. C. 243-A
Hybek, Karel. 386-A
Hyler, W. S. 1306-Q
Hyman, H. H. 166-C
Hysinger, D. M. 328-W
Hyslop, J. F. 649-P
Hyslop, Marjorie R. 569-A, 576-A

I

Iagan, Iu. I. 364-Q
Ianniello, L. C. 632-K
Ichikawa, Kiyoshi. 31-R
Ichitaka, Riei. 441-P
Ickheles, F. Ya. 133-Q
Ida, Ikuo. 414-R
Ida, N. N. 742-R
Ide, Tetsuo 232-A
I-djen, Ho. 375-S
Igantowicz, S. 416-N
Igarashi, Isamu 480-N
Igarashi, Tamotsu 480-N
Ignatov, D. V. 695-R
Ignatova, I. A. 3-N
Igntenko, P. I. 390-Q
Iitaka, I. . . . . 443-E, ... 446-E, 401-M, 1076-Q
Ikeda, Masao. 458-C
Ikeda, Shigero 400-S, 455-S
Ikeda, Shigeyoshi 464-S
Ikeda, Susumu 474-M
Ikeno, Hisashi 251-G
Ikeno, Takashi. . . . . 1-C, 262-F, ...131-G, 481-N, 16-Q
Ikeuchi, S. 130-D
Iler, A. J. 525-E
Il'icheva, L. V. 148-E
Iliescu, P. 88-P
Il'in, A. G. 86-M, 42-N
Il'in, N. P. 229-M
Il'ina, E. M. 436-R
Il'inskii, V. S. 170-G
Ilisavskii, Iu. V. 230-P
Illgner, K. H. 313-J
Illig, Al. W. 244-S
Illmer, K. 604-K
Ilschner, Bernhard. 313-M
Ilschner-Gensch, Christa. 179-R
Ilyushchenkov, M. A. 1499-Q
Ilyushina, L. G. 204-C
Imagawa, H. 625-R
Imai, Yunoshin. 144-H, 130-J, 1368-Q
Imai, Yuuichi. 406-R

Imlah, Katherine 422-M
Imoto, Shosuke. 789-R
Imre, Janos. 263-E
Inagaki, Haruo 101-L
Inagaki, Koji 251-R
Inaue, Mutsuo 916-Q
In Der Schmitten, Wilhelm 318-M
Ineson, E. 41-Q, 300-Q, 1340-Q
Ingham, Herbert S. 651-L, 670-L
Ingles, J. C. 123-C
Inglis, N. P. . . . . 338-A, 349-A, ... 362-A, 414-A, 77-R
Inman, W. R. 343-S
Innes, William P. 353-L
Inouye, H. 7-T
Inouye, Michio 621-D
Insler, R. J. 4-T
Intonti, R. 103-S
Intrater, J. 465-N
Inui, Tadayoshi 60-L, 226-L
Ioffe, V. E. 18-B
Iolko, M. V. 380-C
Iordan, E. F. 34-B
Iovitiu, E. 381-L
Ipatiev, V. V. 86-J, 87-J, 216-R
Ipsen, H. N. 101-J, 160-J
Ireland, G. H. 15-R
Irkhin, Yu. P. 204-P
Irmann, Roland 369-E
Ironside, D. A. 212-L
Irvin, G. 1019-Q
Irvine, K. J. 602-N
Irwin, G. R. 558-Q
Isa, Shigeteru 102-L
Isaac, E. D. 188-P
Isaacs, Ottis 282-S
Isachenko, A. A. 409-W
Isaev, N. I. 604-R
Isbell, W. T. 330-C
Isenberg, C. R. 405-N
Ishida, Haruo. 4-L
Ishida, Seiichi 90-J, 244-J
Ishida, Takeo. 413-L
Ishihara, D. 625-R
Ishihara, M. 637-L
Ishino, T. 445-E
Ishiyama, Kikuzo . . . . . 94-Q, 116-Q, ... 788-Q, 789-Q, ... 889-Q, 1531-Q, 1532-Q
Ishizuka, Takeo 285-F, 628-N
Iske, Fritze. 844-Q
Iskra, B. A. 417-E
Islankina, A. F. 183-H
Isleib, C. R. 352-E
Islent'yeva, P. G. 247-F
Isono, Jo. 262-C
Issa, I. M. 124-S
Issa, R. M. 124-S
Istvan, Kokai 170-D
Ito, Noboru 424-R
Ito, Sukemitu . . . 94-Q, 116-Q, 788-Q, ... 789-Q, 791-Q, 889-Q, ... 1531-Q, 1532-Q, 1533-Q, 1534-Q
Itoh, Mitsuru. 379-N
Itoh, Sukemitsu 1145-Q
Itskovich, N. M. 227-F
Ittner, W. B. 595-P
Iurkov, B. Ia. 279-P
Ivanchev, N. P. 11-N
Ivankova, A. I. 135-S
Ivanov, A. M. 485-C
Ivanov, A. P. 141-F, 267-Q
Ivanov, B. G. 347-K
Ivanov, L. I. 11-N
Ivanov, M. I. 737-P
Ivanov, N. V. 911-Q
Ivanov, O. S. . . . . 166-M, ... 492-M, 143-N, 1276-Q
Ivanov, V. E. 750-Q, 700-R
Ivanov, V. M. 227-K
Ivanova, L. V. 68-S
Ivanova, V. S. 361-Q
Ivanova, Yu. I. 1492-Q
Ivanovskii, L. E. 735-P
Ivanushkin, G. Ya. 605-Q
Ivanyuk, G. I. 104-J
Ivashchenko, Yu. N. 163-P
Iverson, F. Kenneth 913-Q
Ivonina, O. M. 155-S
Iwamoto, Kanetoshi. 610-R
Iwanciw, Emilian 582-D
Iwanski, J. S. 504-N
Iwata, Masao 919-Q
Iwata, Minoru 169-C
Iyer, A. S. 516-N
Izbranov, P. D. 551-N
Izdinsky, Oskar 575-Q, 258-T
Izhvanov, L. A. 374-C
Izmailov, S. V. 150-P
Izu, Tohru. 521-E
Izumi, Osamu . . . . . 482-M, ... 489-N, 1050-Q, 1144-Q
Izumiyama, Masao 130-J
Izyumol, Yu. A. 174-M

J

Jablonowski, Edward J. 236-M
Jablonski, Felix. 499-E
Jacklin, Clarence 141-R
Jackson, A. . . . . 74-D, 340-D, ... 430-D, 431-D, 305-W
Jackson, C. M. 279-F
Jackson, E. G. 727-Q

Jackson, G. H. 368-A, 157-F
Jackson, J. H. 175-F, 198-F, 224-F
Jackson, Kenneth A. 62-N
Jackson, L. R. 53-K
Jackson, P. J. 4-N, 17-N
Jackson, R. C. . . . 110-P, 120-P, 170-S
Jackson, R. J. 1125-Q
Jackson, R. S. 248-E, 250-E
Jackson, S. B. 22-W
Jackson, W. 74-D, 124-F
Jackson, W. J. 27-M, 6-Q, 1366-Q
Jackson, Z. Z. 232-N
Jacob, Gottfried 279-D
Jacobs, A. J. 359-P
Jacobs, I. S. 315-P
Jacoby, Gerhard 1115-Q
Jacque, L. 260-L
Jacquesson, Jean 526-P
Jacquesson, R. 529-N
Jacquet, P. A. 803-L, 252-M,
. . . . . 409-M, 563-M, 1005-Q
Jacquin, Albert 233-D
Jaech, J. L. 247-R
Jaffe, J. W. P. 442-W
Jaffee, Robert I. 410-L, 466-L,
. . . . . 309-N, 447-N, 390-P,
. . . . 762-Q, 841-Q, 1045-Q, 1087-Q,
. . . . . 1236-Q, 1239-Q, 433-R, 770-R
Jager, Willi. 555-R
Jahn, Eduard 136-Q
Jahn, R. E. 240-K
Jahnig, Werner 185-E
Jahnle, Herbert A. 273-F
Jain, A. L. 655-P
James, D. B. 503-E
James, D. I. 479-Q
James, J. R. 276-R
James, V. L. 1440-Q
James, W. J. 532-R
Jamison, E. W. 1011-Q
Jamison, Rolland S. 100-J
Jamison, Roy S. 417-G
Jamrack, W. D. 153-C
Jandos, F. 555-K, 402-S
Janecky, Karel. 113-L
Jangg, Gerhard . . . 23-A, 94-C, 99-C,
. . . . . 184-C, 191-C, 334-C
Janiche, Walter 44-D, 27-N
Janitskaya, M. E. 179-N
Jankowski, Alojzy. 532-E
Janos, L. 795-R
Janousek, Ivan 54-S, 335-S
Janowski, Jan 208-W
Janseen, K. 67-M
Jansen, W. 749-L
Janssen, G. J. 451-S
Jansson, Ole G. 565-R
Jaoul, Bernard. 191-F, 67-N, 271-N
Jasmin, G. 92-W
Jasny, G. R. 120-A
Jaswon, M. A. 646-P
Javelle, P. 47-B, 51-B
Jay, G. T. F. 329-M
Jazwinski, S. T. 641-D, 347-E
Jeancolas, Michel. 57-E
Jeannin, Yves 468-R
Jech, R. W. 114-H
Jefferes, J. M. 677-Q
Jefferson, Ted 140-K
Jeffrey, R. 760-Q
Jefimow, L. M. 554-D
Jehmlich, Guenter 397-N
Jelinek, Robert V. 139-R, 270-R
Jellinghaus, Werner 19-N, 36-P
Jenicek, Ladislav 207-A, 868-Q
Jenkins, A. E. 206-C, 167-R
Jenkins, H. M. 219-F
Jenkins, Ivor 115-H
Jenkins, William D. 1333-Q
Jenkinson, E. A. 435-Q, 455-Q
Jenner, J. P. S. 709-L
Jenness, Lyle C. 598-R
Jennings, L. D. 45-P
Jennings, R. F. 87-B, 292-D
Jensen, Ib. 73-X
Jensen, J. W. 423-Q
Jentsch, G. 154-A
Jepson, M. D. 398-P, 66-T
Jepson, W. B. 299-R
Jessen, Kai 38-M
Jetter, K. 609-M, 680-M
Jezek, Jaroslav 391-M, 656-M,
. . . . . 129-N, 314-N, 536-N,
. . . . . 428-Q, 145-R, 237-W
Jimer, John F. 48-L
Jiskra, Zdenek. 362-M
Joffe, A. 531-P
Johansen, Herman A. 415-L
Johanson, L. N. 168-C
Johansson, Folke 173-D,
. . . . . 438-D, 611-D
Johansson, Lennart. 641-M
Johnson, A. A. 853-Q, 857-Q
Johnson, A. E. 40-Q, 96-Q,
. . . . . 598-Q, 794-Q, 876-Q
Johnson, A. R. 1-L
Johnson, Carl 160-K, 1333-Q
Johnson, E. W. 1173-Q, 324-W
Johnson, F. A. 663-P
Johnson, Forrest W. 310-K
Johnson, G. W. 709-P
Johnson, H. T. 669-R
Johnson, J. C. 21-T
Johnson, J. E. 635-R

Johnson, J. R. 75-T
Johnson, L. A. 238-R
Johnson, M. M. 66-B
Johnson, O. E. 6-E
Johnson, R. 74-D
Johnson, R. E. 253-C, 581-Q
Johnson, Ralph K. 227-K
Johnson, Uno V. 277-F
Johnson, W. 40-F,
. . . . . 105-G, 445-G, 25-M
Johnson, W. H. 574-E
Johnston, A. W. 98-Q
Johnston, H. L. 177-P
Johnston, J. R. 1022-Q
Johnston, James H. 218-C
Johnston, T. L. 1091-Q, 602-R
Johnston, William V. 7-P
Jonakin, James 731-R
Jonck, Rudi 89-J
Jonckers, M. D. E. 41-S, 420-S
Jones, Alfred G. 113-F
Jones, Curtis A. 172-C
Jones, D. 738-R
Jones, D. J. 361-C
Jones, D. R. 395-E
Jones, David T. 674-R
Jones, F. O. 281-C, 76-X
Jones, J. Byron 151-K, 245-K,
. . . . . 360-K, 455-K, 473-K
Jones, J. H. 120-R
Jones, J. W. S. 54-H
Jones, Ken 795-L
Jones, M. H. 159-Q
Jones, P. G. 532-Q
Jones, P. W. 438-K, 439-K, 695-Q
Jones, R. B. 979-Q
Jones, R. H. 397-D
Jones, R. W. 441-S
Jones, T. D. 333-C
Jones, T. E. M. 607-K
Jones, W. E. 221-C
Jones, W. H. 21-S
Jones, W. R. D. 427-N
Jonke, A. A. 20-B
Jordan, H. 130-N, 229-N, 799-Q
Jordan, L. A. 776-L
Jordan, M. F. 259-M
Jorgensen, S. M. 1195-Q
Jortner, Donald 834-Q
Josefsson, Ake. 225-Q, 637-Q,
. . . . . 779-Q, 950-Q, 951-Q
Joseph, C. F. 256-E
Joseph, J. W., Jr. 1408-Q
Joseph, James 450-D
Joseph, R. W. 378-D
Jost, G. 686-P
Jousset, B. 433-W
Juchhoff, J. 479-S
Juchhoff, Wolfgang 331-S
Judge, C. 1516-Q
Juenger, A. 216-J, 660-Q
Juger, Willi. 517-M
Juhasz, Adam 52-B, 109-B
Juhasz, L. 641-P
Jungbluth, Hans 458-M
Jungbluth, O. 256-T
Junghans, Dieter 50-E
Junker, Helmut 220-J
Jura, J. 957-Q
Juretzek, Georg 232-F, 445-P
Jurgen, Hans 191-N
Jurgens, M. 28-K
Jurkiewicz, Leopold 69-A
Jurnak, A. P. 86-G
Justh, Richard. 177-A, 246-A
Justus, Ernst. 190-N

K

Kabanov, B. N. 827-R
Kabanov, N. S. 356-K, 548-K
Kablukovskii, A. F. 480-D
Kachalkin, G. S. 374-Q
Kachanov, L. M. 35-Q
Kachanov, V. S. 46-J
Kaczer, J. 67-P
Kaczkowski, Z. 363-P
Kadaner, E. S. 151-M, 246-Q
Kaddou, K. 1207-Q
Kadlec, Ferdinand 365-C
Kadobnova, N. V. 1083-Q
Kadokawa, Touohisa 192-J
Kadota, Masatane 348-L
Kaesche, H. 456-R, 779-R
Kaesmacher, P. 68-K
Kaftaradze, N. N. 143-P
Kaga, Hiroshi 440-G
Kagami, Motoo. 5-R, 760-R
Kagan, A. 222-M, 699-M
Kagan, D. Ya. 1315-Q
Kagan, E. S. 344-T
Kagan, Henri 805-L
Kagan, I. S. 241-F
Kaganov, M. N. 439-P
Kaganov, N. L. 547-K
Kaganov, V. Yu. 410-D
Kahler, Harold A. 46-X
Kahmann, K. G. 8-X
Kaieda, Hiroya. 227-N
Kailov, L. D. 303-D
Kailov, V. D. 68-D
Kaiser, August. 414-P
Kaiser, H. R. 786-L
Kaiser, Harold D. 91-L

Kaiser, Karl 499-E
Kaiser, Wilhelm F. 5-B
Kajiwara, Hiroshi. 35-G
Kalashnikov, L. A. 442-D
Kalashnikov, S. G. 148-P,
. . . . . 397-P, 533-P
Kalashnikov, S. I. 253-S
Kalikov, D. N. 123-M
Kalinin, K. P. 433-C, 1383-Q
Kalinina, L. T. 313-N
Kalinovich, D. F. . . . 84-N, 166-N, 549-N
Kalinskii, Ya. M. 239-S
Kalish, Herbert S. 21-H, 81-M
Kalita, Bohumil 297-W
Kaliteevskii, N. I. 144-S
Kalkuhl, Arno 386-P
Kalling, B. 101-D,
. . . . . 173-D, 438-D, 611-D
Kallmann, Silve 16-S
Kalman, Lajos 335-E
Kalpers, H. 53-E
Kaltenhauser, R. H. 452-K
Kaluzhnaya, P. F. 566-R
Kamaze, N. 200-J
Kamel, R. 167-M, 934-Q
Kamel, Venice 267-L
Kamenetskaya, D. S. 509-A, 670-D
Kametsev, M. V. 192-C
Kamigaki, Kazuo 103-Q
Kaminskaya, N. P. 8-S
Kaminskii, E. Z. 273-N
Kaminskii, N. A. 132-F
Kamishohara, Kazunori 1448-Q
Kamkina, L. A. 389-D
Kamphaus, W. 329-J
Kan, K. S. 23-M
Kan, Yu. B. 69-D
Kanamori, Kuro 272-D
Kanatani, Fumihiro. 526-K
Kanazawa, Shogo 663-N
Kandawrova, G. S. 14-P, 158-P
Kang, Mungyu 789-R
Kann, W. L., Jr. 4-E
Kanno, Tomonobu 203-E, 368-E
Kanter, J. J. 1190-Q
Kape, J. M. 241-R
Kapichev, A. G. 409-D
Kapilov, A. 99-H
Kaplan, G. E. 99-A, 484-C
Kaplan, H. 89-D
Kaplan, Jerome I. 728-P
Kaplan, R. S. 275-N
Kapoun, Rudolf. 39-K
Kapp, W. 463-P
Kaptyug, I. S. 1000-Q
Kapustin, E. A. 121-D
Kapustyanov, E. V. 605-Q
Kar, K. R. 95-S
Karabinos, J. V. 306-L
Karal'nik, S. M. 384-S
Karam, A. J. 354-E
Karasev, R. A. 355-D, 655-N
Karashima, S. 620-M
Karasik, N. Ya. 474-N
Karby, Kim 277-T
Kardonskii, V. M. 44-X
Karmasin, S. J. 19-E
Karnov, M. Ya. 294-F
Karpenko, G. W. 3-R
Karpenko, T. V. 257-Q
Karpov, G. D. 121-D
Karpov, V. I. 397-Q
Karpunin, A. M. 182-J
Karpushinskii, N. S. 18-B
Karpyshev, M. S. 120-W
Karstensen, Frithjof 366-N
Kartashova, K. M. 58-R, 148-R
Kasak, A. 1189-Q
Kasamatsu, Yutaka 699-P
Kasatkin, B. S. 258-Q
Kase, Hirotoshi 100-L
Kase, Miloslav. 385-S
Kase, Takatoshi 523-L
Kasen, M. B. 256-K
Kashcheeva, N. A. 141-A
Kashima, Minoru 43-R
Kashkovskaya, E. A. 156-S
Kasik, Ivan 505-P
Kass, S. 304-L, 40-M, 703-R
Kasser, R. C. 544-A
Kassov, D. S. 227-K
Kataev, G. I. 273-Q
Katashi, Masumoto 261-C
Katasik, N. Ya. 470-S
Kathrein, Alfred. 247-E,
. . . . . 249-M, 206-N
Katler, A. I. 720-K
Kato, Etsuro 82-H
Kato, Haruo. 638-N
Kato, T. R. 363-R
Kato, Yozo 919-Q
Katoh, Kaoru 367-E
Katomin, B. N. 239-D
Katsnel'son, A. M. 380-E
Kattus, J. R. 122-Q, 503-Q,
. . . . . 715-Q, 726-Q, 987-Q
Katz, S. 424-Q
Kauffman, J. W. 672-Q
Kaufman, Alvin B. 334-K, 1348-Q
Kaufman, Larry 336-M,
. . . . . 295-N, 442-N, 621-P
Kaufman, M. M. 80-F
Kaufmann, A. 322-C
Kaufmann, A. R. . . . 98-N, 513-N, 144-Q

Kaufmann, W. J. 205-J
Kauhausen, E. 68-K, 271-W
Kavanagh, J. A. 515-E
Kavka, J. 465-E
Kawachi, Rihei. 1-J, 13-R
Kawada, K. 111-A
Kawaguchi, Mitsuhiro . . .1145-Q, 1534-Q
Kawai, Kiyokazu. 796-Q
Kawai, Yoshio 253-L
Kawamura, H. 111-A
Kawamura, Kazutaka. 262-C
Kawanaka, Ryusuke. 691-M
Kawanishi, R. 358-M
Kawarasaki, Y. 637-L
Kawasaki, E. P. 25-H
Kawasaki, Masayuki 424-R
Kawasaki, Tadashi 324-N
Kawinski, Stanislaw 515-D
Kayaba, Takao. 275-G
Kayama, N. 445-E
Kayser, Karlheinz 110-T
Kazachkov, E. A. 557-D,
. . . . . 559-D, 91-F
Kazachkov, I. P. 587-D, 430-Q
Kazakov, N. F. 267-K, 718-K
Kazantsev, V. F. 458-G, 459-G
Kazarin, V. I. 828-R
Kazennov, S. A. 158-E
Kazennov, Y. I. 73-R
Kazhlaev, M. A. 555-P
Kazimirov, A. A. 605-Q
Ke, Bacon. 738-L
Keating, R. J. 73-A
Kececioglu, Dimitri 294-G
Keck, P. H. 21-X
Keefer, D. 192-M
Keel, C. G. 382-A, 191-K,
. . . . . 192-K, 193-K, 639-Q
Keeler, Robert A. 758-L
Keeling, Harry J. 570-R
Keen, R. V. 41-E
Keenan, Malcolm W. 722-P
Keh, A. S. 1222-Q
Kehl, G. H. 679-P
Keiji, Tyogo 16-Q
Keil, Albert. 504-L
Keilholtz, G. W. 264-R
Keilitz, Rudolf 232-L
Keir, D. S. 178-R
Keis, N. V. 283-D
Keith, R. E. 353-M, 622-Q
Kekua, M. G. 546-N
Kelchner, B. L. 256-C
Keller, A. 190-K
Keller, Arthur G. 26-R
Keller, Donald L. 720-L, 687-R
Keller, F. 5-A
Keller, H. 624-L
Keller, K. 166-W, 252-W
Keller, R. J. 262-K
Keller, R. M. 109-R
Keller, Wayne H. 457-C
Kelley, J. H. 526-D
Kellner, R. G. 53-G
Kellogg, H. H. 139-B
Kelly, A. 462-N
Kelly, E. A. 131-D, 263-D
Kelly, George D. 226-T
Kelly, J. J. 424-Q
Kelly, K. K. 346-C
Kelly, P. M. 416-G
Kelsey, D. F. 15-S
Kemp, W. E. 318-L
Kemp, W. R. G. 637-P
Kemula, W. 269-M
Kendall, E. G. 68-C
Kendall, W. B. 590-P
Kenderi, T. 482-L
Kenedi, R. M. 353-G
Kennedy, A. J. 402-Q
Kennedy, C. R. 230-Q,
. . . . . 468-Q, 505-Q, 679-Q
Kennedy, E. M., Jr. 23-Q, 657-Q
Kennedy, G. L. 3-B, 316-E
Kennedy, J. 683-N
Kennedy, Paul S. 520-P
Kennedy, S. W. 242-R
Kennedy, Ted, Jr. 97-L
Kennedy, W. B. 218-T
Kennedy, William C. 357-E, 507-E
Kenneford, A. S. 603-N
Kennelley, J. A. 27-C
Kenny, Donald J. 121-E
Kentta, G. R. 47-L
Kenworthy, H. 151-D
Kerkhof, W. P. 720-Q, 134-T
Kern, Fred E. 137-L
Kernich, N. K. 758-R
Kernohan, R. H. 154-P
Kerridge, D. H. 197-N
Kersey, E. C. 338-M
Kershanskii, I. I. 371-C, 405-C
Kershner, K. K. 186-C
Kerstetter, D. R. 337-N
Kerstovnikov, A. N. 335-N
Kerti, Jozsef 185-S
Kessler, H. 100-E,
. . . . . 124-E, 191-R
Kessler, H. D. 451-K
Kets, N. V. 255-M
Kewish, R. W. 256-C
Keys, David A. 116-W
Keyser, Carl A. 486-A
Keyser, N. H. 4-E

Keysselitz, B. 282-L,
. . . . . 570-L, 463-M, 210-S
Khadeev, V. A. 210-C
Khaikin, M. S. 226-P
Khairy, E. M. 565-P, 580-P,
. . . . . 585-P, 229-R, 257-R
Khakhalin, B. D. 417-E
Khan, B. Kh. 413-D
Khansevarov, R. Iu. 229-P
Kharchenko, V. A. 36-J
Kharitonova, L. D. 997-Q
Kharkar, D. P. 45-C
Kharlmanov, I. P. 466-R
Khatanova, N. A. 3-N, 17-R
Kheifetc, I. G. 164-N
Khein, E. A. 449-Q
Khiebnikov, G. I. 418-L
Khimenko, N. V. 252-S
Khipov, V. I. 441-D
Khitric, S. L. 479-C
Khizhnichenko, A. M. 283-D
Khlynov, V. V. 119-C
Khodov, E. L. 222-Q
Khokhlov, D. G. 31-B
Khokhlov, P. T. 303-J
Kholodenko, P. I. 78-W
Kholopov, A. V. 336-N
Khomyakov 417-P
Khorosh, V. A. 118-F
Khrenov, K. K. 463-K, 49-X
Khrisanova, L. B. 323-T
Khristoforov, B. S. 421-C
Khromenko, N. S. 72-B
Khrykina. 389-D
Khudyakov, A. N. 105-C
Khudyshev, A. F. 81-K
Khun-I, Chen 360-Q
Kichin, N. P. 253-S
Kidin, I. N. 664-D, 262-J,
. . . . . 266-J, 602-M, 687-N
Kidson, G. V. 172-N
Kieffer, R. 250-C, 93-H, 127-M,
. . . . . 307-M, 396-M, 423-M,
. . . . . 478-M, 545-M, 560-M, 44-T
Kienberger, J. P. 275-W
Kienlin, Albrecht V. 42-P
Kienzle, Otto 20-F, 263-F
Kies, J. A. 558-Q, 1019-Q
Kiessling, Roland 486-M
Kigoshi, Akichi 364-C
Kihara, Hiroshi 526-K, 624-Q
Kihlermann, R. 57-T
Kikoin, I. K. 719-P
Kikuchi, M. 443-E, 510-E, 1336-Q
Kikuta, Yoneo 796-Q
Kilinski, Z. 139-C
Kilpatrick, S. A. 155-G
Kimura, H. 288-M, 289-M
Kimura, Hiroshi. 347-M, 464-S
Kimura, Hirozo 526-M, 477-N
Kimura, Hisashi. 101-H
Kimura, Jin. 454-S
Kimura, Shin 621-N
Kimural, Takashi 158-H, 164-H
Kindbom, L. 63-J
Kinelski, E. H. 1038-Q
King, A. J. 186-K, 369-K
King, B. W. 644-L, 782-L, 226-T
King, Blake 742-R
King, C. P. 840-Q, 175-T
King, C. W. 686-Q
King, Cecil V. 172-P
King, P. P. 405-K
King, R. 487-A, 113-T
King, R. A. 83-C, 237-C
King, T. B. 98-D
King, Thomas B. 215-C
Kingery, W. D. 575-A,
. . . . . 179-H, 251-P, 635-P
Kingsbury, A. H. 250-R, 496-R
Kingsbury, E. P. 1425-Q
Kingston, J. A. 508-M
Kino, Takao. 1113-Q
Kinoshita, Naoharu 485-L
Kinsky, Frantisek. 59-D, 399-D
Kipling, R. A. 74-D
Kipp, R. L. 358-P
Kirby, R. 669-K
Kirchbach, Hanns 258-W
Kircher, J. A. 277-C
Kirenskii, L. V. 68-P, 75-P
Kirianenko, A. 53-N, 376-N, 609-N
Kirichenko, I. D. 308-W
Kirk, F. A. 163-R, 40-T
Kirk, M. M. 193-W
Kirk, W. F. 20-Q
Kirkaldy, J. S. 184-N
Kirkby, H. W. 455-Q, 1434-Q
Kirkland, W. G. 354-G
Kirkov, Pance 9-R
Kisel, N. N. 506-D
Kiselev, A. A. 234-F, 694-R
Kiselev, V. E. 13-M
Kishi, Matsuhei 98-L,
. . . . . 395-L, 506-L, 778-L
Kishi, Yoshiyuki. 100-L
Kishkin, S. T. 177-N
Kisiel, T. J. 342-R
Kisileva, S. A. 427-M
Kisin, B. I. 235-Q
Kisluk, P. 259-P
Kislyuk, F. I. 81-K
Kiss, Ervin. 90-W
Kissel, R. 320-D

Kissin, D. A. 18-B, 144-B
Kissling, Rolf 353-E, 1127-Q
Kita, Shigeaki 367-E
Kitagawa, H. 484-R, 783-R
Kitaigorodskii, Yu. I. 6-K
Kitayev, B. I. 313-D
Kittel, J. H. 664-M, 82-P,
. . . . . 598-P, 936-Q, 255-T
Kjasimow, B. 57-R
Klarding, J. 178-W
Klassen, I. F. 437-P
Klatte, H. 33-C
Klazunov, S. T. 907-Q
Kleber, John P. 107-R
Kleber, Will 113-H, 548-P
Klein, A. L. 558-D
Klein, A. W. 5-T
Klein, E. 91-B, 358-D, 542-D
Klein, Frank J. 229-W
Klein, J. G. 1130-Q
Kleinman, D. A. 419-M
Kleinschmidt, Bernhard. 198-G
Klemantaski, S. 395-D
Klemens, P. G. 589-P, 637-P
Klement, John F. 219-R, 534-R
Klemm, H. 88-G, 92-M, 1251-Q
Klempt, Walter 446-N
Klems, George J. 658-M
Klepanda, V. V. 310-W
Kleppa, O. J. 101-P
Klersy, R. 1278-Q
Klesnil, Mirko 316-Q, 1537-Q
Kletchenkov, I. I. 208-Q
Kletenik, Yu. B. 291-R
Klier, E. P. 735-Q
Klimenko, G. P. 151-F
Klimov, A. D. 376-E
Klimovitskii, M. D. 355-S
Klinchuk, K. D. 538-P
Kline, H. E. 1209-Q, 751-R
Klingenstein, T. 288-E
Klingler, Emil 135-T
Klochkov, D. S. 215-P
Klochnev, N. I. 225-E
Kloeris, P. W. 221-Q
Klokholm, Erik 678-P
Kloos, H. K. 146-G, 1411-Q
Klopp, W. D. 505-A, 433-R
Kluge, H. 365-S, 32-W
Klyachko, Yu. A. 84-M, 139-S
Klyagina, N. S. 213-C
Klyuev, M. M. 616-D
Kmetko, E. A. 81-Q
Knacke, Ottmar 89-H
Knappwost, Adolf 938-Q
Knapton, A. G. . . . 400-M, 581-N, 76-X
Knaul, Wolfgang 287-C
Knecht, W. Feit 710-R
Kneller, Eckart 380-P, 387-P
Kniaginin, Gabriel 635-D
Knight, R. A. 126-H, 153-H
Kniseley, R. N. 29-S, 259-S
Knittl, Zdenek 513-P
Knopp, Walter V. 165-H
Knorr, W. 1446-Q, 1447-Q
Knorr, Walter 344-G
Knorr, Willy 174-J
Knospe, L. 101-T
Knotek, M. 288-F
Knotek, O. 185-W
Knott, H. W. 420-M
Knowles, H. E. 344-W
Knowles, J. W. 587-P
Knowlton, H. B. 150-J
Knox, John A. 717-R
Knudsen, A. C. 542-N
Knuppel, Helmut. 137-D, 286-D,
. . . . . 287-D, 325-D, 426-D,
. . . . . 444-D, 479-D, 682-D,
. . . . . 62-J, 331-S, 479-S
Knyazev, S. I. 425-E
Kobayashi, M. 147-A
Kobayashi, S. 53-F, 237-F, 79-G,
. . . . . 385-G, 450-G, 378-N, 1297-Q
Kobayashi, T. 504-K, 52-Q
Kobayashi, Torao 1110-Q
Kobayashi, Toyoji 423-R
Kobler, J. S. 1260-Q
Koburneev, I. M. 272-W
Koch, B. A. 105-K
Koch, E. F. 188-M
Koch, F. 520-R, 682-R, 683-R
Koch, Karl Hans. 216-D
Koch, Lisl. 472-R
Koch, M. 682-M
Koch, Othmar G. 86-S
Koch, Walter. . . . 32-S, 162-S, 194-S,
. . . . . 248-S, 249-S, 250-S,
. . . . . 283-S, 418-S, 422-S, 368-W
Kochanova, L. A. 365-Q
Kochendorfer, Albert . . 56-N, 103-N,
. . . . . 362-N, 470-N, 879-Q, 1466-Q
Kocher, R. 42-K, 212-K, 510-K
Kochergin, S. M. 142-L
Kochergin, V. P. 213-R, 214-R
Kocherov, I. V. 551-P
Kochinev, E. B. 308-W
Kochnev, E. K. 655-D
Kochnev, M. I. 215-D
Kochnev, V. I. 1313-Q
Kocinski, J. 301-P
Kodolov, V. D. 177-Q
Kodrle, Ludek 299-P
Koebel, Norbert K. . . 25-H, 88-H, 310-J

Koechling, Harald. 267-E
Koehler, E. L. 669-R
Koehler, J. Franklin 796-R
Koehler, J. S. 6-P
Koehler, W. A. 741-L, 91-R
Koeneman, J. 637-Q, 779-Q
Koepf, A. H. 216-W
Koeroes, B. 353-W
Koester, Werner 394-M
Koester, Wolfgang 265-W
Kogaev, V. P. 527-Q
Kogan, L. I. 83-N
Kogan, M. G. 68-G, 6-K
Koganova, L. A. 256-Q
Kogos, A. M. 548-K
Koh, P. K. 364-P
Kohara, Shiro 4-R
Kohler, Imre 108-F, 139-F
Kohler, Reinhard 201-A
Kohler, W. 141-T
Kohlermann, R. 493-A
Kohlhase, F. 327-T
Kohlstrung, G. 548-P
Kohn, A. 222-N, 1329-Q, 242-S
Koike, Kichizo 1392-Q
Koizumi, Mahito. 204-E, 216-E
Koizumi, Seizo. 14-Q
Kojima, Shinji 190-J
Kokarev, N. I. 409-D
Kokeisl, M. 77-X
Kokh, B. A. 54-K, 468-K
Kokkonen, V. 286-Q
Kokobskii, I. A. 38-B
Kokorin, G. A. 165-M
Kolb, Ludwig 112-E, 238-P
Kolb, Ray 238-K
Kolbel, H. 281-A
Kolbl, F. 305-T
Kolchin, O. P. 377-C, 37-H
Kolchinskii, V. I. 1315-Q
Kolenko, E. A. 642-K
Kolesnik, B. P. 157-J
Kolesnikov, A. F. 397-Q
Kolesnikov, V. P. 110-W
Kolgatin, N. N. 992-Q
Kollrack, R. 221-J
Kolobneva, L. I. 1282-Q
Kolobova, K. M. 145-M, 4-S
Koloc, J. 915-Q
Kolodnyi, S. Ya. 385-E
Kolomiets, B. T. 228-P
Kolomitskii, F. M. 466-C
Kolomytsev, P. T. 549-M, 556-M
Kolontsova, E. V. 906-Q
Kolorz, Alfred 348-P
Kolosov, M. I. 491-Q
Kolotyrkin, Ya. M. . . 62-R, 147-R, 606-R
Kolov, M. I. 54-J
Kolpashnikov, A. I. 266-F, 317-J
Komar, A. P. 718-P
Komarov, A. P. 381-E
Komarova, M. F. 74-N
Komatsu, R. 110-A
Komori, Shinichi 233-A
Kompaniets, M. F. 430-C
Kon, N. I. 25-F, 469-Q
Kondakov, V. V. 683-D
Kondas, E. G. 290-W
Kondic, V. 458-E, 502-E, 135-M
Kondo, Yutaka 693-M
Kondorskii, E. I. 69-P,
. . . . . 70-P, 205-P, 224-P
Kondrashnov, A. I. 36-J
Kondrashov, D. P. 400-C
Koniger, Anton. 385-P
Konigshofer, Theodor 7-W, 8-W
Konishi, Yoshikichi. 521-P,
. . . . . 1102-Q, 1106-Q
Kono, Hiroshi 325-P
Konobeevsky, S. T. 518-N,
. . . . . 592-N, 52-P, 1285-Q
Kononenko, V. A. 18-Q, 382-Q
Kononenko, V. G. 718-Q
Kononov, B. Z. 86-M
Konoorskii, E. 83-P
Konoplenko, V. P. 370-Q
Konopleva, N. K. 29-B
Konorat'ev, A. N. 217-R
Konovalov, A. S. 334-D
Konovalov, I. M. 197-F
Konovalov, V. G. 241-S
Konovalov, V. P. 88-F, 96-F
Konstantinov, L. S. 416-E
Konstantinova, G. S. 329-L
Kontorov, B. M. 732-L
Kontorovich, I. E. 250-N
Kontorovskii, A. Z. 1496-Q
Konyshkova, T. E. 2-C, 301-C
Kooistra, L. F. 927-Q
Kool, P. J. 327-J
Koontz, D. E. 469-L, 470-L, 473-L
Koopman, Kenneth H. 528-K
Koops, H. 64-J
Kootz, Theo. 78-D,
. . . . . 256-D, 354-D, 91-J
Kopa, Lubos 320-S, 394-S
Kopchenko, D. S. 340-C,
. . . . . 371-C, 387-C
Kopelman, Bernard. 243-T
Kopel'man, L. A. 295-K
Kopersak, N. I. 525-M
Kopetskii, Ch. V. 551-M
Kopineck, Hermann-Josef . . . 323-D,
. . . . . 358-S

Koppelmann, Jan 1109-Q
Koppenhoffer, R. L. 282-K, 696-K
Koppi, W. A. 512-D
Korabel'nik, R. K. 425-S
Korablev, A. I. 63-W
Korablev, E. I. 389-D
Korablin, F. A. 220-W
Korach, M. 355-W
Koranyi, I. 1443-Q
Korbelak, A. 377-L
Korchynsky, M. 1025-Q
Kordabhev, I. D. 654-D
Korecki, Kazimierz 537-E
Kore'eda, Atsuo 330-M, 442-M
Koritta, I. 404-M
Koritta, Josef 163-M
Korman, Samuel. 392-C
Kornfeld, Heinz 434-S
Kornfel'd, V. H. 203-D, 422-D
Kornilov, I. I. . . . . 234-F, 119-M, ... 126-M, 556-M, 734-P, 88-Q, ... 260-Q, 907-Q, 1543-Q, 170-R
Korobov, I. I. 222-D, 695-R
Korobov, M. A. 454-C, 407-W
Korol', V. K. 246-F, 1482-Q
Korolev, F. V. 429-N
Korolev, G. G. 47-J
Korolev, V. D. 266-F, 317-J
Korolev, V. M. 580-E
Korolev, X. M. 374-E
Korol'kov, G. A. 228-N, 1346-Q
Korotkov, A. I. 68-E
Korovich, V. I. 569-D
Korovin, Yu. M. 151-R, 798-R
Korpiun, J. 201-L
Korshunov, I. A. 182-S
Korsunskaya, K. N. 429-N
Kortendieck. 33-W
Koschewnikow, S. N. 88-W
Kosco, J. C. 164-H
Koselev, Vladimir 863-Q
Kosevich, A. M. 20-M
Koshelev, V. I. 491-D
Koshiba, Sadao. 621-N
Koshovnik, G. I. . . . 305-E, 199-N, 615-N
Koshurin, A. V. 265-F
Kosiba, W. 12-R
Kosko, Z. K. 9-N
Koslov, J. 6-C
Kosmider, H. 13-B, 183-D
Kosolapov, T. Y. 236-C
Kossakovskaya, M. M. 1377-Q
Kossovskii, L. D. 118-F
Kostelov, V. V. 426-C
Koster, Werner . .55-J, 246-J, 314-M, ... 315-M, 348-M, ... 311-N, 746-Q, 747-Q
Kostin, V. N. 397-C
Kostlin, Konrad 382-P, 400-W
Kostrov, E. N. 847-Q
Kostyanovskaya, N. M. 153-S
Kostyukov, A. A. 452-C
Kostyukova, E. P. 661-M, 478-N
Kosuge, Takashi. 114-B
Kosugi, D. 10-W
Kotel, Nikov, V. P. 1255-Q
Koterazawa, Ryoichi. 916-Q, 918-Q
Kothari, Navin. 2-J
Kotkin, G. L. 1484-Q
Kotnik, Yu. F. 450-N
Kotov, O. K. 284-J
Kotov, P. I. 64-Q, 1494-Q
Kotov, V. I. 64-D
Kotovshchikov, A. A. 407-M
Kotrovsky, M. M. 219-S
Kotsyubinskii, O. Yu. 716-Q
Kotthaus, H. 512-K
Kottmeier, Fritz 126-F
Koudela, Vaclav 191-Q
Koulikowsky, W. A. 67-G
Koutsky, Jaroslav. . . . 391-M, 462-M, ... 656-M, 129-N, 402-S
Kovacs, K. 508-R
Kovacs, S. 67-H
Koval', A. F. 488-D
Koval'chenko, M. S. 113-M, 256-N
Koval'chuk, E. I. 65-D, 421-D
Kovar, Antonin. 37-K
Kovenskii, I. I. 84-N, 166-N, 549-N
Koves, Elemer. 267-W
Kovtun, P. G. 1361-Q
Kovunenko, V. A. 607-Q
Kovynev, M. V. 184-F
Kowalczyk, Jerzy 104-T
Kowalewski, M. 468-D
Kowalski, Zbigniew. 562-L, 266-R
Kozakevitch, P. P. . . . 93-D, 110-D, 90-P
Kozarin, V. I. 169-R
Kozhaev, A. F. 116-K
Kozhanskii, V. N. 828-Q
Kozhevnikov, I. Yu. 166-D
Kozhevnikov, V. V. 117-L
Koziarski, J. 408-K
Kozlik, R. A. 536-Q
Kozlov, L. A. 209-Q
Kozlov, P. A. 793-Q
Kozlova, M. N. 85-M
Kozlovskii, M. T. 34-C, 403-C
Koznov, G. G. 823-R
Kozyrskii, G. Ya. 18-Q, 382-Q
Krabacher, E. J. 394-G, 406-W
Kraechter, Hans. 358-S
Krafft, J. M. 818-Q
Kraft, R. Wayne, Jr. 852-Q

Kraichik, M. M. 55-K, 466-K
Krainer, Ekkehardt. 307-S
Krainer, H. 657-N, 307-S
Krajewski, S. J. 204-F
Kralik, Arisztid. 244-E
Krall, H. A. 37-E, 100-S
Kramer, D. 334-M
Kramer, I. R. 769-Q
Kramer, K. H. 1191-Q
Kramer, Karl 189-E
Krammer, D. 412-Q
Kraner, Hobart M. 288-W
Kranitzky, W. 392-R
Krapukhin, V. V. 316-J
Krasavtsev, Nikolay I. 662-D
Krashkin, A. A. 267-Q
Krasilshchikov, A. I. 61-R,
. . . . . 434-R, 626-R
Krasotskaya, S. N. 572-N
Krasovskii, A. I. 177-Q
Kratky, Ludek 112-H
Kratsik, B. 221-P
Kraus, H. 5-W
Kraus, Rudolf 1-S
Krause, F. 377-A
Krause, Rolf 150-G
Krause, Ulrich. 284-S
Krauss, Friedrich 379-P
Krauss, G., Jr. 346-N
Kraut, Harald 231-F
Krautmacher, Hans. 487-L, 15-W
Krautz, Erich 377-P
Krebs, H. 454-M
Krefeld, W. J. 631-Q
Kreisberg, S. 326-T
Kreitz, K. 318-S
Krejeik, Milan. 131-A
Krekel, P. 432-K
Krekeler, K. 412-K, 41-T
Kremer, H. 203-C
Kremer, V. A. 236-S
Krenkler, K. 268-R
Krenz, F. H. 743-R
Krepyshev, N. V. . . . 79-D, 425-D, 161-W
Kreshchanovskii, N. S. 485-E,
. . . . . 436-N, 717-Q
Kretschmer, William J. 92-R
Kretzschmar, H. 41-K
Kretzschmer, Fritz 319-E
Krikorian, Oscar H. 428-M
Krimer, B. I. 673-M, 577-N
Kripiakevich, P. I. 590-M
Krisch, Alfred. . . 636-Q, 985-Q, 1420-Q
Krisement, Otto 58-N, 384-N
Krishnan, A. A. 345-C
Krishtal, M. A. 51-N, 1243-Q
Kristal, M. M. 708-R
Kristof, G. 19-K
Kritskaya, V. K. 144-M
Kritzer, S. 294-L
Kriulin, A. V. 23-J
Krivitskii, M. E. 57-W
Krivobok, V. N. 505-K
Krivorunchenko, V. V. 385-C
Krivosheev, A. E. 1304-Q
Krivoshein, G. S. 801-R
Krivosheyev, V. M. 484-E
Krivusha, Yu. V. 573-N
Krnak, A. 557-K
Kroll, Th. 343-C
Kroll, W. J. 293-C
Kron, H. 188-E,
. . . . . 298-E, 356-E, 527-E
Kronberg, D. A. 401-C
Kronberg, M. L. 1072-Q
Kroneis, M. 148-J, 235-J
Kronmarck, Stefan 63-Q
Kronmuller, Helmut 459-P
Kronnenberg, M. 236-G
Kronstein, Max 731-L
Kropp, M. A. 524-L
Kropschot, R. H. 1274-Q
Krotkiewski, Zygmunt. 78-B
Krotov, I. V. 832-L
Kroundycheff, Y. S. 28-G
Kroupa, Frantisek 626-M
Krpyakevich, R. I. 257-Q
Krug, F. C. 594-P
Kruger, Alfred. 244-Q
Kruger, G. 86-Q
Kruger, Jerome. 767-R, 815-R
Kruglova, E. G. 568-R
Krulfeld, M. 10-R, 364-R
Krulikovskaya, M. P. 310-M
Krumnikl, Frantisek 978-Q
Krumpholz, R. 90-Q
Krumpos, J. 1149-Q, 57-X
Krupicka, S. 675-P
Krupin, A. F. 511-L
Krupin, A. V. 1258-Q
Krupkowski, Aleksander . . 633-P, 542-Q
Krupnikov, K. K. 129-Q
Kruse, Fritz 155-A
Krushchov, M. M. 347-T
Krym, I. A. 1433-Q, 463-S
Krymakova, E. E. 516-L
Kryokov, S. N. 83-M
Krzekotowski, Zenon. 205-F
Krzeszewski, Roman. 271-F, 238-J
Krzhechkovskii, A. K. 294-K
Krzhizhanovskii, R. E. 61-P
Ksandopuldo, G. I. 233-S
Ksendzyk, G. V. 444-W
Ku, S. M. 175-P

Kubaschewski, O. 736-R
Kubelik, Jaroslav 46-H
Kubichek, L. 627-P, 660-P
Kublik, Z. 269-M
Kubota, T. 366-E
Kubota, Yoshio. 692-M, 666-N
Kubsh, L. M. 1273-Q
Kubyshev, N. N. 340-C, 381-C
Kuchko, I. I. 185-F
Kucia, K. 1479-Q, 332-S
Kuczewski, Wlasyslaw. 140-C
Kuczynski, G. C. 503-N
Kudrass, K. 374-W
Kudrin, A. N. 349-C
Kudrryavtsev. 185-F
Kudryabtsev, I. V. 511-Q
Kudryabtsev, N. G. 67-L
Kudryashova, L. N. 443-C
Kudryavitsev, I. V. 91-G
Kudryavtsev, E. V. 528-Q
Kudryavtsev, J. P. 732-P, 733-P
Kugaenko, M. E. 184-F
Kugler, A. N. 402-K
Kuhlman, C. W. 113-B
Kuhlmann-Wilsdorf, Doris . . . 288-M, ... 289-M, 347-M
Kuhn, Martin 704-L
Kuhn, P. 171-Q
Kuhn, Rudolf 3-L, 13-L
Kuhn, V. 98-S
Kuhn, W. E. 302-R
Kuhnel, R. 441-Q
Kukaczka, R. 696-L
Kuksenko, E. P. 254-R
Kula, Eric B. 418-Q, 896-Q
Kulagin, I. D. 300-J, 164-K, 411-W
Kulakov, N. A. 69-J
Kuleshov, P. I. 630-Q
Kuli, John C. 328-R
Kulichenko, G. F. 438-G
Kulikov, I. S. 510-D
Kulikova, N. N. 375-C
Kulin, P. A. 58-H
Kulin, S. Andrew 336-M
Kulinski, Z. 150-H
Kulzhinskii, V. L. 203-K
Kumada, Uko 663-N
Kumar, Rajendra . . . . . 313-D, ... 258-N, 1296-Q
Kumazawa, Masuji 144-H, 1368-Q
Kumor, Jozef. 532-E
Kumskov, V. T. 567-E
Kumura, Yasuo 643-N
Kuncz, Frank. 161-K, 354-K
Kunda, Bron 43-F
Kunert, Franciszek. 2-F
Kung, Alexander. 414-P
Kung-Soo, Chang 375-S
Kunicki, M. 44-B
Kunii, Daizo 179-C
Kunin, Robert 147-C
Kunis, M. I. 63-W
Kunitake, T. 277-N
Kunovalova, T. S. 428-W
Kunz, H. G. 206-J, 279-K
Kunze, Ernst 214-M
Kuprina, V. V. . . . . 118-M, ... 175-M, 355-M, 322-N
Kuptepov, M. M. 558-R
Kura, J. G. 574-E, 15-P
Kuramoto, Ryosuke. 389-Q
Kurauchi, Tohru. 341-N
Kurchatov, B. V. 276-P
Kurchatov, M. S. 98-C
Kurdyumov, A. V. 912-Q
Kurdyumov, G. V. 110-N, 441-N
Kurek, M. 1479-Q, 332-S
Kurennikh, L. K. 182-P
Kurenskii, L. V. 114-M
Kurganov, G. V. 671-P, 132-Q
Kurgin, K. H. 1529-Q
Kurilekh, L. P. 611-N
Kurochkin, B. N. 442-D
Kurochkin, K. T. 334-D
Kurov, G. A. 65-M, 639-M
Kurtetsov, M. M. 566-P
Kurtov, I. F. 147-E
Kurtova, L. A. 354-M
Kurtschatow, Mstislaw 429-D
Kurtseva, N. N. 431-C, 220-S
Kurtz, Walter 70-B
Kurzova, Kyetuse. 415-S
Kusaka, Kunio 640-N, 641-N, 658-N
Kusakawa, T. 444-E
Kusamichi, Hidetake. . . . . 138-A, ... 3-P, 389-Q
Kuschell, K. E. 545-E
Kushner, Joseph B. 613-Q
Kushnir, F. F. 702-M
Kus'menko, V. A. 212-Q
Kusnitzina, Z. I. 113-N
Kusserov, H. 268-G
Kussmann, Albrecht . . . . . 38-M, ... 215-N, 239-N
Kussmann, Herbert. 1108-Q
Kuteinikov, A. F. 5-S
Kutsenko, Iu. I. 143-S
Kuwahara, Kaizo 712-P
Kuzental', V. E. 407-C
Kuz'ma, Yu. V. 180-M
Kuzmenko, Peter 737-Q
Kuz'menko, V. A. 753-Q
Kuzmenko, V. O. 113-Q
Kuzmick, J. F. 609-K, 656-K

Kuz'min, I. A. 68-D, 303-D
Kuznetsov, B. A. 186-S
Kuznetsov, D. A. 375-E
Kuznetsov, V. D. 118-G, 1066-Q
Kuznetsov, V. I. 6-S, 136-S, 151-S
Kuznetsova, M. Ia. 276-P
Kuznetsova, V. A. 6-K
Kuznik, Jaroslav 321-L
Kuzub, A. G. 352-D
Kvasman, M. G. 413-E
Kwiatkowski, S. 1479-Q, 332-S
Kwiatkowski, Z. B. 47-S
Kyunche, V. 360-D

L

Laar, Tibor. 469-C
Labat-Camy, Andrew 636-D
Labour, H. E. 164-R
Labusca, Elena 285-P
Labut'ev, Yu. D. 265-M
Labzin, V. A. 111-Q, 783-Q
Lach, Edward J. 240-G
Lachenaud, R. 120-K
Lachin, M. 107-S
Lachman, J. C. 70-X
Lacombe, Paul. . . . 82-M, 24-N, 37-N, ... 52-N, 223-N, 376-N, ... 443-N, 526-N, 600-N, 453-R
Lacomble, M. 436-S
Lacorne, M. 128-L
Lafourcade, Lucien. 467-N
Laganov, V. Iu. 230-D
Lagerberg, Goran. . . 225-Q, 637-Q, 77-Q
Lagovskaya, M. S. 638-M
La Grange, Lee D. 11-C
Lagutin, V. P. 973-Q
Lahr, A. F. 1190-Q
Laine, David 264-S
Lainer, D. I. 704-M
Lainer, V. I. 329-L
Lais, A. 103-S
Laithwaite, E. H. 170-T
Lakatos, Ladislav. 345-L
Lake, Brooks. 687-K
Lakernik, M. M. . . 399-C, 423-C, 447-C
Lakomskii, V. I. 424-D
Lamale, Gerald E. 449-P
Laman, N. K. 261-F
Lamb, G. C. B. 22-E
Lamb, Vernon A. 711-L
Lambert, Jack L. 130-S
Lambert, P. F. 267-G, 372-G
Lambert, W. 272-T
Lamm, M. M. 229-G
Lancaster, J. F. 99-K, 139-K
Lancaster, P. R. 454-G
Lancellotti, G. 383-S
Lanciano, R. A. 72-G
Land, C. 255-P
Landau, A. I. 112-N
Landberg, P. 194-G
Landen, E. W. 697-Q
Landi, M. E. 299-C
Landsberg, R. 686-P
Landwehr, Gottfried 1109-Q
Lane, D. H. 323-C
Lane, I. R., Jr. 230-C, 231-C
Lane, P. H. R. 150-K, 498-K
Lang, A. R. 703-M
Lang, F. S. 367-R
Lang, G. P. 121-A, 113-B
Lang, R. M. 15-P
Lang, R. S. 125-C
Lang, Walter 283-N, 311-N, 746-Q
Lange, A. 40-C, 114-C, 305-C
Lange, E. A. 464-E, 571-E
Lange, G. 569-L
Lange, Kurt. 145-F
Lange, N. 625-N
Langenberg, F. C. . . . 86-D, 89-D, 410-S
Langenecker, Bertwin. . . . 282-N, 560-Q
Langenheim, A. H. 288-T
Langeron, Jean-Paul. . . 152-C, 25-N, ... 38-N, 66-N, 697-P
Langford, K. E. . . . 207-L, 532-L, 190-S
Langston, M. Eugene. 850-Q
Lanino, P. G. 289-E
Lanitskii, V. I. 548-D
Lansche, Arnold M. 28-A, 328-A
Lanterman, Elma 588-R
Lantratof, M. F. 507-P
Lantzky, Jozsef 345-D, 368-D
Lanusse, P. 108-Q
Lanyi, Ladislav 48-K
Lanzara, A. A. 263-K
Lapee, Roland J. 324-C
Lapin, L. N. 63-S
Lapin, V. V. 431-C, 220-S
Lapitskii, V. I. 547-D
Lapkin, N. I. 211-P
Lapointe, Christian M. 78-C
Lapota, J. B. 55-E
Lapray, D. H. 271-J
Lapshina, M. I. 81-P
Lapsley, J. T., Jr. 53-F
LaQue, F. L. 583-R
Lardenoit, Vernon F. 1507-Q
Largeteau, J. 192-S
Larichev, V. N. 228-P
Larikov, L. N. . . . . 92-N, ... 257-N, 372-N, 373-N
Larin, David J. 426-L
Larin, G. N. 70-K

Larke, W. M. 170-F
Larkin, James B. 30-A
Larkin, N. I. 202-J
Larocca, E. W. 362-G, 365-G
Larrabee, C. P. 719-R
Larroque, Paul 532-M, 467-N
Larson, Edwin R. 298-G
Larson, Frank R. 218-F, 896-Q
Larson, H. R. 543-E
Larson, Louis J. 337-G, 230-K
Larson, Thurston E. 37-R
Larson, W. B. 256-E
Larsson, Ake V. 391-G
Larsson, L. E. 417-N
Lascoe, Orville D. 209-G
Lash, L. D. 16-C
Lashchiver, S. M. 546-K
Lashkarev, V. E. 538-P
Lashkevitch, R. I. 131-F
Lashko, A. S. 555-M
Lashko, N. F. 467-K, 85-M,
. . . . . 521-M, 711-M, 161-N
Lashko-Avaryan, S. V. 467-K
Laskutov, A. I. 1066-Q
Laszlo, V. 328-J
Latinak, I. 138-F
Latisheva, V. P. 43-N
Latkher, K. Kh. 235-S
Latour, A. 144-D
Latysheva, V. P. 72-N
Lauchner, J. H. 529-Q
Lauderdale, R. H. 235-W
Laukonis, J. V. 786-R
Laurenson, T. M. 695-K
Laurent, P. 101-N, 529-N
Laux, Leon E. 341-G, 542-K
Laux, Walter 511-M
Lavendel, H. W. 142-H
Lavigne, M. J. 166-K
Lavrenko, V. A. 234-R
Lavrov, L. G. 423-C
Lavrovskii, K. P. 73-B
Lawless, G. William 1507-Q
Lawless, Kenneth R. 581-M, 768-R
Lawley, Alan 264-C, 356-C
Lawrance, A. J. 69-G
Lawrence, H. McC. 285-D
Lawroski, Stephen 20-B
Lawson, W. D. 137-N, 594-N
Lawthers, D. D. 1033-Q
Lawton, George C. 286-W
Lawton, H. 1319-Q
Lax, Edward 1212-Q
Lax, Melvin. 118-P, 535-P
Lazareva, B. G. 69-N
Lazarus, David 6-N, 494-N
Leach, A. 361-C
Leach, J. S. Ll. 582-P
Leadbetter, A. J. 425-P
Leake, L. E. 509-D
Lean, J. B. 216-M,
. . . . . 541-Q, 1051-Q, 1469-Q
Leary, J. A. 62-C, 335-P
Lebas, B. J. 519-L
Lebedev 411-P
Lebedev, B. F. 193-F
Lebedev, S. I. 79-E
Lebedev, V. A. 442-P
Lebedev, V. K. 225-K
Lebedev, V. P. 266-M
Lebedeva, K. P. 343-N
Lebl, K. 404-M
Le Boucher, Bernard 453-R
Le Boulbin, E. 63-H
Lebrasse, Gordon J. 57-H
LeClaire, A. D. 554-N
Leclerc, Edm. 404-R
Leclerc, G. 192-F
Leclerc, J. 13-D, 3-F
Leclercq, D. 275-R, 701-R
Leddicotte, George W. 13-S, 208-S
Lednov, V. A. 220-W
Leduc, J. Adrien M. 180-H
Lee, C. H. 461-N
Lee, E. H. 241-K
Lee, E. W. 110-P, 120-P, 189-P
Lee, Harold E. 330-C
Lee, O. A. 358-C
Lee, R. L. 166-J
Lee, Tien-Shaey. 156-L
Leech, P. 1318-Q
Leek, C. B. 329-T
Lees, D. G. 569-M, 570-M
Leeser, D. O. 657-P
Lefebre, Andre 310-E
Lefebvre, Achille 314-D, 473-D
Lefebvre, Andre. 281-E, 439-E
Lefebvre, H. 674-K
Lefourcade, Lucien. 532-M
Legare, E. A. 423-L
Le Garec, M. 64-H
Legat, A. 64-F, 43-J, 323-J
Legault, R. A. 718-R
Leggett, R. A. 367-G
Leggett, R. D. 512-N, 580-Q
Legrandjacques, J. 465-D
Le Grand, Rupert 626-L
Legvold, S. 46-P
Lehar, F. 678-K
Lehmann, J. 66-J, 42-M, 356-N
Lehmann, Y. 410-N
Lehr, Pierre 152-C, 25-N,
. . . . . 38-N, 66-N, 697-P
Lehrer, W. M. 207-M

Lehrman, Leo 55-P
Lehto, P. 1522-Q
Lehwald, W. 339-G
Leiber, Gerhard. 121-W
Leich, Hans. 198-L, 12-W
Leidheiser, Henry, Jr. 803-R
Leigh, F. S. 83-W
Leighly, H. P., Jr. 478-N
Leinert, Carl. 226-D
Leites, V. A. 219-D, 427-D
Leith, W. C. 723-R
Leitl, J. 477-E
Leitsin, V. A. 386-C, 388-C
Leitten, C. F., Jr. 166-H
Leizerovich, G. Ya. 32-B
Lejay, H. 40-A, 236-K, 441-L
Lejserov, Ya. S. 480-D
Lelong, P. . . . . 63-F, 257-F, ... 111-R, 593-R, 698-R
Lemainque, Henri. 343-T
Lemcoe, M. M. 756-Q
Lement, B. S. 195-M
Lemfeld, Josef. 76-D
Lemm, Helmut. 254-S
Lemon, R. B. 9-C, 329-T
Lena, Adolph J. 126-J
Lenel, Fritz V. 448-N
Lengrusser 7-X
Lenhoff, S. M. 1198-Q
Lenin, G. I. 999-Q
Lenn, L. Y. 303-D
Lennartz, Gustav 200-N, 469-N
Lennox, T. J., Jr. 679-R
Lenoir, Gabriel 333-N
Lenz, Randall 240-G
Lenze, Josef 183-F
Leonard, J. 236-E
Leonard, J. T. 319-L
Leonardos, Olivero H. . . . . 36-A, ... 37-A, 90-A
Leone, O. Q. 338-C
Leoni, M. 331-A, 251-Q
Leontis, T. E. 543-A
Lepeshinskaia, V. N. 636-P
Lepin, G. F. 1354-Q
Lepinskikh, B. M. 213-P
Lepnev, C. V. 492-Q
Leporatti, Sirio . . . 249-G, 304-G, 713-K
Leretnik, L. D. 215-J
Leroy, P. 253-D
Lesak, S. 1489-Q
Lesk, I. A. 179-L
Leslie, W. C. 577-M
Lesnewich, A. 530-K
Lesnik, A. G. 352-M
Lesokhin, I. G. 111-B
Lesser, Richard. . .325-M, 395-M, 619-M
Lessing, Heinz. 43-M
Lessley, Herman L. 715-Q
Le Thomas, P. J. 1181-Q
Letsky, B. M. 765-L, 796-L
Lev, I. E. 387-N, 1304-Q
Levaux, J. 375-D
Levelink, H. G. 20-E
Levenson, M. 43-C
Levente, S. 1794-R
Lever, R. C. 631-P
Levi, D. L. 586-P
Levi, L. I. 157-E
Levick, R. 574-K
Levin, A. I. 384-C, 516-L, 550-R
Levin, A. M. 401-D
Levin, E. E. 210-M, 1356-Q
Levin, L. Ya. 68-D
Levin, S. I. 430-Q
Levin, S. L. 587-D
Levine, E. D. 472-N, 1172-Q
Levinsohn, H. 12-K
Levinson, D. W. . . . . 213-A, ... 596-M, 337-Q, 1129-Q
Levinstein, M. A. 468-L
Levinzon, Kh. Sh. 39-J
Levinzon, S. M. 278-C
Levitasov, Ya. M. 484-D
Levitin, V. V. 103-J
Levitskii, B. M. . . . . 518-N, ... 592-N, 52-P, 630-P
Levitz, N. M. 20-B
Levkhevilski, I. N. 124-L
Levtchenko, A. A. 7-M
Levy, Alan V. . . . . 368-G, 155-L, ... 295-L, 733-L, 696-Q, 1174-Q
Levy, B. 721-P
Levy, Charles 639-L
Levy, E. M. 438-P
Levy, R. 122-L, 264-L
Levy, S. F. 512-E
Lewis, B. 194-P
Lewis, B. L. 74-X
Lewis, C. J. 5-C
Lewis, Charles F. 7-J
Lewis, D. A. 564-R
Lewis, D. C. 123-C
Lewis, H. A. 364-P
Lewis, Helen E. 126-A
Lewis, K. G. 42-G
Lewis, Milton 20-T
Lewis, P. 341-T
Lewis, W. B. 172-T
Lewis, W. H. 10-C
Lewtas, Ralph 18-X
Leybold, Herbert A. 71-Q
Leyda, W. E. 590-N
Leymonie, C.376-N, 443-N, 526-N, 600-N

Leyshon, H. J. 551-E, 81-W, 367-W
Li, C. H. 1091-Q, 602-R
Liaschenko, B. G. 710-M
Libanati, Cesar 453-R
Liberman, L. Ya. 393-Q
Libman, P. M. 1356-Q
Li-Chi, Tai 485-P
Lichtenberger-Bajza, E. . . 335-L, 338-L
Lichtenberger, Endrene. 613-L
Lichtman, David. 338-N
Liebhafsky, H. A. 122-S
Liebig, W. 257-T
Liebmann, B. 210-N, 501-N
Liebscher, Erich 129-B
Liegeois, J. 682-Q
Liekmeier, F. 342-W
Lifshits, E. V. 241-S
Lifshits, I. M. 439-P
Lifshits, S. I. 124-D, 248-D, 691-D
Lifshits, Ya. G. 1323-Q
Lifshitz, I. M. 124-N
Liggett, L. M. 433-P
Lightenberger, Endrene. 461-L
Lightner, M. W. 189-D
Likes, Jiri 497-M
Likhtman, V. I. 104-G, 111-Q,
. . . . . 256-Q, 362-Q,
. . . . . 365-Q, 783-Q, 1540-Q
Lillie, C. R. 1129-Q
Lilljekvist, Gunnar 518-R
Lillywhite, P. L. 99-W
Limb, H. R. 142-Q
Limonik, M. S. 234-S
Lin, Robert 16-S
Linchevskii, B. V. 97-A
Lincoln, John, Jr. 193-R
Lindackers, K. H. 595-K
Lindauer, R. B. 12-C
Lindblom, Gosta. 448-S
Linde, J. O. 644-P
Lindenlaub, W. 305-C
Lindgren, Arthur 444-S
Lindh, G. 380-K
Lindsay, R. W. 1235-Q
Lindstrand, K. F. 707-Q
Linford, Henry B. 712-L
Ling, F. F. 1388-Q
Lingelbach, R. 731-P
Linhardt, F. 229-S
Linhart, V. 1456-Q
Linicus, W. 136-F
Linnert, G. E. 385-K
Linssen, J. L. 648-K
Lintner, K. 479-R
Lipa, Milan 237-K, 250-K
Lipinskich, B. M. 400-D
Lipkin, Ya. H. 492-L
Lipovetskii, G. Z. 384-E
Lipovetz, Ivan 346-D
Lippenberger, D. V. 34-T
Lipshin, N. N. 227-J
Lipson, S. 128-S
Liseau, Rene 169-W
Lisienko, V. G. 409-D
Lisitsyn, V. D. 392-Q
Litovchenko, I. B. 196-F
Little, George C. 167-W
Little, J. E. O. 175-E
Littmann, Martin F. 365-P
Litton, F. B. 489-A
Litty, Albin 20-B
Lituin, D. F. 710-M
Litvak, S. 592-K
Litvakovskaya, Yu. L. 304-E
Litvin, A. B. 268-Q
Litvinenko, D. A. 67-D, 83-D
Litvinov, B. M. 117-F
Litvinova, T. I. 494-D
Liu, R. P. 475-M
Liubov, B. Ia. 146-N
Livey, D. T. 337-C, 578-P
Livingston, J. D. 247-J
Livshits, A. L. 249-F
Livshits, B. G. 261-J, 116-M,
. . . . . 133-N, 576-N,
. . . . . 613-N, 126-P, 606-P
Livshits, G. L. 172-J
Livshits, L. D. 1538-Q
Livshits, L. S. 226-K,
. . . . . 240-M, 571-Q, 1359-Q
Livshitz, B. G. 291-Q, 1377-Q
Lizal, Boh. 319-S
Lizhinskaya, M. G. 145-P
Ljubarsky, I. M. 458-Q
Ljubchenko, A. P. 458-Q
Ljubov, B. Y. 176-N
Ljungberg, I. 117-H, 139-J
Llewellyn, D. T. 602-N
Lloyd, H. W. 543-E
Lloyd, L. T. 466-N, 574-N, 623-N
Loasby, R. G. 25-P, 33-P
Lobanova, N. D. 228-M
Lobashev, B. P. 11-W
Lobl, K. 773-L, 784-L,
. . . . . 314-N, 428-Q, 1477-Q, 237-W
Locati, L. 1057-Q
Lock, J. M. 130-B
Lockhart, L. L. 608-P
Lockwood, W. H. 163-K
Loess, R. E. 686-R
Loestlin, Konrad 403-N
Loevenstein, H. 406-A
Loewenstein, P. 24-F
Lofblad, B. 380-K

Loftfield, Richard E. 180-H
Logan, Arthur 168-E, 169-E
Logan, Hugh L. 272-R, 641-R
Logan, M. J. 97-P
Logan, R. A. 419-M, 677-N
Loginae, N. A. 735-P
Logsdon, B. E. 74-G
Lohberg, Karl 294-N, 348-P, 85-Q
Lohr, Thomas 47-E
Lokotilov, A. A. 90-R
Lokshin, F. L. 566-N
Loladse, T. N. 267-T
Loll, Thomas 203-L
Lomas, F. M. 1-G
Lombardini, Julius 479-K, 536-K
Lomer, Jenifer N. 388-M
Lomer, W. M. 284-M
Lommel, J. M. 519-P
Lomov, A. L. 480-P
Long, E. L., Jr. 340-M
Long, R. S. 20-C
Longa, Wladyslaw. 635-D
Longan, Hugh L. 336-R
Longaretti, C. 145-W
Longinov, M. F. 380-M, 361-S
Longland, L. 128-H
Lonskii, E. D. 63-K, 141-L
Loofboro, K. S. 124-B
Loomis, Benny A. 190-Q
Loos, F. 68-A
Lopatko, I. F. 238-S
Loper, C. R., Jr. 355-E
Lopes, Anchyses C. 42-D, 54-D
Lord, J. O. 195-G
Lord, W. B. H. 46-T
Lorentz, R. E. 439-W
Lorenz, F. R. 1264-Q
Lorenz, R. 785-R
Lorenz, W. 522-R
Loria, Edward A. . . . . 252-C, ... 85-P, 471-Q, 797-Q
Loriers, Jean 90-C
Lorig, Clarence H. 224-A
Lorking, K. J. 529-L
Loschau, Siegbert. 112-C, 367-C
Loscher, Helmut 25-D
Losco, E. F. 247-K, 242-T
Loscoe, Claire. 725-P
Loseva, L. E. 229-M
Loshkarev, A. G. 113-P
Loshkarev, B. I. 415-E
Loskutov, A. I. 118-G
Loskutov, F. M. 382-C
Lothe, J. 708-M
Loughrey, D. R. 315-D, 418-W
Love, B. 235-A, 530-A
Loveday, P. E. 280-Q
Lovejoy, S. W. 397-G
Lovell, L. C. 205-M, 292-M, 321-M
Low, J. R., Jr. 275-M
Low, Manfred J. D. 252-P
Lowenheim, F. A. 194-R
Lownie, H. W., Jr. 86-E
Lowry, L. 333-L
Lozinskii, M. G. . . . . 97-M, ... 202-M, 259-Q, 1214-Q
Lubahn, J. D. 153-Q, 1085-Q
Lubalin, Irwin 123-E
Lubavskij, K. V. 535-K
Lubitov, Yu. N. 550-P
Lubke, A. 376-A
Lublin, Paul 372-S
Lucas, Heinz 223-E
Lucas, L. D. 467-P
Lucas, R. 63-H
Lucek, R. C. 1388-Q
Lucey, J. A. 17-K, 709-K
Luchok, J. 474-Q
Lucke, K. 210-N
Ludemann, W. D. 1220-Q
Ludwig, H. C. 475-K
Lueder, E. 411-K
Lueg, Werner . . . . . 50-F, 51-F, ... 125-F, 1053-Q
Luerssen, F. W. 371-D
Lueth, August 320-R
Lueth, Gero. 130-C
Luft, G. 377-R
Lukasek, J. 556-K
Lukes, Frantisek 512-P
Lukin, A. N. 140-B
Lula, R. A. 472-Q
Lumb, R. F. 334-Q
Lumley, E. J. 739-L
Lumley, M. C. 450-L
Lumsden, J. 175-C
Lund, H. 107-G
Lundgren, Gunvor. 666-L, 677-M
Lundsten, R. H. 354-P, 642-P
Luneva, Z. S. 47-J
Lunn, Borge 663-R
Lunt, G. E. 102-A
Lupu, Al. 24-C, 111-C
Lustman, B. 185-T, 204-T
Lutgens, Otto. 87-K
Lutter, Erich. 505-L
Luty, W. 206-F
Lutz, F. 518-E
Lux, B. 1013-Q
Lux, H. J. 270-D
Luzhinskaia, M. G. 248-Q
Luzhnikov, L. P. 991-Q
L'vov, G. K. 438-N, 597-N
L'vova, E. P. 69-K, 535-K

Lyalin, E. V. 1422-Q
Lyamina, M. P. 433-C
Lyamkov, P. V. 353-S
Lyamn, W. Stuart 260-T
Lyashchenko, V. S. 792-Q
Lynton, E. A. 47-P, 570-P
Lyon, R. J. 838-Q
Lysaght, V. E. 1135-Q
Lytle, Arthur R. 332-A, 801-Q
Lytle, F. E. 36-S
Lyubavskii, K. V. 69-K,
. . . . . 205-K, 638-K, 320-N
Lyubinov, A. P. 105-M, 669-P
Lyubinskii, B. E. 923-Q
Lyubov, B. Ya. 81-N
Lyucheva, N. N. 178-F
Lyukevich, D. A. 550-K
Lyulicheva, N. N. 1322-Q
Lyumkis, S. E. 678-M

Mc

McAndrew, J. P. 337-Q
McArdle, Gordon D. 354-N
McArthur, D. A. 512-L
McAuliffe, J. F. 397-G, 174-T
McBean, K. D. 133-B
McBreen, Kathleen M. 64-A
McBride, D. L. 19-D, 189-D
McCabe, C. L. 88-D
McCammon, R. D. 854-Q
McClaine, L. A. 145-C
McClean, C. A. 211-W
McClelland, H. U. 279-E
McClintock, Frank A. 345-Q
McClintock, R. M. 1274-Q
McClung, Fred. 700-P
McClung, R. W. 346-S, 437-S
McCollum, R. L. 497-P
McCormick, L. O. 101-R
McCoy, C. W. 111-D
McCuen, Newell H. 154-T
McCullough, E. M. 517-Q
McCullough, J. D. 605-D
McCune, Robert A. 478-N
McDaniel, Forest 311-G
McDonald, William J. 361-G
McDougal, R. L. 350-Q
McDowell, D. W. 357-R
McDowell, J. R. 535-Q
McDowell, J. Spotts 69-B
McDowell, K. H. 708-K
McDowell, Richard W. 209-G
McElhaney, C. J. 385-D
McElrath, T. 242-K
McFee, W. E. 156-K
McGeary, R. K. 405-K
McGee, R. L. 680-Q, 736-Q
McGill, T. C. 120-Q
McGlasson, R. L. 640-R
Mc Glothlin, Gilbert 46-Q
McGonnagle, W. J. 52-S,
. . . . . 260-S, 427-S
McGraw, L. D. 396-L
McGuffey, J. R. 279-N
McGuire, F. G. 279-J
McGuire, Hugh V. 370-L
McGuire, W. J. 675-R
McHargue, C. J. 609-M, 680-M
McHedishvili, V. A. 150-S
McHenry, H. T. 1032-Q
McHugh, J. P. 574-M
McInnis, Wilmer 29-A
McIntire, H. O. 530-Q
McIntosh, L. 226-E
McIntosh, R. B. 716-R
McIntyre, J. B. 435-E
McKee, W. E. 294-C
McKelvie, J. 231-D
McKeown, J. 377-Q
McKim, F. S. 174-P
McKinney, Nancy E. 172-P
McKinnon, N. A. 55-Q
McKinsey, C. R. 654-M
McLean, D. 287-M
McLean, J. S. 275-D
McMahan, J. S. 161-D, 460-D
McMahon, A. D. 61-A
McManus, G. J. 550-D, 580-D
McMillan, W. D. 135-J
McMullen, J. 72-J, 272-J,
. . . . . 380-W, 385-W, 389-W
McMullen, J. G. 1365-Q
McMullen, J. J. 378-P
McNamara, E. P. 130-H
McNary, Donald 12-F
McNeese, L. E. 150-C
McNeil, J. F. 142-Q
McNiece, W. V. 385-D
McPherson, Bryan 987-Q
McPherson, D. J. 26-A
McPherson, John L. 328-R
McPherson, R. M. 190-M
McQueen, H. J. 503-N
McQuillan, M. K. 92-A, 359-A
McTaggart, F. K. 100-M,
. . . . . 131-P, 132-P, 249-Q
McVey, H. J. 480-L
McZedliszwili, W. A. 132-D, 129-S

M

Maacks, H. 268-J
Maas, Hermann 288-D, 666-D

MacArthur, T. J. 293-T, 298-T
MacAskill, Donald 99-B
MacClarence, John 389-E
MacCrone, R. K. 854-Q
MacDonald, D. K. C. 427-P
MacDonald, N. F. 586-R
MacEwan, J. U. 157-R
Macherauch, E. 550-Q
Macherey, Robert E. 223-F
Machlin, E. S. 312-D, 465-N, 412-Q
Machol, R. E. 22-P
Machu, Willibald . . . . . 68-L, 83-L, ... 267-L, 393-L, 134-R, 353-R
MacIntosh, Robert M. 545-L
Mack, D. J. 305-N
MacKenzie, I. M. 511-A, 1-T, 206-T
Mackenzie, J. 283-W
Mackey, G. 535-L
MacLennan, D. F. 564-L
Macnab, A. J. 611-R
Macnairn, J. 335-R
Madden, H. H. 95-P
Maddin, Robert . . . . . 288-M, 289-M, ... 347-M, 461-N, 544-Q
Madigan, G. C. 69-W
Madsen, I. E. 122-A, 169-A
Madsen, P. E. 663-M
Maeda, Motozo. 631-D
Maersch, Robert E. 219-R, 534-R
Magat, L. M. 248-N, 249-N
Magidson, I. A. 285-N
Magno, P. J. 59-C
Magnusson, P. C. 193-W
Magoteaux, Orville R. . . . 247-C, 427-L
Mah, Alla D. 346-C
Mahaffey, J. W. 318-W
Mahl, H. 56-M
Mahler, G. T. 327-C
Mahmoud, K. A. 167-N
Mahn, Gustav. 249-D
Maichenko, H. A. 124-L
Maiden, C. J. 44-Q, 741-Q, 939-Q
Maier, F. 140-T, 177-T
Main, B. 348-G
Mains, R. M. 690-Q
Mair, L. 171-D
Maitak, G. P. 585-L, 114-P
Maitland, R. J. . . . . 168-R, ... 189-R, 295-R, 312-R
Majima, K. 500-E
Makaev, S. V. 70-F
Makarenko, V. S. 67-W
Makarov, E. L. 230-N, 434-N
Makarow, A. N. 4-D
Makhatadze, M. A. 424-G
Makhov, A. F. 124-P
Makhukov, N. G. 606-P
Makin, M. J. . . . . 848-Q, ... 1067-Q, 1284-Q, 1287-Q
Makin, S. M. 245-S
Makino, N. 151-A, 84-P, 447-P
Makioka, Minoru 1398-Q
Makoides, A. C. 166-R
Makolkin, J. A. 218-R
Makovskii, V. A. 121-D
Maksimenko, G. A. 469-Q
Maksimov, Yu. S. 123-D
Maksimova, O. P. 110-N
Maksimovich, G. S. 66-H
Makunin, M. S. 359-C
Makurin, V. A. 642-Q
Mal, Andre 66-W
Malakha, A. V. 360-W
Malakhov, A. I. 375-E
Malcor, H. 220-D, 293-D
Maleev, S. V. 227-P
Malevskii, Yu. B. 321-N
Malinin, N. N. 524-Q
Malinochka, Ya. N. . . . . 207-J, ... 137-M, 712-M, 175-N
Malissa, Hanns 43-M, 32-S
Malkin, V. I. 232-D
Malkin, Ya. Z. 403-C, 424-C
Mallach, W. 716-L
Mallett, G. S. 263-S, 344-S
Mallett, Manley W. . . . . 421-M, ... 182-N, 325-N, 559-N
Mallik, A. K. 629-M, 1296-Q
Mallikarjunan, R. . . . . 254-C, ... 345-C, 50-D
Malmberg, Tore. 200-E
Malofeevd, G. I. 151-S
Maloof, S. R. 635-N, 658-Q
Malotki, H. V. 1250-Q
Malov, A. N. 51-G
Mal'tsev, B. V. 341-C
Mal'tsev, L. A. 619-D, 692-D
Mal'tsev, M. V. . . . . 700-M, ... 627-P, 1481-Q
Mal'tseva, V. S. 84-M
Malvano, R. 691-P
Malyi, A. L. 354-S
Malyshev, N. K. 305-K
Malyshev, V. A. 118-D
Malyukov, A. F. 216-K
Malyutina, T. M. 133-S
Manchen, W. 300-E
Manchenko, L. V. 422-C
Mandaus, J. 34-K, 553-K
Mandin, N. 52-N
Mandl, Miroslav. 476-D, 385-S
Manenc, J. 186-J, 219-N, 272-N
Mang, E. 433-S
Mangelsdorf, Paul C., Jr. . 398-N, 270-P

Mangold, Werner 20-W
Mangone, R. J. 1086-Q, 1344-Q
Manilova, P. Z. 261-Q
Manin, A. E. 390-C
Manjoine, M. J. 157-Q, 1033-Q
Mankher, Lajos 66-F, 427-Q
Manly, W. D. 22-H, 7-T
Mann, J. Y. 419-Q, 1261-Q
Mann, K. E. 202-E
Mann, Walter. 384-D
Manning, G. 587-P
Manning, George K. . . .148-Q, 181-Q,
. . . . . 680-Q, 734-Q, 736-Q
Manns, T. J. 823-L
Manser, W. C. 95-C
Mansfield, R. 32-P
Mansford, R. E. 21-L, 206-L
Manson, S. S. 508-Q,
. . . . . 970-Q, 1009-Q, 199-T
Mantel, W. 302-G, 409-K
Mantovani, Giorgio. 612-R
Mantulin, N. G. 465-C
Manuel, Lloyd 31-L
Many, A. 539-P
Marais, D. De. W. 412-W
Marais, J. J. 176-E
Maraman, W. J. 62-C
Maran, F. 468-E
Maranchik, John, Jr. 223-G,
. . . . . 242-G, 342-G
Maratray, F. 125-Q
Marchand, J. F. 595-P
Marchandise, Hubert. 27-B
Marchenko, Yu. T. 58-K, 204-K
Marchukova, I. D. 136-M,
. . . . . .229-M, 698-M
Marczis, Laszlo. 169-D
Mardon, P. G. 291-M
Marechal, Jean R. 107-Q
Marechal, Karoly 337-E
Marek, Richard 4-K
Margerand, Rene 411-M, 650-N
Margerie, J. C. . . . 412-N, 1014-Q, 36-W
Margival, F. 214-L
Margolin, H. 20-Q,
. . . . . 763-Q, 777-Q, 1132-Q
Margoninski, Y. 540-P
Margouless, A. U. 85-T
Marianeschi, E. 74-S
Mariassy, Mihaly 105-B
Marienbakh, L. M. 382-E
Marin, Joseph 1185-Q, 1218-Q
Marincek, B. 330-D, 424-S
Maringer, R. E. 187-M
Marino, Daniel A. 163-L
Marinov, A. I. 57-D, 67-D
Marion, Fernand 193-S, 24-X
Marker, Rudolf 360-L
Markman, B. F. 120-C
Markov, A. I. 448-G
Markov, B. L. 567-D, 568-D
Markova, S. D. 179-F
Markovic, T. 24-R, 79-R
Marks, Harold. 117-G
Marler, Margaret A. 218-S
Marochkin, V. N. 1423-Q
Marotz, Robert 57-S
Marriner, R. S. 1349-Q
Marschall, H. J. 42-S
Marsh, L. E. 975-Q
Marsh, L. L. 181-Q
Marshakov, I. K. 435-R, 485-R
Marshal, W. 306-M
Marshall, A. 170-E
Marshall, G. D. 172-T
Marshall, H. 74-D
Marshall, J. 356-G
Marshall, L. C. 956-Q
Marshall, M. W. 473-Q, 490-R
Marshall, P. H. 677-L
Marshall, P. W. 111-J
Marshall, T. 249-R
Martin, A. J. 467-C, 496-N
Martin, D. C. 282-K, 358-K, 407-K
Martin, F. S. 389-R
Martin, G. 458-E
Martin, Lucien. 378-E
Martin, M. J. C. 51-P
Martin, R. K. 225-F
Martin, Roger E. 1442-Q
Martin, W. G. 78-T
Martinez, Ramon Roman 250-J
Martinod, Henry. 231-J
Martinov, I. G. 193-F
Marton, L. 111-P
Martorell, Jose Terraza 584-P
Marty, W. 247-P
Martynov, V. P. 614-N
Marucchi, Jean 533-M
Maruoka, Hidetoshi. 313-T
Maruya, Kazuo. 45-D
Maruyama, Kiyoshi. 100-L
Maruyama, Masuteru 114-E,
. . . . . 187-E, 379-N
Marwedel, G. 376-R
Mar'yanovskaya, T. S. 874-Q
Masanobu, Sasagawa. 2-P
Mascre, Claude 281-E, 310-E,
. . . . . 439-E, 481-P, 288-Q
Mashkov, A. K. 193-N
Mashovets, V. P. 350-C,
. . . . . 454-C, 221-S
Masin, Alois 444-M
Maslanka, A. 35-D, 468-D

Maslenitskii, I. N. 396-C
Mason, David M. 513-R
Mason, J. F., Jr. 365-R
Mason, Warren P. 774-Q
Mass, R. H. 461-R
Massalski, T. B. 185-M, 688-P
Massard, J. M. 733-Q
Massion, Wolfgang 138-B
Massobrio, G. 613-D
Mastel, B. 361-M
Masubuchi, Koichi 624-Q
Maszucchelli, A. P. 51-W
Matchett, R. L. 372-K
Mateer, R. S. 335-M
Matejec, Michal 44-G
Mathea, Alfred. 81-F
Matheson, Wilfrid G. 572-L, 619-P
Mathews, H. E. 685-R
Mathewson, C. H. . . . . 534-A, ... 614-M, 284-T
Mathien, V. 436-S
Mathur, S. K. 705-K
Mathur, V. D. . . . . 40-Q, ... 96-Q, 794-Q, 876-Q
Matoba, Sachio. 699-P
Matraski, A. 82-B
Matsukura, Tsuneo 703-P
Matsukura, Y. 375-N
Matsumae, T. 93-T
Matsumoto, Etsuo. 703-P
Matsumoto, K. 94-T
Matsunaga, Masahisa 378-Q
Matsuo, Shigeki 50-S
Matsuo, Shigeru 240-N
Matsushita, Yukio. 54-P
Matsuura, Tsuguyoshi 426-A
Matsuura, Y. 1075-Q
Matsuyama, Tokuzo 275-G
Mattern, K. L. 68-C
Matthews, A. E. 408-A
Matthias, Bernd T. 643-M
Mattig, Alexander. 359-W
Matting, A. . . . . 301-G, ... 253-J, 412-K, 429-Q
Mattsson, E. 537-A, 761-Q
Matukura, Y. 613-P
Matusek, J. J. 283-L
Matveev, A. T. 381-C
Matveev, P. M. 333-D
Matveev, V. N. 578-L
Matveev, Yu. E. 673-M
Matyas, Milos 509-P
Matz, G. 183-T
Mautz, Earl W. 87-C, 89-C
Mavrodii, P. D. 347-W
Max, A. M. 244-N
Maxwell, W. A. 729-P, 346-T
May, C. E. 26-B
May, J. E. 305-M
May, Martin 495-N
May, Otto 217-G, 232-G
Mayants, A. D. 409-C
Mayer, G. 877-Q
Mayer, K. E. 137-D, 289-D, 353-D
Maykuth, Daniel J. 433-R
Mayne, J. E. O. 113-R, 594-R
Maynes, Malcolm M. 270-L
Mayr, Klara 274-D
Mazanek, Eugeniusz 208-W
Mazel, A. G. 58-K, 308-K
Mazzarella, Vincente 341-E, 98-H
Mead, H. W. 980-Q
Meallier, Andre 369-P
Meany, J. J., Jr. 127-R
Meany, W. J. 451-G
Mears, R. B. 720-R
Mecham, W. J. 21-B
Mechenov, P. I. 410-C
Meckel, B. B. 101-M
Meckelburg, H. 86-K, 346-K, 183-S
Medeleanu, Valentin 130-A
Mednikov, Yu. A. 44-F
Medovar, B. I. 154-K, 269-K, 321-N
Medvedev, V. K. 400-C
Medvedev, Ya. I. 63-E
Meers, Henry A. 356-L
Meerson, G. A. 234-A, 448-C, 183-H
Meessen, A. 645-P
Meghreblian, R. V. 163-Q
Meguro, Hiroshi. . . . 184-E, 386-Q, 895-Q
Mehl, E. 118-H
Mehl, R. F. 242-N
Mehringer, F. J. 1292-Q
Meier, J. W. 608-Q
Meier, R. 218-G
Meijering, J. L. 456-M, 506-R
Meinhart, W. L. 1190-Q
Meinhold, Ted F. 1-B
Meisenheim, R. S. 294-E
Meissner, Joachim 827-Q
Mekhedov, V. N. 276-P
Mekhovshschikova, G. N. 466-R
Meldau, Robert 221-A
Melde, Karl F. 314-T
Meleshko, A. M. 184-F
Meleshko, V. I. 150-F
Melick, E. Stanley 207-S
Melikhov, V. V. 214-C
Mellgren, Svante 131-S
Mel'nichuk, P. I. 641-Q
Melnik, V. I. 441-G
Meloy, Richard C. 286-A
Mencarelli, E. 252-M, 409-M
Mendeleeva, D. 464-R

Meng, Chierego Nidia 90-T
Menges, Georg. 207-G, 248-G
Mensing, W. 604-K
Mentch, Robert L. 328-A
Menuet-Guilbaud, B. 84-B
Menzel, Dorothea. 561-M
Mercader, Jeno 122-W
Mercer, A. D. 250-R
Merchant, Harish D. 163-E
Mercier, P. 50-G
Meredith, B. E. 1518-Q
Meredith, K. E. G. 405-M
Meredith, R. 664-K
Meriel, Pierre. 715-P
Merkulova, O. P. 86-J
Merkulova, R. F. 483-C
Merlina, A. V. 236-N, 371-Q
Mermel'shtein, Yu. M. 250-N
Merrick, R. D. 461-R
Merriman, A. D. 214-A
Merriman, H. B. 446-K
Merten, Ulrich. 11-C
Meschi, D. J. 593-P
Meshii, M. 672-Q
Mes'kin, V. S. 202-J
Mesnyaev, Yu. R. 428-W
Messner, O. H. C. 50-T
Mesyats, V. I. 160-W
Metcalf, W. E. 100-N
Metcalfe, Arthur G. 778-Q
Metrailer, F. M. 273-L, 350-L
Mette, Herbert. 537-P, 725-P
Metz, A. 47-X
Metz, C. F. 55-A
Metzer, M. 630-M
Metzger, Ernst 447-G
Metzger, M. 13-G
Metzger, W. 339-L
Meuller, E. R. 517-R
Meussner, R. A. 516-M
Meyer, A. J., Jr. 11-H, 159-Q
Meyer, D. 569-L
Meyer, F. H., Jr. 363-R
Meyer, G. 1183-Q
Meyer, H. 264-Q
Meyer, L. 688-P
Meyer, Robert H. 307-R
Meyer, Robert J. 335-C
Meyer, Siegfried 86-S
Meyer, W. H. 540-Q
Meyer, Walter B. 392-L, 598-L
Meyer, Walter P. 558-L
Mezhennaya, S. O. 1244-Q
Mezoff, J. G. 162-Q
Mgebran, O. I. 611-M, 612-M
Michaelis, Robert E. 17-S
Michard, J. 82-B, 88-B
Michel, Andre-Heuri. 479-N
Michel, Pierre. 527-N
Micheletti, Gian Federica 269-G
Michels, I. 381-L
Michelson, John A. 121-R
Miculescu, R. 8-F
Middelhaufe, Paul. 14-J
Middleton, J. M. 503-E
Mielenz, C. 110-S, 466-S
Mielke, Chester R. 3-E, 394-E
Migaud, Bernard 153-N, 567-Q
Migdal, A. B. 168-M
Mignolet, J. C. P. 179-P
Mihajlovics, Marienbah Lev. 562-E
Mihalisin, J. R. 301-N
Mii, Hisao. 35-G, 15-J
Mikesell, R. P. 672-N, 1475-Q
Mikhailenko, A. Ya. 435-W
Mikhailov, N. I. 472-C
Mikhailovsky, Y. N. 259-R
Mikhalenkov, V. S. 91-N
Mikhalev, M. S. 184-Q
Mikhaylov, D. V. 457-G
Mikhin, T. A. 69-J
Mikhlin, I. I. 58-K
Mikhno, B. P. 496-D
Miklosi, C. 668-Q
Miklosi, Viorel 250-W
Mikos, Walter 226-A
Mikus, E. B. 542-N, 1184-Q, 1436-Q
Milanese, G. 589-R
Milants, H. 814-R
Milazzo, Giulio 505-R
Mil'chev, V. A. 84-M, 265-M
Milek, John T. 263-T
Miles, A. T. 9-B
Milford, R. P. 12-C
Millage, Donald R. 357-L
Millar, H. P. 340-W
Miller, D. 54-E, 166-E
Miller, D. R. 1371-Q
Miller, E. C. 222-F
Miller, Earl H. 128-R
Miller, Elmer L. 332-C
Miller, G. L. . . . . 146-A, 336-A, ... 185-C, 379-C, 120-H
Miller, G. Tyler, Jr. 581-M, 768-R
Miller, George T. 37-C
Miller, H. R. 627-L
Miller, Harry E. 136-K
Miller, Howard E. 109-J
Miller, Iu. G. 138-N, 222-P
Miller, James F. 520-P
Miller, John G. 370-E
Miller, L. 539-E
Miller, L. E. 729-L
Miller, O. G. 381-C

Miller, P. D. 275-Q, 99-T
Miller, R. 88-D
Miller, R. R. 252-E, 261-P, 608-P
Miller, Yu. G. 1498-Q
Million, Adolphe. 302-K
Mills, C. V. 194-T
Mills, R. D. 480-E
Mills, R. G. 23-H
Milman, B. S. 284-E, 411-E, 799-R
Mil'man, E. S. 148-E
Milne, H. S. 147-F
Milner, D. R. 376-K
Milyaev, V. L. 400-C
Mima, Genjiro . . . . . 665-N, ... 795-Q, 1390-Q, 1461-Q
Mima, Yoshifumi 490-N, 112-S
Mimukhin, B. M. 678-M
Minato, Akira 184-E, 895-Q
Minato, Kiyoshi 273-G
Mincu, C. 157-T
Minden, H. T. 175-P
Mindukshev, V. F. 277-M, 486-Q
Miner, Harvey D. 370-E
Miner, Milton A. 351-Q
Miner, W. N. 623-M
Minford, J. D. 280-R, 281-R, 113-W
Mingazin, T. A. 63-P
Ministr, Zdenek . . . . . 47-H, ... 146-H, 54-M, 64-M
Minkevich, A. N. 577-L
Minkina, E. A. 1347-Q
Minowa, Susumu. 290-E, 15-J
Minter, F. J. 1067-Q
Mintern, R. A. 127-S
Mintrop, H. 1215-Q
Minullina, M. Sh. 214-R
Mioen, Th. 283-C
Mirand, P. 412-M, 575-M
Mirgalovskaya, M. S. 669-M
Mirkin, L. I. 600-M, 612-N, 245-Q
Mirolyubov, E. N. 566-P
Mironov, L. V. 103-J, 115-M
Mironov, N. F. 234-A
Mirovskii, E. I. 25-F
Miryasov, N. Z. 127-N
Mirzabekov, F. 210-C
Misch, R. D. 151-P
Misek, Karel 150-Q
Miselyuk, E. G. 538-P
Mishima, Tokushichi. 324-A, 447-P
Mishima, Y. 111-A, 666-Q, 1394-Q
Mishimura, Akinori 522-P
Mishler, H. W. 407-K, 612-K
Mishukov 372-E
Misiokek, Z. 233-Q
Miske, Jack C. 59-E
Missel, L. 46-L
Missman, Rolland. 544-P
Misurec, Rudolf 603-L
Mital, John A. 584-Q
Mitchel, J. W. 385-M
Mitchell, B. J. 118-S
Mitchell, E. 3-J
Mitchell, Malcolm 96-L
Mitchell, R. N. 243-A
Mitchell, W. H. 16-P
Mitkalinnyi, V. I. 553-D
Mitsuhashi, Tetsutaro . . . 1103-Q, 1104-Q
Mitui, Tadayasu 714-P
Miura, Sei. 254-N
Miyahard, Syohei 713-P
Miyakawa, Ohmi. 622-N
Miyamoto, Hiroshi 888-Q
Miyamoto, Kazuo 389-Q
Miyauchi, J. 129-A
Miyazaki, Takeshi 318-P
Miyoshi, Satoshi. 146-F, 292-F
Mizokawa, Jiroh. 508-L
Mizuno, Keichi. 359-N, 31-Q
Mizuta, Michio. 1461-Q
Mobchan, B. A. 211-M
Mobius, Hans Eberhard 169-M
Mobley, L. S. 276-W
Mocek, Jiri 393-D
Mochel, N. L. 724-R
Mochizuki, F. 637-L
Mochizuki, Kaname. 271-D
Mocsy, A. 133-E
Modic, F. 623-L
Modin, H. 310-N
Modin, Sten 278-J
Modracek, O. 273-T
Modrzejewski, Antoni 357-N
Modylevskaya, K. D. 481-R
Moe, C. A. 344-M
Moehling, J. P., Jr. 207-E
Moerman, W. 646-K
Mogford, I. L. 99-Q, 656-Q
Moguchii, L. N. 267-F
Mogutnov, B. M. 535-D
Mohl, H. 378-S
Mohler, J. B. . . . . 58-L, ... 397-L, 463-L, 640-L
Mohrnheim, A. . . . 233-F, 239-F, 230-W
Mokhov, Iu. N. 150-N
Mokhov, V. M. 53-M
Moldavskii, O. D. 713-M
Molderez, J. 243-D
Moll, Sheldon H. 502-N
Moller, Hermann 128-M, 226-M
Moller, M. E. 618-M
Moller, P. T. R. 334-T
Molnar, Imre. 196-C
Molotilov, B. V. 144-P, 156-P

Molotkov, V. A. 506-D
Momose, Tsuneo 521-E
Monakhova, V. S. 83-S
Monastyrskii, V. Ya. 401-D
Mondolfo, L. F. 299-N
Moneyron, M. 209-K
Monfagne, R. 108-G
Monroe, R. E. 331-K, 366-K, 653-K
Monsees, Ralph G. 254-F
Montalenti, G. 708-P
Montariol, F. 440-P
Montgomery, K. R. 294-P
Montgomery, W. E. 340-G,
. . . . . 377-G, 296-T
Monti, H. 200-M
Montil'o, I. 653-D
Montuelle, Jean 367-M, 26-N,
. . . . . 224-N, 651-N, 674-N, 1090-Q
Mooradian, A. J. 203-T
Moore, A. 496-N, 249-Q
Moore, A. J. W. 414-M
Moore, Alan R. 549-E
Moore, D. W. 303-Q
Moore, J. D. 6-C
Moore, James H. 429-A
Moore, K. K. 650-R
Moore, N. C. 128-H
Moore, Robert L. 71-Q
Moore, W. W. 195-G
Moore, William H. 79-Q
Moorman, J. H. 573-E
Moorti, V. R. Guru 9-M
Morachevskaya, V. S. 426-C
Morachevskyi, Yu. V. 68-S
Moran, J. J., Jr. 124-A
Moranville, C. 63-H
Mordike, Barry L. 1178-Q
Mordvintsev, A. V. 398-K
Moreau, A. 112-K
Moreau, Jean. 320-D,
. . . . . 365-M, 171-R, 468-R
Morehouse, D. 451-G
Morgan, A. D. 390-E, 707-L
Morgan, A. N. 55-C, 62-C
Morgan, Albert R., Jr. 562-R
Morgan, E. L. 83-F
Morgan, E. R. 608-N
Morgan, Eric R. 108-J
Morgan, Evan 440-S
Morgan, G. R. 609-D
Morgan, J. B. 228-S
Morgan, J. G. 264-R
Morgan, J. H. 46-R, 232-R, 634-R
Morgan, P. A. 574-K
Morgan, P. G. 408-M, 295-Q
Morgan, R. E. 680-P
Morgan, S. W. K. . . 502-A, 175-C, 329-C
Morgan, T. N. 577-P
Morgan, W. A. 93-F,
. . . . . 111-F, 1327-Q, 732-R
Morgan, W. G. 175-E
Morgart, P. M. 591-L
Morgun, V. P. 605-Q
Mori, L. 252-Q, 522-Q, 966-Q
Mori, S. 686-R
Mori, Tsutomu. 659-N
Morichika, Toshiaki 102-L
Morimoto, Ichiro 1106-Q
Morimoto, Saburo. 1392-Q
Morinaga, T. 60-F, 482-N,
. . . . . 5-R, 228-R, 760-R
Morisset, P. 586-L, 85-R, 526-R
Morita, Zen-Ichiro. 363-D
Mornheim, Anton F. 702-L
Moroanu, A. 88-P
Morooka, T. 1076-Q
Morosnikov, I. A. 326-J
Moroz, L. M. 177-N
Morozov, A. N. 248-F
Morozov, I. S. 39-C
Morozova, A. M. 660-N
Morozova, E. M. 319-J
Morozumi, Shotaro. 141-M
Morral, F. R. 94-A, 181-T
Morri, D. 289-Q
Morris, C. R. 74-W
Morris, J. 349-S
Morris, J. P. 358-P
Morris, Peter R. 296-M
Morris, R. J. 1024-Q
Morrison, C. W. 134-B
Morrison, J. A. 425-P
Morrison, John J. 496-L
Morriss, F. G. 705-R
Morrogh, H. 28-M
Morrow, Jodean. 531-Q,
. . . . . 764-Q, 1374-Q, 1401-Q
Morsing, Lars 648-R
Morten, F. D. 115-P
Mortlock, A. J. 394-N, 522-N
Mosher, Donald 203-L
Mosny, Martin. 44-K, 363-W
Moss, A. R. 282-C, 546-M
Moss, G. E. 691-R
Moss, M. L. 287-S
Moss, R. L. 238-M
Mosser, J. E. 476-A
Mote, M. W. 296-N, 19-Q, 1476-Q
Mote, Richard H. 523-A
Motloch, Zdenek. 77-D
Motoyama, Seitarou 181-J
Mott, Norman S. 650-Q
Mott, R. A. 300-A
Motz, W. 262-L

Moussa, A. A. 248-P
Movchan, B. A. 145-N
Movchan, V. A. 557-M
Mozhaev, N. V. 412-D
Mozhaiskaya, T. I. 234-F
Mozjukhin, E. I. 73-H,
. . . . . 332-J, 588-N, 289-R
Mraz, M. J. 190-T
Mrowec, Stanislaw . . .155-N, 51-R, 74-R
Mrowka, Ditmar. 201-N
Muan, Arnulf 344-D
Mucka, Jan 118-J
Mueller, E. R. 39-L
Mueller, J. 144-J
Mueller, J. A. 21-G, 147-G, 182-G
Mueller, John J. 291-F, 742-R
Mueller, M. H. 420-M
Mueller, R. S. 78-K, 659-K
Mueller, Rolf K. 572-P
Muennch, C. F. 727-Q
Muhlberger, Horst 339-S, 237-T
Muir, Hugh 62-Q
Mukae, S. 12-E
Mukai, Masao 253-L, 412-L
Mukai, Tadasuke 1112-Q
Mukherjee, S. G. 313-D
Mukherji, G. 593-K
Mukhin, G. G. 102-K, 192-N
Mukhina, M. A. 118-F
Muldawer, Leonard. 30-P
Mulder, B. 437-K
Mulders, O. 1302-Q
Mulhearn, T. O. 740-Q
Mullenbach, W. 94-W, 106-W, 390-W
Muller, G. 67-H
Muller, H. H. 407-G
Muller, Hans Gunter 125-F, 44-W
Muller, Hartwig 464-M
Muller, Herbert 323-M, 461-M
Muller, Horst-Guido 317-M, 407-P
Muller, Joachim. 186-E, 488-E
Muller, K. 452-Q
Muller, Ludwig 122-C
Muller, Rudolf 89-W
Muller, W. 395-K
Muller-Trimbusch, K. 47-W
Mullins, W. T. 208-S
Mullins, W. W. 274-M
Mulvey, T. 79-X
Mumrikov, P. V. 546-K
Muncner, Ladislav 373-K
Munro, B. S. 1457-Q
Munro, W. 54-H
Murach, N. N. 209-C
Murai, Kousuke 627-N
Murakami, Miyuki 152-P
Murakami, Yotaro 526-M
Murai, Kousuke 640-N
Muraki, Tsunemitsu 193-E
Murao, Tsuyoshi 26-P
Muravev, A. V. 441-G
Murayama, Kenji 44-R
Murbach, E. W. 253-C
Murdoch, A. W. 26-L
Muromachi, Shigeo 284-F
Muromkin, Yu. M. 719-P
Murphy, Andrew H. 119-F
Murphy, E. B. 734-L
Murphy, Glenn 215-Q
Murphy, Nelson F. 643-L
Murphy, W. F. 78-P
Murrary, J. D. 455-Q
Murray, D. 1159-Q
Murray, J. P. 56-A
Murray, J. R. 70-M,
. . . . . .465-M, 548-M, 1040-Q
Murray, R. G. 671-R
Murray, S. F. 341-T
Murray, T. P. 91-S
Murty, G. V. L. N. 347-R
Muscott, A. 553-R
Musgrove, M. D. 308-T
Musial, Michal. 13-F
Musikhin, V. I. 161-P
Musin, A. K. 217-P
Mustafin, I. S. 156-S
Musted, G. Gordon 618-K
Mustelier, J. P. 593-N
Mutaguchi, Mototaka 104-E
Muth, Peter. 407-P
Muttach, Harold A. 286-W
Muvdi, B. B. 59-H
Muzelevskii, O. G. 112-Q
Myagkova, A. P. 441-R
Myasnikov, Yu. G. 672-L
Myer, R. T. 452-A, 155-G
Myers, R. G. 260-S
Myhill, A. R. 417-A
Mykura, H. 684-N
Myles, K. M. 1503-Q
Mylonas, C. 1180-Q, 1352-Q
Myshenkov, N. I. 441-D
Myshkin, V. A. 694-R
Myslivec, Theodor 476-D
Mysowski, W. S. 533-E
Myssovski. 176-D

N

Nabarro, F. R. N. 4-N, 17-N
Nachtman, E. S. 166-G
Nachtrieb, Norman H. 60-N,
. . . . . 174-N, 520-N
Nacken, Matthias 198-D

Nadasan, Stefan 304-K
Naeser, Gerhard 235-D
Nagai, Akira 703-P
Nagai, Ryutaro. 1491-Q
Nagakura, Sigemaro 261-M
Nagasaka, Hideo. 445-Q
Nagasaki, Kyuya. 4-L
Nagashima, Shin'ichi. 694-M, 695-M
Nagata, Norio 1105-Q
Nagatsu, H. 98-T
Nagel, F. J. 571-L
Nagy, Ferenc. 281-W
Nagy, Lajos. 199-S
Naidich, Yu. V. 662-P
Naitoh, A. 102-T
Naitoh, I. 97-T
Najima, Nobuaki. 13-Q
Naka, Shigeharu. 82-H
Nakache, F. 659-P
Nakajima, S. 115-B
Nakajuma, Koichi 102-Q
Nakamichi, Takuro 546-P
Nakamura, Fumitosi 387-Q
Nakamura, K. 446-E
Nakamura, Minoru 99-L
Nakamura, Motoyuki 33-M, 240-N
Nakamura, Shoji. 112-R
Nakamura, T. 115-B, 195-Q
Nakane, K. 113-K
Nakanishi, Fujio. 255-Q
Nakayama, Noboru 35-G
Nakayama, Tadayuki 596-R
Nakayama, Takakado. . .233-L, 509-L,
. . . . . 510-L, 638-L, 781-L
Nakagawa, Ryuichi 1102-Q
Nakano, Taira 1398-Q
Nakazima, Hirooki 622-D
Nakhimov, D. M. 990-Q
Nandi, A. N. 446-R
Nandori, Gyula. 262-E, 444-R
Nantz, D. S. 351-P
Narsky, S. A. 706-K
Naryshkin, A. A. 996-Q
Nasarov, S. T. 159-S
Nash, R. R. 472-N, 1172-Q
Nashel'skii, A. Ya. 439-C
Nasledov, D. M. 122-P,
. . . . . 123-P, 280-P
Naslevkov, D. N. 96-M
Natapov, B. S. 565-N, 281-T
Natarajan, A. 446-R
Nathans, M. W. 212-A
Nathorst, H. 146-R
Naumann, A. W. 494-P
Naumann, Fritz 238-E
Naumann, Friedrich Karl. . . . 880-Q,
. . . . . 986-Q, 500-R
Naumchenkov, N. E. 511-Q
Naundorf, Alfred 106-A
Navara, Vaclav 604-L
Navrotskii, D. I. 642-Q
Nazarenko, G. T. 1001-Q
Nazarenko, V. A. 64-S, 134-S
Nazarov, G. V. 415-K
Nazarov, S. T. 549-K
Nazarova, T. N. 247-Q
Nechaev, V. D. 115-K
Necheles, Robert M. 285-K, 332-K
Nedey, Georges 597-L, 401-R
Nedumov, N. A. 322-N
Needleman, B. 208-E
Nefedov, A. A. 34-J, 186-P
Negrejew, W. 57-R
Negrescu, Traian Tr. 27-D, 115-D
Nehrenberg, A. E. 340-T
Neill, W. J. 150-C
Neiman, A. S. 532-R
Nekhendzi, Yu. A. 69-E
Nekrasov, S. G. 156-W
Nekrasov, Z. I. 42-B, 476-S
Nel, L. G. 64-R
Nell, E. 29-L
Nelli, J. R. 95-C
Nelson, C. E. 2-A
Nelson, E. N. 113-B
Nelson, E. W. 86-G
Nelson, G. A. 662-R
Nelson, Homer B. 390-G
Nelson, K. E. 1328-Q
Nelson, Michael 449-R
Nelson, Ronald D. 681-M, 97-N
Nelson, W. L. 27-R
Neifeld, I. E. 56-K
Neighbours, J. R. 204-Q
Nemec, Jaroslav 315-Q
Nemec, Josef. 6-R, 378-R
Nemeth, Pal. 346-D
Nemkin, V. M. 220-W
Nemnonov, S. A. 145-M, 4-S
Nemoshkalenko, V. V. 230-M,
. . . . . 23-P, 396-P
Nenaezdnikov, I. A. 404-K
Nenasheva, L. A. 6-S
Nepomuceno, L. X. 427-A,
. . . . . 262-G, 305-S
Nepper, M. 375-D
Neroslavskaya, L. L. 449-C
Nesbitt, E. A. 485-M, 333-P, 496-P
Neshpor, V. S. . . .113-M, 149-M, 170-P
Nesmeyanov, An. N. 411-P
Nesterenko, T. T. 223-D
Nestler, C. G. 89-M, 273-M
Nettle, J. R. 298-C, 338-C
Neu, M. G. 156-C

Neuberger, Alfred . . . . . 33-S, ... 419-S, 475-S
Neuhaus, Herbert 30-B, 183-D
Neuhaus, W. 809-L
Neuhofer, Georg. 569-K
Neuilly, M. 461-S
Neumann, A. 395-Q
Neumann, F. W. 203-G, 343-G
Neumann, Franz. 617-P
Neumann, K. 513-K
Neumayr, F. 232-C
Neuweiller, N. G. 85-T
Nevitt, M. V. 488-M
Nevzorova, A. A. 225-R
Newby, B. J. 26-B
Newkirk, H. W., Jr. 909-Q
Newkirk, J. B. . . . 518-M, 225-N, 242-N
Newman, D. R. 656-L
Newman, R. C. 171-M, 59-N, 168-N
Newman, R. P. 860-Q, 1295-Q
Newman, T. R. 260-R, 537-R
Newmann, M. M. 18-P
Newmark, N. M. 612-Q
Newton, Clarence J. 33-X
Newton, Joseph 143-B
Ney, Eugene 429-E
Neyland, A. P. 109-E
Neynaber, R. H. 437-M
Niblett, D. H. 298-Q
Nicholas, E. E. L. 35-E
Nicholas, J. F. 1291-Q
Nicholas, K. E. L. . . . . 144-E, ... 253-E, 293-E
Nicholas, M. G. 376-K
Nicholas, R. G. 21-E
Nicholls, John H. 476-R, 812-R
Nichols, Frank R. 170-C
Nichols, J. L. 416-K
Nicholson, M. E. 424-Q
Nickel, E. Gunter 529-E
Nickel, J. C. 279-M
Nickel, Otto. 299-S
Nickell, Gustav 268-E
Nicol, J. D. 420-G, 671-K
Nicolaeva, L. G. 384-S
Nicolaid, Maria 130-A
Nicolaides, P. 514-N
Nicolaus, H. O. 196-T
Niebch, Georg 110-J
Niebylski, L. M. 537-Q
Niechendzi, J. A. 675-N
Niedrach, L. W. 93-C
Niedzwiedzki, Antoni. 165-G
Nielsch, Walter 327-S
Nielsen, H. 1470-Q
Nielsen, Hans Thornberg 441-E
Nielsen, N. A. 614-R
Nielson, S. 79-C, 137-N, 594-N
Niemann, J. T. 407-K
Niesse, J. E. 544-E
Niessen, K. F. 413-M
Nieth, F. 1412-Q
Nifontoff, Nicolas 533-M, 483-R
Nigri, Piero 643-D
Nigriny, Victor 657-L
Niisawa, Jun'etsu 254-Q
Nijhawan, B. R. . . . 341-A, 595-D, 407-N
Nikerkorn, I. 106-C
Nikiforov, G. D. 470-K
Nikitaeva, O. I. 308-C
Nikitin, A. N. 64-D
Nikitin, I. D. 234-F
Nikitin, M. S. 222-K
Nikitina, E. I. 142-S
Nikitina, L. N. 142-B
Nikolaev, A. G. 281-D
Nikolaev, A. V. . . . 300-J, 164-K, 411-W
Nikolaev, G. A. 342-K
Nikolaev, M. A. 390-C
Nikolaev, N. A. 676-D
Nikolaeva, S. A. 159-P
Nikol'skaya, A. V. 480-P
Nikol'skaya, I. V. 151-S
Nikol'skii, I. V. 1252-Q
Nikonorova, A. I. 110-N
Nikonova, M. P. 140-S
Nikulina, A. F. 694-R
Nilson, W. G. 82-Q
Nilsson, Karl. 55-W, 65-W
Ninea, N. E. 567-E
Ninomiya, K. 139-L
Nippes, Ernest F. . . . . 315-K, ... 632-K, 620-Q
Nisel'son, L. A. 138-M
Nishida, Keizo 425-R
Nishihara, Mamoru. 1398-Q
Nishihara, Toshio. 887-Q
Nishimatsu, C. 1223-Q
Nishimura, Tomitaka 676-M
Nishimura, Yoshio 526-M
Nishioka, Kunio 74-J, 61-Q
Nishiyama, K. 366-E
Nishiyama, Sachio 458-R
Nishiyama, Zenji . . . . . 330-M, ... 442-M, 691-M
Nishizawa, Taiji. 627-N, 640-N
Niskanen, E. 477-M
Nisle, R. G. 626-P
Nissen, Chr. Kjaergaard 240-T
Nitsche, J. 547-E
Nitzovich, V. M. 181-P
Nittel, Karl W. 6-F
Nixon, J. C. 506-A
Niznenko, V. I. 163-P

Nock, J. A., Jr. 5-A
Noda, T. 374-M
Nodia, H. M. 144-M
Noel, A. 227-D
Noesen, S. J. 219-C
Nohl, H. 1013-Q
Nolan, B. J. 686-Q
Noland, Robert A. 506-K, 6-T
Nole, V. F. 177-R
Nolen, R. K. 451-K
Nomura, Sueo 424-R
Norbury, J. 19-M
Norden, R. B. 116-A, 323-R, 31-T
Nordin, S. 9-J
Noren, T. M. 63-J, 420-Q, 1018-Q
Norman, T. E. . . . . 601-Q, ... 1158-Q, 266-T
Northwood, J. E. 910-Q
Norton, John T. 478-A, 138-H
Norton, M. 962-Q
Norton, Patrick J. 508-E
Norton, W. O. 84-G
Nosek, M. V. 403-C
Nosova, G. I. 591-M
Nosova, R. S. 75-P
Nosovitskii, B. M. 122-D, 352-D
Noton, B. R. 13-T, 119-T, 127-T
Notvest, Kenneth R. 461-K
Novak, H. J. 614-K
Novak, Jiri 223-T
Novichkov, P. V. 238-N, 32-X
Novik, A. A. 199-G
Novik, F. S. 471-C
Novik, L. M. 362-D, 671-D
Novikava, N. A. 350-C
Novikov, A. V. 653-N
Novikov, I. I. . . . . 471-C, ... 228-N, 437-N, 1346-Q
Novikov, N. N. 377-M, 496-M
Novikov, P. G. 469-Q
Novikova, I. A. 121-M
Novikova, T. A. 1544-Q
Novikova, V. M. 991-Q
Novitskii, V. K. 674-D, 183-W
Novoselov, S. S. 340-C, 418-C
Novoselova, A. V. 359-M
Novotny, J. . . . 37-G, 32-K, 291-K, 679-K
Novozhilov, A. B. 416-C
Novozhilov, N. M. 399-K
Novozhilova, L. I. 148-N
Nowacki, Louis J. . . . . 39-L, ... 391-L, 517-R
Nowak, P. P. 665-L
Nowikowski, Leonard J. 184-G
Nowotny, Hans 307-M, 423-M, 560-M
Nozaki, N. 116-N
Nuccitelli, S. A. 1476-Q
Nuchols, J. B. 279-N
Nulk, Donald E. 161-T
Nunes, John. 218-F
Nurijew, M. 57-R
Nurmi, E. O. 455-C
Nurnberg, Werner 176-W
Nutkins, M. A. E. 23-N
Nutting, J. . . . . 416-G, 298-J, ... 450-M, 531-M, 562-M, 554-Q
Nygren, G. 286-Q
Nyrkovskaya, C. C. 432-N

O

Oaks, A. E. 304-L
Oates, W. A. 14-N
Oatman, H. T. 1194-Q
Obasi, Yosio 551-Q
Oberthin, Hans. 16-S
Obinata, I. 358-M, 587-M, 594-M
Oblomeev, E. N. 183-C
Obrebski, John. 314-E, 486-E
O'Brien, Thomas G. 91-L
Obrucheva, A. D. 137-P
Obsienko, D. E. 6-M
Obst, Karl-Heinz 78-D, 354-D
Occhipinti, E. S. 451-R
Ochiai, Masao 128-F, 901-Q
Ochiai, Osamu 30-Q
Ochsenfeld, Robert 393-P
Ocip'yan, Yu. A. 144-M
Oda, Naoteru 74-J, 61-Q
Oda, Zenjiro 310-P
Oding, I. A. 526-Q, 999-Q, 1354-Q
Odone, G. 589-R
O'Donovan, J. P. 185-R
O'Driscoll, W. G. 696-R
Oehler, G. 216-G, 1231-Q
Oel, H. J. 178-H
Oelsen, Olaf 200-P
Oelsen, Willy. 43-P, 87-P, 200-P
Oelsner, G. 267-R
Oesters, Franz . . . 325-D, 444-D, 479-D
Oettel, Wolfgang O. 524-M
Ofengenden, A. M. . . . . 428-D, ... 484-D, 688-D, 360-W
Ogan, A. C. 190-D
Oganowski, Kasimir 694-L
Ogawa, Kiyoichi. 189-J, 193-J
Ogawa, Kiyokazu 19-J
Ogawa, Shiro. 90-M
Ogawa, Yoshiki 160-C, 262-C
Ogburn, Fielding 580-L, 623-P
Ogden, H. R. . . . . 76-A, 357-A, 410-L, ... 153-M, 390-P, 762-Q, ... 841-Q, 1087-Q, 1116-Q, 1128-Q
Ogier, W. T. 279-M

Ogiermann, G. 95-H
Ogilvie, J. P. 243-R
Ogilvie, Robert E. 476-M, 98-N,
. . . . . 502-N, 513-N, 636-N
Ogle, J. C. 680-M
Ogle, M. Robert 30-H
Ogren, J. R. 29-P
Ogryzkin, E. M. 547-D, 548-D
Oguchi, Toshiaki 4-G
Oh, Jaehyun. 64-B
Ohara, Toru 547-P
Ohba, Yukio. 263-C
Ohira, Goro. 204-E, 216-E
Ohji, Kiyotsugu 887-Q,
. . . . . 917-Q, 1431-Q
Ohki, S. 33-R
Ohmori, Atsuo 176-J
Ohnishi, Iwano 796-Q
Ohno, Atsumi. 96-H, 808-L
Ohno, Reiichi. 644-D, 645-D
Ohta, Mutsuo. 664-N
Ohtani, Namio 68-R
Oiks, G. N. 617-D
Oishi, Yasumichi 350-R
Ojima, G. 150-A
Okabayasi, Kunio 387-Q
Okada, M. 607-P
Okada, S. 607-P
Okada, Takayasu 358-N
Okamoto, Go. 416-R
Okamoto, K. 307-W
Okamoto, Masazo. . . . 500-E, 285-F,
. . . . . 622-N, 628-N, 1391-Q
Okamoto, S. 484-R, 783-R
Okamoto, Tetsuhiko 522-P
Okamoto, Toyohiko. 158-F, 313-T
Okamura, Kenjiro. 274-G
Okawa, Mutsumi. 13-R
Okazaki, Atsushi 47-M
Okerblom, N. O. 114-K, 317-K
Okorokov, G. N. 148-D
Okorokov, N. V. 619-D, 692-D
Okoshi, Makoto 272-G, 18-W
Okrainets, P. N. 18-Q
Okubo, H. 116-N
Okumura, Toshie 1429-Q
Okunev, A. I. 109-C, 438-C
Okushima, Keiji. 11-G, 46-G,
. . . . . 273-G, 439-G
O'Laughlin, Jerome W. 14-S
Olberts, D. R. 287-G
Olden, E. C. 298-M
Oldfield, W. 75-X
Olds, G. C. E. 1280-Q
Oleshkevich, T. I. 280-D
Olette, M. 222-N, 89-P, 468-P
Olifer, G. O. 605-Q
Oliver, Richard T. 137-C
Olivieri, Joseph G. 944-Q
Ol'Khov, I. I. 764-R
Ollard, E. A. 419-L
Olleman, R. D. 1524-Q
Olmstead, C. F. 143-W
Olofson, Carl T. 252-G, 313-G,
. . . . . 328-G, 329-G, 330-G,
. . . . . 331-G, 359-G, 360-G
Olsen, Clayton E. 655-M
Olsen, K. M. 253-P
Ol'shanskii, N. A. 342-K, 398-K
Olson, G. C. 75-D, 192-D
Olson, J. Edward 364-W
Omori, Jimpei. 313-T
Omori, Masanobu. 1375-Q
Omori, Yasuo 520-D, 612-D, 464-P
Omourtague, Dimitrov. 682-P
Onbe, Hachiro 112-R
Oncescu, Mircea 92-P
O'Neill, Hugh. 118-N
Ono, Michio. 301-J
Onodera, Shinsaku 639-N
Onstott, E. L. 360-C
Onuchkina, N. I. 425-C
Onuma, Akira 454-S
Ooshima, Keinosuke 357-Q
Oosterhout, J. C. D. 512-R
Opekhov, I. A. 296-K
Openshaw, J. G. 118-A, 19-T
Opfer, Gustav 323-D
Opie, W. R. 187-C, 543-N
Opinsky, A. J. 270-C
Oppel, G. U. 206-Q
Oppenheim, R. 381-A
Oppermann, Helmut 402-E
Oram, J. E. 331-D, 461-D
Orehotsky, J. L. 270-C
Oreshkin, G. G. 112-B, 273-W
Oreshko, N. A. 415-C
Orlov, A. V. 310-W
Orlov, B. D. 51-K, 545-K
Orlov, L. G. 380-M
Orlov, V. I. 318-J
Orlowski, P. 438-R
Orloy, B. D. 59-K
Orman, M. 138-R
Ormont, B. F. 117-M
Orner, George M. 1301-Q, 301-T
Orr, D. B. 170-E
Orrssaud, J. 1419-Q
Ors, Jose Martinez. 597-Q, 409-S
Orsini, Lelio. 411-N
Ortgies, R. C. 4-A
Orzechowska, J. 129-S
Orzechowski, S. 41-J
Orzeszko, W. 237-D

Osada, N. G. 207-J
Osada, Ya. E. 274-W
Osborn, Harry B., Jr. 141-G
Osborn, R. J. 660-K
Oshe, A. N. 90-N
Oshima, Katumi 11-E, 103-E
Osipov, A. I. 428-D
Osipov, K. A. . . . 50-N, 86-N, 382-N, ... 162-P, 239-P, 443-P
Osman, Mitchell G. 589-L
Osterberg, D. 763-Q, 1132-Q
Osterer, David G. 202-F
Osterland, W. A. 113-G
Osterle, J. Fletcher 834-Q
Ostermann, G. 1166-Q
Ostrogorskaya, O. P. 220-S
Ostroukhov, M. Ya. 537-D
Ostroumov, G. A. 125-D, 681-D
Ostroumov, V. V. 125-L
Ostroushko, Yu. I. 448-C
Ostrovski, V. S. 362-Q
Ostroykhov, M. Ya. 149-D
Osvenskii, V. B. 116-M
Ota, Eiichi 35-G
Ota, Tomoya 1430-Q
Otahal, J. 203-J
Otake, Yasumoto 26-S
Otoguro, Yasuo 1102-Q
Otstani, T. 114-E
Otsu, Takemichi. 233-R, 470-R
Otsuka, Rikuro. . . . . 599-P, ... 411-R, 741-R, 763-R
Ott, G. E. 1158-Q, 266-T
Otta, B. 810-L
Ottestad, J. B. 224-G, 347-G
Otto, Fred L. 115-J
Otto, Gerhard 56-N, 103-N, 362-N
Oudar, Jacques 504-P
Ouhashi, Toshifumi. 180-J
Oujik, G. V. 969-Q, 1418-Q
Ouvrier, Klaus. 201-N
Ovcharenko, V. P. 371-C, 405-C
Ovechkin, B. I. 662-M
Ovsepyan, E. S. 485-C
Ovsyanikov, B. M. 316-G
Owadano, Toshiro. 242-P
Owczarski, W. A. 632-K
Owen, Ellis P. 685-K, 430-S
Owen, L. W. . . . . 307-L, ... 422-L, 493-L, 549-L
Owen, Leonard. 224-T
Owen, W. S. 842-Q, 1325-Q
Oxley, J. H. 68-B, 303-L
Oxley, P. L. B. 24-G, 244-K
Oya, S. 447-E, 448-E, 1335-Q
Oyama, Isao 1100-Q, 1242-Q
Oyama, Takeji. 642-D
Ozaki, K. 115-B
Ozawa, U. 312-W
Ozhigov, I. E. 70-P

P

Paar, Bela 365-A, 400-A, 449-A
Pace, John 205-A
Pack, Albert 387-S
Paczula, B. 139-C
Paczula, P. 254-J
Paganelli, M. 529-M, 404-N, 290-Q
Pahlitzsch, G. 95-G
Paine, S. H. . . . . 664-M, 78-P, ... 82-P, 598-P, 255-T, 86-X
Paisov, A. I. 264-M, 1253-Q
Pakhomova, G. N. 398-C
Pal, L. 73-P
Pal, P. 67-T
Palasvirta, O. E. 24-B
Palathik, L. S. . . . . 7-M, 78-M, ... 147-N, 275-N, 458-Q
Palazzi, A. 1467-Q
Pal'chuk, N. Yu. . . . . 102-K, ... 639-K, 192-N
Palethorpe, L. G. W. 224-J, 234-W
Palfalvi, A. 109-H
Palfalvi, Istvan 181-A
Pallanch, Rollin A. 132-B
Palme, R. 94-H
Palme, Richard B. 230-G
Palmer, Howard R. 543-N
Palmer, John. 36-K
Palmer, M. F. 32-G
Palmer, W. B. 24-G
Pamfilov, A. V. 132-L, 591-L
Pan, V. M. 325-Q
Panasenko, E. I. 565-N
Panazzo, A. J. 215-S
Panchenko, E. V. 1259-Q
Panchuk, O. E. 132-L
Pande, A. 45-M
Pandelescu, Cornel. 22-B
Panev, G. A. 122-D, 352-D
Panicheva, A. S. 994-Q
Panikkar, S. K. 744-L
Panknin, W. 121-F, 317-G
Pankowski, R. 80-S
Pankowski-Fern, Regina 1079-Q
Panov, B. V. 134-Q
Panov, J. P. 159-S
Panov, V. M. 574-Q
Panseri, C. C. . . . . 331-A, ... 58-M, 131-M, 251-Q
Panteleev, L. D. . . . 518-N, 592-N, 52-P
Panteleimonov, L. A. 118-M
Panu, Huber 76-W

Panyushin, L. A. 209-D
Paone, James 31-A, 62-A, 67-A
Papke, W. H. 102-S, 196-S, 322-S
Papp, Janos. 717-P
Paprocki, Stan J. 319-K, 720-L
Papuli, G. 259-W
Papush, A. G. 118-D
Parasnis, A. S. 385-M
Parau, Niculae. 392-D
Pardon, Donald E. 322-J
Paret, Richard E. . . . . 6-A, 249-A, ... 428-A, 542-A, 39-F, ... 73-G, 123-G, 149-K, 176-K
Parfenov, A. 89-B
Parfenov, V. V. 129-P
Parfessa, G. I. . . . 301-L, 109-M, 263-M
Parigi, Renzo 417-S
Parikh, N. M. 1062-Q
Park, F. R. 52-K
Park, J. J. 76-M
Park, W. R. R. 369-R
Parkacheva, V. V. 40-B
Parke, R. M. 219-C
Parke, Richard A. 47-G
Parker, A. K. 610-L, 769-L
Parker, Edward A. 551-L
Parker, E. R. 770-Q
Parker, H. A. 290-W
Parker, H. M. 294-W
Parker, Richard A. 27-E
Parkins, R. N. 642-M, 706-R
Parma, Vaclav. 10-X
Parr, J. Gordon. 637-N
Parr, Norman L. 135-C, 553-R
Parratt, L. G. 674-P
Parry, G. W. 19-R
Parry, J. G. 276-R
Parsons, A. C. 371-G
Parsons, B. 816-Q
Parsons, D. 1-P
Parten'ev, I. F. 524-L
Partridge, P. G. . . . . 597-M, ... 706-M, 352-N
Pasarenko, G. A. 45-W
Pascard, R. 402-N
Paschke, F. 369-C
Paschkis, V. 141-J
Pascoe, Walter R. 755-L
Pashak, J. F. 182-F
Pashchenko, A. I. 62-K, 270-K
Pashkov, N. V. 55-K
Pashkov, P. O. 293-Q
Pashley, D. W. . . . . 489-L, ... 235-M, 387-M, 59-N
Pasierb, E. J. 277-N
Pask, Joseph A. 220-K
Pasnak, Michael. 354-P, 642-P
Pasquet, M. 46-B, 51-B
Passal, Frank 552-L
Pastore, John R. 3-H
Pastukhova, Z. V. 247-P
Patchett, J. H. 276-D
Patel, C. C. 45-C
Paterson, James E. 119-S
Paterson, K. 74-D
Paton, B. E. 225-K
Paton, V. E. 519-K
Patrakhin, N. P. 180-P
Patrakova, A. Ia. 96-M
Patriarca, P. . . . . 311-K, ... 667-K, 7-T, 439-W
Patrick, Robert F. 835-Q
Patskevitch, V. M. 208-M
Pattee, H. E. 75-K, 200-K
Patterson, C. C. 181-E
Patterson, Clarence T. 454-A
Patterson, H. B. 48-G
Patterson, M. M. 306-G
Patterson, W. . . . . 266-E, ... 343-E, 175-J, 316-P
Patterson, W. R. 304-A
Pattison, J. R. 246-S
Patton, F. S. 56-A
Patton, L. L. 309-J
Paul, William 573-P, 574-P
Pavlenko, Z. D. 110-N
Pavlik, Ivan. 467-E, 486-N
Pavlov, F. N. 34-B
Pavlov, I. M. . . . . 220-F, ... 259-F, 260-F, 1258-Q
Pavlov, T. I. 251-S
Pavlov, V. A. . . . . 134-M, 10-N, ... 551-N, 292-Q, 327-Q, 629-Q
Pavlov, V. L. 150-F
Pavlov, Yu. A. 483-C
Pavlova, S. N. 118-G
Pavlovic, A. S. 414-Q
Pavlovic, D. 489-P
Pavlovtseva, N. I. 331-E
Pawelski, Oskar. 127-F
Pawlek, F. . . . . 54-C, ... 169-M, 308-P, 492-P
Pawlikowski, Stefan 7-R
Pawlowski, S. 237-D
Paxton, H. W. . . . . 580-M, 203-N, ... 226-N, 277-N, 512-N
Payer, Janos 263-E
Payne, B. S. 316-K
Payne, Burton 407-A, 563-K
Payne, H. 743-Q
Payne, J. W. S. 432-W
Payne, S. L. 358-P
Pazdnikov, P. A. 341-C
Pazukhin, V. A. 451-C

Peabody, A. W. 672-R
Peacock, D. E. 857-Q
Peakall, K. A. 643-R
Peake, C. C. 52-W
Pearce, J. G. 427-E
Pearl, Harry A. 798-Q
Pearson, B. M. 286-R
Pearson, G. L. 419-M
Pearson, J. 177-D, 110-G, 362-G
Pearson, Oscar . . . . . 327-D, 348-D, ... 432-D, 596-D, 630-D
Pearson, T. F. 310-D
Pearson, W. B. 427-P
Pease, G. R. 278-K
Peavler, R. J. 270-N
Pechanski, Jozef 105-T
Pechkovskii, V. V. 40-B
Peck, J. B. 323-N, 517-Q
Peckner, D. 447-Q, 516-R
Pedicini, L. J. 7-E
Peelairs, W. 685-P
Pehlké, R. D. 677-P
Peiffer, H. R. 31-P
Peiffer, R. 290-G
Peirce, W. M. 326-C
Peiter, Arnold 205-G
Pejcoch, Osvald 321-L
Peker, Ya. A. 124-J
Pelleg, Joshua 479-E
Pellegrino, Jose Carlos. 16-K
Pellini, William S. 342-E, 693-Q
Pelloux, R. M. N. 684-Q
Pelzel, Erich. 370-N, 469-P, 553-P
Pemberton, George M. 436-K
Pemsler, J. Paul 115-N, 71-R
Pendeleton, J. S., Jr. 12-D
Pender, Howard W. 121-S
Penel, Paul 142-K
Pen'kovskii, V. V. 84-N
Penkovsky, B. B. 166-N
Pennington, J. W. 65-A
Pennington, W. A. 188-Q
Penrice, T. W. 122-H
Pensotti, C. 145-W
Pepperhoff, Werner 279-S
Perekurest, G. L. 138-M
Perepelkkina, M. A. 239-S
Peres, A. 1281-Q
Peretti, E. A. 74-M
Pereturina, I. A. 292-Q, 327-Q
Perevalov, N. N. 535-D
Pereverzeva, E. G. 91-F
Perez, M. 378-A
Perkas, M. D. 44-X
Perkel, Robert J. 498-L
Perkins, E. C. 125-C
Perkins, Frank C. 478-N
Perkins, R. C. 170-E
Perks, R. P. 134-H
Perleman, L. M. 1130-Q
Perlin, I. L. . . . . 246-F, ... 281-F, 175-H, 1482-Q
Permivov, P. S. 136-P, 736-P
Peronnin, J. 392-K
Perry, Donald E. 201-G
Perry, E. R. . . . . 495-K, ... 573-K, 71-X, 93-X
Perry, H. A. 685-R
Perry, Michel 36-W
Perryman, E. C. W. 501-P
Persiani, P. J. 78-P
Persiantseva, V. P. 63-R
Petch, N. J. 9-Q, 1513-Q
Peters, A. J. 677-N
Peters, A. T. 379-D, 628-D
Peters, Albert H. 750-R
Peters, Friedrich-Karl 499-R
Peters, H. 163-K
Peters, John H. 437-G
Peters, Rolf 24-D
Peterson, Alfred H. 129-G
Peterson, Charles L. 99-T
Peterson, David T. 595-M, 518-P
Peterson, E. C. 97-W
Peterson, M. H. 670-R
Peterson, Norman L. 636-N
Peterson, R. E. 343-Q, 352-Q
Peterson, R. L. 259-K
Petit, J. F. 249-C
Petitdidier, M. 102-C
Petlyakov, M. M. 354-M
Petrenko, A. G. 354-M
Petrenko, A. T. 135-R
Petrescu, N. 249-M
Petrick, H. 308-Q
Petritz, R. L. 542-P
Petrocelli, J. V. 653-P
Petronio, Marco. 92-G
Petrosyan, P. P. 169-J
Petrov, C. A. 272-W
Petrov, D. A. 167-M, 546-N
Petrov, K. I. 69-S
Petrov, L. K. 349-C
Petrov, O. L. 80-J
Petrov, V. M. 142-B
Petrov, Yu. N. 211-L
Petrova, E. F. 81-P
Petrova, L. A. 552-M
Petrovich, Anton I. 374-R
Petrovits, Nikolaus. 43-W
Petrow, H. G. 4-C, 59-C
Petrunichev, V. A. 655-K
Petrushevskii, M. S. 404-P
Petter, A. 1232-Q

Pettibone, Robert L. 141-H
Pettinger, Eva-Marie 186-E
Pettit, Grant A. 49-A
Pettit, R. E. 783-L
Petzold, Armin 215-L
Peucker, Manfred. 138-B
Pfann, W. G. 56-C
Pfeiffer, C. 707-K, 421-Q
Pfeiffer, Harald. 41-P
Pfeiffer, Irmtraud 351-D
Pfeil, P. C. L. 234-M
Pflaume, E. 39-G
Pfleiderer, Hans 491-N
Pfundt, H. 106-S
Phebus, Raymond T. 18-R
Philbrook, W. O. 111-D, 370-D
Philibert, J. 565-M, 265-N,
. . . . . 531-N, 541-N,
. . . . . 569-N, 445-S, 16-X
Philip, Roger. 730-P
Philip, T. V. 340-T
Philipchuk, Vasil 110-G
Philipp, H. 222-G
Phillippe, Albert 682-P
Phillips, A. L. 577-K
Phillips, Arthur 207-K
Phillips, James H. 141-R, 667-R
Phillips, K. A. 325-C
Phillips, Norman D. 335-C
Phillips, Norman E. 569-P
Phillips, R. 16-M
Phillips, Sidney L. 440-S
Phillips, V. A. 773-Q
Pian, T. H. H. 687-Q
Pianelli, Antoine 366-M, 410-M
Piaskowski, J. 553-A, 532-E
Piaskowski, Stanislaw 77-Q
Piatti, Luigi 414-P
Picard, J. 459-S
Piccardo, Jack E. 283-T
Pickering, F. B. 602-N
Pickering, N. E. 683-N
Pickett, J. 335-R
Pickles, A. E. 60-J
Pickman, D. O. 211-F
Pidermann, B. G. 592-D
Piehl, Robert L. 311-R
Pier, Guenther. 331-R, 501-R
Pierce, C. B. 494-N
Pierce, W. J. 316-R
Pierson, Russell 303-R
Pietka, Jerzy. 38-D
Pietrkiewicz, Stanislaw 633-D
Pietrkovskii, G. G. 143-D
Piguzov, V. 488-Q
Pikalov, P. Q. 179-W
Pikna, Eduard 539-K, 677-K
Pikunov, M. V. 676-N
Pikus, G. E. 82-C
Pilat, I. M. 125-P
Pilipenko, A. T. 157-S
Pilissy, Lajos 470-C
Pilous, L. 312-J
Pilous, Vaclav 33-K,
. . . . . 370-K, 555-K, 713-K
Piltz, H. H. 774-R
Pin'es 577-D
Pines, B. Ya. 308-M,
. . . . . 329-P, 1542-Q
Pinkel, B. 199-T
Pinkhusovich, L. L. 874-Q
Pinsker, Z. G. . . . 65-M, 271-M, 351-M
Pintard, J. 502-K
Pirner, Miroslav 253-T
Piryazev, D. I. 260-F, 1054-Q
Pisarenko, G. A. 219-E
Pisareva, N. V. 178-F, 1322-Q
Pishcjikov, G. P. 96-F
Pis, Mennikov V. E. 77-W
Pitler, R. K. 174-A, 251-C
Pitsch, Wolfgang 57-N,
. . . . . 383-N, 393-N, 579-N
Pittaway, A. H. 95-J
Pittoni, D. 308-A, 309-A
Pivnik, E. M. 210-M, 1356-Q
Pivovarov, L. 222-M, 451-N, 289-R
Plachy, Jan 469-E
Plail, O. S. 629-P
Plaksin, I. N. 29-B, 39-B, 312-C
Plankenhorn, W. J. 770-L
Plateau, J. 52-M, 216-M,
. . . . . 1051-Q, 1468-Q, 1469-Q
Platonov, G. F. 446-C
Plaza, A. 199-K
Pleiner, Radomir 136-A, 329-A
Plesinger, Adolphe 351-A, 103-W
Plieth, K. 54-C
Pliva, Ladislav 469-K
Plochothichkova, J. F. 125-L
Plockinger, Erwin 151-N
Ploshchenko, E. A. 496-D
Plotkin, N. Z. 112-B
Plotnikova, T. P. 518-L, 165-M
Pluhar, Jaroslav 391-M
Plumpton, C. 236-R, 420-R, 504-R
Plusnin, V. G. 34-B
Plusquellec, Jacques. 264-N, 540-N
Plyasunov, V. D. 626-R
Plyatskovskii, O. A. 164-F
Plzak, Frantisek 498-M, 319-S
Pobedimskii, G. P. 142-L
Pobereskin, M. 387-A
Poboril, Frantisek 61-D,
. . . . . 287-F, 154-M

Pocock, Walter E. 313-L
Pochwisnew, A. N. 127-D
Podbreznik, F. 314-R, 776-R
Podgoetskii, M. L. 406-C
Podlipec, F. J. 363-R
Podmore, E. 224-L, 365-L
Podnek, A. K. 67-B
Podovaev, N. I. 432-R
Podrezov, L. I. 74-N
Podstrigach, Ya. S. 58-Q
Podvoiskii, L. N. 1253-Q
Podzei, A. V. 307-Q
Pogodin-Alekseev, G. I. 210-Q
Pogribhoi, E. N. 33-N
Pohl, H. 408-S
Pohle, Hans-Joachim 232-W
Pohm, G. 138-F
Pointud, R. 64-H
Poirot, Roger 592-R
Pokhvisnev, A. N. 478-S
Pokorny, Richard 864-Q
Pokrass, I. M. 360-W
Pokrovskii, Ia. E. 231-P
Pokrovsky, Y. I. 1285-Q
Polansky, D. 222-S
Polatnik, L. S. 450-N
Poliakov, A. Iu. 148-D
Poliakov, A. M. 234-P
Polikarpov, Y. A. 178-N
Polishchuk, A. P. 230-J
Pollack, J. F. 286-W
Pollentier, R. 685-P
Pollo, Iwo 7-R
Polmear, I. J. 191-M, 46-M, 454-Q
Polonis, D. H. 681-M, 560-N, 53-X
Polotskii, I. G. 222-Q
Polovchenko, I. G. 367-D
Poluetkov, N. S. 140-S
Polyakov, A. Yu. . . . . 359-C, ... 481-C, 547-N
Polyakov, S. N. 274-N
Polyakova, R. S. 491-M, 170-R
Polyanskii, V. M. 550-P
Polykapov, Yu. M. 334-N
Pombo, Carlos 450-K
Pomeroy, J. N. 135-B
Pomey, G. 685-M, 401-S
Pomey, Jacques . . . . . 626-N, ... 460-Q, 822-Q, 344-R
Pomosov, A. V. 516-L
Pompei, Luigi 262-A
Ponomarev, V. D. . . . . 463-C, ... 466-C, 552-D
Pons, Louis 241-M
Ponyatovskii, E. G. 82-N
Poor, John G. 1298-Q
Poos, A. 242-D
Popa, Emil 76-W
Pope, J. A. 332-L, 602-Q, 610-Q
Popel, S. I. 225-D, 160-P, 214-P
Popescu, Mira 431-P
Popescu, N. 107-A, 283-P
Popescu, P. 157-T, 319-T
Popilov, L. Ya. 35-X
Popkov, A. P. 62-L
Popoff, A. 1005-Q
Popov, A. A. 599-M, 132-N
Popov, A. D. 238-D
Popov, G. I. 65-D, 421-D
Popov, I. A. 671-P
Popov, K. V. 1314-Q, 1358-Q
Popova, E. V. 490-D
Popova, G. V. 663-D
Popova, N. V. 732-L
Popova, O. S. 57-M
Popovici, Vladimir 248-W
Popovskaya, N. P. 264-J
Popyalkovskii, Yu. K. 267-M
Porembka, S. W. 344-L
Poretskaya, L. V. 150-M
Porr, W. C. 1222-Q
Porro, G. 75-C
Porta, A. 108-S
Porter, Ellis O. 616-K
Porter, F. C. 282-A, 430-L, 495-R
Porter, L. C. 145-K
Porter, L. F. 648-N, 681-N
Portevin, Albert 215-M
Porthoi, L. Ya. 576-D
Portnoi, K. I. 49-H, 826-R
Portugeis, A. V. 568-Q
Posey, Franz A. 654-P
Pospisil, Antonin 233-J
Pospisil, Rudolf 208-R
Post, G. I. 710-P
Postnikov, V. S. . . . . 33-Q, ... 326-Q, 728-Q, 1539-Q
Postnikova, S. V. 142-B
Postogna, G. 482-E
Postyka, V. V. 334-D
Potak, Ya. M. 492-Q
Potapevskii, A. G. 264-K
Potapkov, N. A. 216-P
Potaud, J. 288-A
Potebnya, Yu. M. 494-D
Potekushin, N. V. 386-E
Potenski, Albert R. 224-S
Poth, L. 397-K
Potter, E. C. 387-R
Pottgiesser, Caspar Heinrich 357-D, 358-D, 541-D, 542-D
Potthoff, W. C. 245-K, 455-K, 473-K
Potucek, Bedrich 155-M
Potvin, R. J. A. 742-L

Potyka, K. 1289-Q
Pouget, Jean-Pierre 377-S
Pouillard, E. 320-K, 38-X
Poulos, N. E. 77-H
Pound, G. M. 61-N
Pourbaix, M. J. N. 321-P,
. . . . . 503-P, 86-R, 87-R, 88-R
Povarova, K. B. 67-J, 344-N
Povolotskii, D. Ya. 248-F
Powell, D. B. 213-D
Powell, G. W. 590-Q, 139-W
Powell, H. M. 232-R
Powell, J. E. 276-C
Powell, R. G. 5-E
Powell, R. W. 405-S
Powell, Robert A. 163-H
Powell, Robert L. 690-P
Power, Gerard L. 121-R
Powers, R. M. 48-C
Powers, R. W. 267-N, 508-N
Poyarkov, A. M. 547-D, 548-D
Pozdeev, A. A. 1255-Q, 1256-Q
Pozhyak, L. A. 463-K
Pozzo, Robert M. 548-A
Prakash, Ved. 165-J
Pranatis, A. L. 12-H, 15-H
Prange, F. A. 244-R
Prasad, Sarju 164-C
Prati, A. 186-R
Pratt, P. L. 285-M
Pravdyuk, N. F. 592-N,
. . . . . 52-P, 1285-Q
Prawitz, Jan 658-P
Pray, R. F. 925-Q
Predel, B. 452-M, 460-M, 554-P
Preiser, H. S. 351-R, 805-R
Prenosil, B. 364-M
Preobrazhenskaya, N. V. 1347-Q
Preskitt, C. A. 694-P
Presnyakov, A. A. 550-N,
. . . . . 653-N, 689-Q
Prestel, W. J. 329-E
Preston, C. T. 326-P
Preston, J. B. 503-Q, 715-Q
Preuss, Albert F. 147-C
Preussler, Hermann 76-G
Priachina, L. I. 126-M
Pribyl, Josef 33-E, 536-E
Price, P. B. 35-M
Price, Peter E. 572-M
Priceman, S. 393-S
Pridantsev, M. V. 172-J, 643-Q
Pride, Gordon J. 160-D
Priest, D. K. 412-R
Primatova, L. V. 572-Q
Princ, Frantisek 604-L, 605-L
Prince, E. J. 607-D
Prince, Harry C. 1152-Q
Prior, J. E. 156-R
Priselkov, Yu. A. 81-X
Prishchepa, M. P. 397-Q
Pritchard, H. R. 1240-Q
Pritchard, W. H. 10-D
Pritulo, V. F. 142-B
Prnka, Tasilo 299-P
Probst, H. B. 1032-Q
Probst, Robert L. 57-H
Prochazka, Ludek. 1068-Q
Prochorenko, K. K. 224-D
Prochorov, N. N. 230-N
Proctor, J. H. 609-Q
Proctor, Robert V. 94-L
Proffitt, H. J. 265-E
Proft, Rudolf 157-C
Proizvodstvo, Svarochnoe 52-G
Prokay, Pal. 212-N
Prokhorov, A. V. 89-F
Prokhorov, N. N. 434-N
Prokhorova, V. M. 148-N
Prokopovich, P. A. 1305-Q
Proksa, F. 228-G
Promisel, N. E. 151-Q
Pron'kin, V. F. 371-C
Pronov, A. P. 713-M
Propastina, V. V. 729-Q
Proskourjakoff, J. G. 67-G
Prostakov, M. E. 444-L
Prosvirin, V. I. 660-M, 40-N
Prosyankin, I. P. 215-K
Protopescu, A. 155-H
Protopopesku, M. 286-P, 452-P
Protsenko, L. N. 908-Q
Protsenko, P. I. 264-J
Protskii, N. E. 347-W
Protzl, Martin 102-N
Prus, L. B. 5-T
Pruvot, Emile 399-A
Pry, R. H. 356-P, 370-P
Pryanishnikov, M. P. 371-N
Pryor, M. J. 178-R
Przezdziecka, Emilia 297-P
Psarev, V. I. 156-N
Pshelkina, M. A. 578-L
Pshenicin, N. K. 155-S
Puban, P. M. 211-Q
Puchkov, S. G. 1255-Q
Puchner, O. 1410-Q
Pufahl, H. R. 439-W
Pugachev, D. K. 281-D
Pugh, D. 817-Q
Pugh, John W. 464-A, 273-C
Pugh, S. F. 57-P, 258-P,
. . . . . 629-P, 201-Q, 285-Q, 1515-Q
Pugin, A. I. 700-K

Pulsifer, Verne 119-E
Pumphrey, W. I. 861-Q
Pungel, W. 487-L
Pupke, Gerhard 499-E, 383-P
Purdie, J. 74-D
Purdon, A. P. M. 73-F
Pusch, Richard 191-N
Pushkova, S. A. 239-C
Putilova, I. N. 441-R
Putley, E. H. 16-P, 246-P
Puttick, K. E. 1506-Q
Putzer, Hannfrit. 137-A
Puzak, P. P. 693-Q, 977-Q
Puzei, I. M. 710-M, 72-P, 74-P,
. . . . . 135-P, 144-P, 156-P, 166-P
P'yankov, V. A. 376-C
Pyle, T. 272-P

Q

Quade, Gunter 128-B, 147-B
Quadt, Raymond A. 187-G,
. . . . . 256-G, 1154-Q, 1197-Q
Quarendon, R. 17-X
Quarrell, A. G. 449-M
Quattrone, C. 81-L, 268-L, 310-L
Queneau, B. R. 105-D
Quere, Y. 659-P
Quigg, R. J. 304-Q
Quimby, W. S. 512-R
Quinn, C. E. 428-S
Quinney, B. B. 259-S

R

Raab, Dieter 242-M
Rabinouicz, E. 1425-Q
Rabinovich, E. I. 993-Q
Rabinovich, I. Ya. 109-W
Rabinovics, B. V. 563-E, 565-E
Rabinowicz, E. 1204-Q
Rabkin, D. M. 265-K, 272-M
Rabone, Philip 80-C
Rachinger, W. A. 1073-Q
Rack, Peter. 384-Q
Racz, Otto. 335-E
Raczka, Jan. 334-L
Raczynski, B. 559-E
Radanyi, Geza 110-B
Radautson, S. I. 102-M, 111-M
Radavich, John F. 581-R,
. . . . . 591-R, 808-R
Radcliffe, J. Q. 812-L
Radcliffe, S. V. 119-N, 389-N
Radd, F. J. 1487-Q
Radeker, Wilhelm. 209-L, 276-S
Rademacher, L. 277-J, 39-N
Radley, J. A. 691-R
Radloff, Dieter. 113-H
Radomski, Gerhard. 368-Q
Radriguez-Yufera, Francisco 393-E
Radtke, R. 523-R
Radzwicki, K. 139-C, 652-D
Radzwicki, R. 55-D
Raevskaya, M. I. 383-M
Rafael, M. 649-R
Raffelock, Charles 13-K
Rafflenbeul, G. 95-G
Raghava Rao, Bh. S. V. 93-S, 94-S
Ragland, F. J., Jr. 152-K
Raguin, J. 458-D
Rahmel, Alfred 517-M, 555-R
Rahn, Dorothy J. 535-M
Raichenko, A. I. 141-P, 169-P
Raimes, S. 422-P
Raine, T. 1280-Q, 696-R
Raistrick, A. 545-A
Rait, I. R. 17-F
Rajagopalan, K. S. 546-L,
. . . . . 240-R, 735-R
Rajals, B. R. 213-A
Rajda, Bohuslav 77-M
Rakhanov, A. S. 226-K, 571-Q
Rakin, V. G. 160-M
Rally, F. C. 520-Q
Rama Char, T. L. 675-L,
. . . . . 744-L, 237-R
Ramachandran, S. 98-D, 459-M
Ramaiya, K. S. 465-R
Ramamurthy, S. 568-E
Ramanathan, K. G. 340-P
Ramanathan, V. R. 745-L
Rambaud, G. 459-S
Ramma Varma, K. T. 266-P
Rammele, F. 220-M
Ramseyer, Karl W. 488-K
Randak, Alfred. 151-N
Randall, W. F. 142-C
Ranger, Ralph P. 572-L
Rankin, A. W. 208-T
Ransley, C. E. 586-R, 55-S
Rao, K. N. 339-P
Rapaport, M. B. 201-R
Rapatz, Franz 143-K
Rapperport, E. J. 849-Q, 1372-Q
Rardin, G. N. 363-G
Rasechnik, M. S. 132-F
Raseman, C. J. 4-T
Rasheev, D. 41-N
Rashofen-Berndorf 634-K
Raskin, R. M. 338-T
Rasteraev, M. V. 168-F
Rastogi, R. P. 266-P
Rastorguev, A. A. 34-J

Rasumov, L. D. 155-R
Rasumova, G. P. 231-S
Rasworschegg, H. 388-W
Rathenau, G. W. 351-N, 8-P
Rather, R. I. 790-L, 791-L
Ratner, A. V. 994-Q
Rau, Steven 472-K
Raub, E. 198-C, 74-L,
. . . . . 568-L, 544-M, 561-M
Rauch, A. H. 323-N, 517-Q
Raudebaugh, R. J. 128-J, 186-M
Rauhut 38-S
Rausch, W. 14-L, 367-L
Rauterkus, Werner 358-S
Rauzin, Ya. R. 1357-Q
Rave, Hans-Peter. 246-J
Ravitskaya, R. V. 64-S
Rawlings, R. 1505-Q
Ray, A. E. 508-M
Ray, Robert L. 218-J
Ray, W. E. 402-P, 60-T
Rayles, R. Russell 156-J
Raymond, Lloyd E. 365-E
Raymond, Paul L. 743-L
Rayne, J. A. 1504-Q
Rayne, John. 100-P
Raynor, G. V. 535-A,
. . . . . 219-M, 257-M, 447-M
Rayson, H. W. . . . 219-M, 257-M, 69-M
Razikov, M. I. 243-N
Razov, I. A. 267-Q, 573-Q
Rea, D. E. 277-W
Rea, T. W. 141-Q, 1161-Q
Read, E. B. 205-S
Read, Robert H. 87-H
Rebholz, M. J. 27-Q
Rebinder, P. A. 829-Q
Rechlin, Floyd F. 218-K
Rectenwald, R. L. 661-K
Reddaway, J. L. 837-Q
Redden, T. K. 186-F
Redding, G. B. 1060-Q
Red'ko, A. N. 212-D
Redmond, John C. 14-H, 1048-Q
Redwood, M. 1156-Q
Reed, E. C. 931-Q
Reed, E. P. 672-N
Reed, M. 398-L
Reed, R. E. 512-N
Reed, R. P. 1475-Q
Reed, Richard J. 259-J
Reen, O. W. 1194-Q
Reese, J. T. 731-R
Reeves, Mark 72-W
Regel, V. R. 1219-Q
Regstorff, W. P. 520-P
Rehder, J. E. 4-J
Reichard, E. C. 95-R
Reichel, W. L. 346-L
Reichenbach, George. 295-G
Reichenecker, W. J. 467-Q
Reid, D. G. 9-C
Reid, Elliott A. 336-D
Reid, Warren. 377-W
Reimann, Dieter. 135-D
Reimer, Ludwig 248-M,
. . . . . 268-M, 397-M
Rein, William J. 187-L, 237-L
Reinartz, Leo F. 348-A, 382-D,
. . . . . 449-D, 454-D, 493-D
Reinbach, R. 380-A
Reinberg, E. S. 37-Q
Reinemann, G. N. 975-Q
Reinhold, R. 40-K
Reininger, Hans 32-E, 155-E,
. . . . . 191-E, 192-E, 240-E,
. . . . . 470-E, 526-E, 61-J,
. . . . . 245-L, 276-L, 408-L,
. . . . . 483-L, 789-L, 106-N, 306-Q
Reis, N. V. 63-S
Reischl, A. 15-T
Reiswig, R. D. 305-N
Rejc, Dragan. 398-D
Rejhon, J. 123-T
Rekar, Ciril 201-C
Rellermeyer, Heinrich 40-D, 419-D
Remmeke, Leo. 231-E
Remmersmaal, J. L. 427-G
Remond, G. B. 1-L
Remport, Zoltan. 298-S
Reneker, Darrell H. 689-P
Renken, C. J. 260-S
Renken, Howard C. 104-B
Reno, Horace T. 126-A
Renof, Sidney M. 143-A
Renouard, Martial 527-R
Renourd, G. M. 25-J
Renout, M. 297-Q
Ren-Pao, Liu. 485-P
Renshaw, W. G. 459-M
Renucci, L. 697-P
Repasy, Gellert 157-D
Repin, A. K. 386-N, 420-N
Repko, A. J. 1435-Q, 356-S
Resen, Larry. 42-R
Resh, Stephen H. 283-G
Reshetnikov, F. G. 183-C
Reshetnikova, N. V. 75-P
Reshetnyak, Kh. D. 1355-Q
Resin, M. G. 655-D
Resing, H. A. 520-N
Resketnikov, A. M. 140-N
Resnick, R. 36-N
Resnik, B. B. 232-S

Rethy, Karoly 154-D
Reti, Pal. 381-S
Rettig, H. 120-T
Reufels, Hans 104-W
Revenko, I. F. 197-F
Revnivtsev, V. I. 38-B
Rew, R. 66-X
Rexroth, Alfred 156-E, 578-E
Reynes, G. 144-K
Reynolds, E. E. 174-A, 251-C
Reynolds, G. F. 12-S
Reynolds, P. A. 372-D
Reznik, I. D. 349-C
Rezova, A. T. 69-S
Rhines, Frederick N. 34-H, 426-M
Rhoda, Donald E. 176-T
Rhodes, D. 412-P
Rhodin, T. N. 45-N
Rice, G. A. 731-R
Rice, J. L. 174-E, 13-W
Rice, James F. 129-L, 361-L
Rice, O. D. 262-W
Rice, S. A. 520-N
Rice, W. B. 143-G
Rich, Francis M. 505-D
Rich, J. B. 1060-Q
Rich, R. B. 143-F
Richard, N. A. 187-M
Richards, Cedric W. 963-Q
Richards, E. L. 114-F
Richards, P. N. 644-M
Richards, W. G. 330-R
Richardson, Bruce F. 643-P, 646-R
Richardson, E. G. 131-R
Richardson, F. D. . . . 235-C, 87-D, 90-D
Richardson, H. K. 460-R
Richardson, L. D. 62-E
Richardson, L. S. 406-Q
Richaud, H. 592-L, 123-Q, 821-R
Riches, J. W. 416-Q
Richmond, F. M. 1029-Q
Richmond, J. C. 338-R, 622-R
Richmond, Joseph C. 433-Q
Richt, A. E. 166-H
Richter. 817-L
Richter, G. 679-D
Richter, Hans 558-M
Richter, Herbert 757-Q
Richter, Paul. 565-K
Richter, Robert 56-G
Ricken, Theodor. 401-W
Riddell, F. L. 320-P
Ridgion, J. M. 85-B
Ridout, Robert A. 564-K
Riecke, Hans-Gunter. 53-D
Riedl, Istvan 37-B
Riegel, M. S. 1294-Q
Rieppel, P. J. 75-K,
. . . . . 200-K, 131-W, 330-W
Riess, Horst 224-E
Rietveld, F. L. 454-E
Rigault, G. 104-S
Rikman, E. P. 51-N
Riley, Bernard J. 402-L, 416-L
Rimmer, D. E. 507-M, 1225-Q
Rimrott, U. A. 1185-Q
Rinehart, John S. 110-G,
. . . . . 546-Q, 562-Q, 1141-Q
Rinehart, W. G. 136-W
Ringueberg, Nairn 97-K
Ripling, E. J. 155-Q, 94-X
Rippel, C. 282-T
Rischbieth, J. R. 528-L
Rispal, Ch. 64-H
Rist, A. 109-D
Ritchie, David F. 605-K
Ritchie, O. T. 308-T
Rittenhouse, John B. 513-R
Ritter, Edmond J. 30-G
Ritz, J. M. 252-T
Ritzerfeld, G. 150-W
Ritzow, Gunter. 256-P
Rivlota, Bruno. 49-R
Rizescu, C. 172-F, 249-M
Rizzardini, Vittorio 209-T
Roach, D. B. . . . 1086-Q, 1343-Q, 1344-Q
Robb, R. N. 591-K
Robb, W. L. 250-L
Robba, M. 266-S, 383-S
Robe, E. 491-K
Roberson, A. H. 316-C, 320-C
Roberts, B. W. 61-M
Roberts, D. A. 1343-Q
Roberts, E. C. 53-X
Roberts, G. 582-K
Roberts, George F. 126-R
Roberts, H. 106-G
Roberts, J. E. 367-K
Roberts, R. R. 1280-Q
Roberts, W. H. 623-P
Robertshaw, T. L. 1021-Q
Robertson, J. A. L. 291-M
Robertson, T. S. 813-Q
Robertson, W. D. 127-J, 177-R
Robiette, E. 137-W
Robillard, A. 37-N
Robin-Kandare, Sonja 367-P
Robins, D. A. 44-H,
. . . . . 135-H, 453-M, 479-M
Robinson, A. T. 119-Q
Robinson, F. P. A. 711-R
Robinson, George H. 142-J,
. . . . . 665-Q, 1342-Q
Robinson, G. M. 538-Q

Robinson, H. A. 296-N, 559-Q
Robinson, Harold 133-L
Robinson, P. M. 1505-Q
Robinson, P. S. 181-C
Robinson, W. H. 431-M
Robson, R. A. 65-B
Roche, T. K. 7-T
Rocher, Y. A. 772-Q
Rockl, L. 58-X
Rockwell, W. C. 338-G
Rodbell, D. S. 56-P, 355-P
Rodd, J. W. 97-G
Rodden, C. J. 216-S
Rodder, William. 210-F
Rode, V. E. 75-N
Rodenius, Evert 630-K, 635-K
Roder, Hans M. 690-P
Rodger, Walton A. 212-T
Rodgers, D. C. 96-G
Rodgers, F. 48-W, 50-W, 112-W
Rodgers, J. S. 479-A
Rodgers, Thomas M. 513-L
Rodichev, A. M. 114-M
Rodigin, N. M. 103-J, 551-N
Rodman, Sayre. 106-F
Rodnyi, M. I. 434-C
Rodyakin, V. V. 408-C, 419-C
Roe, L. A. 23-B
Roe, R. M. 20-S
Roe, William P. 543-N
Roeder, E. 595-K
Roemer, J. L., Jr. 684-L
Roesch, Karl 766-Q
Roever, Wilhelm 91-C
Rogach, A. P. 81-J, 436-W
Rogel'berg, I. L. 435-C
Rogers, H. C. 1171-Q
Rogers, L. B. 354-C
Rogers, L. R. 459-L
Rogers, R. R. 302-D, 256-R
Rogers, T. H. 632-R
Roggendorf, W. 115-L, 266-L
Roginskii, I. S. 495-D, 115-S
Rohan, J. J. 683-N
Rohan, Rene 248-K
Rohardt, Klaus. 704-L
Rohde, K. L. 26-B
Rohlke, Gerhard. 63-G
Rohloff, Ebbe. 179-K
Roilos, M. 109-P
Roitburd, A. L. 81-N, 146-N
Roitman, A. A. 430-P
Rokotyan, E. S. 137-F
Rolfe, S. T. 612-Q
Roll, Franz 232-M
Roll, Kempton H. 128-A
Rollason, E. C. . . . 374-K, 119-N, 389-N
Roller, David. 248-R
Rollig, Hein-Eberhard. 62-H
Rollins, A. H. 809-R
Rollins, F. R. 439-M
Rolsten, R. F. 257-C, 258-C
Romanov, A. A. 579-E
Romanov, A. S. 351-C
Romanov, V. V. 432-R
Romanski, Jerzi. 20-R
Romauldi, J. P. 1187-Q
Romenets, V. A. 58-W
Ronami, G. N. 282-P
Rones, Josef 132-A
Roof, R. B., Jr. 673-P
Rooney, R. C. 27-S, 188-S, 189-S
Roos, Andre 305-A, 189-F, 521-Q
Ropp, P. A. 394-G
Roques, C. 236-K
Rosahl, Harry 234-D
Rose, A. 277-J, 39-N, 327-N
Rose, H. E. 337-W
Rose, Jack 684-K
Rose, R. G. 168-Q
Rose, R. M. 266-C
Rosen, Anda 700-P
Rosenbaum, J. B. 146-C
Rosenberg. 83-P
Rosenberg, A. J. 1011-Q
Rosenberg, H. M. . . . 388-M, 491-P, ... 404-Q, 755-Q, 854-Q, 855-Q
Rosenberg, L. D. . . . . 175-G, ... 458-G, 459-G
Rosenberg, M. 224-P
Rosenberg, Robert 118-P
Rosenberg, V. M. . . . . 273-N, ... 447-Q, 1347-Q
Rosendorf, P. 342-T
Rosene, R. B. 246-R
Rosenfeld, I. L. . . . . 63-R, ... 340-R, 435-R, 485-R
Rosenkrantz, W. 138-Q, 1270-Q
Rosenqvist, Terkel 466-P
Rosenshtrauch, L. D. 274-S
Rosenthal, Daniel 347-Q
Rosenthal, H. 315-S
Rosenthal, P. C. 681-N, 1207-Q
Roser, W. R. 545-E
Roshin, V. V. 149-P
Rosi, F. D. 28-P
Rosina, Vittorio. 28-X
Rosner, Bela. 127-E
Rosner, K. 186-D, 435-D, 508-D
Ross, A. S. 1401-Q
Ross, Evan J. 37-W
Ross, R. 172-N
Ross, T. K. . . . . 206-L, ... 322-R, 611-R, 811-R

Ross, V. W. 519-N
Ross, William J. 715-L
Rossa, H. 77-G
Rossberger, Franz 237-E
Rosseau, L. B. 693-K
Rossetti, U. P. 109-Q
Rossi, F. D. 121-N
Rossi, Michel 233-D
Rossin, P. C. 217-C
Rossoshinskii, A. A. 109-M, 263-M
Rostoker, W. 79-F, 530-M, 778-Q
Rostovtsev, S. T. 547-D,
. . . . . 548-D, 585-D, 586-D
Rotenberg, M. I. 373-E, 412-E
Rotenstein, B. 78-Q,
. . . . . 494-Q, 510-Q, 1320-Q
Roth, E. 300-L
Roth, H. 563-P, 25-X
Roth, H. P. 2-M, 125-M
Roth, Harold 568-P
Roth, Julius. 238-G
Rothbart, Harold A. 3-X
Rothman, S. J. 623-N, 744-Q
Rotinyan, A. L. 420-C
Rotter, Herbert 603-K
Roudouresques, B. 115-R
Rough, Frank A. 20-H, 221-M,
. . . . . 579-M, 624-M, 625-M, 657-P
Rousselot, Geroges E. 57-L,
. . . . . 165-L, 806-L
Rousselot, Robert H. 57-L,
. . . . . 165-L, 806-L
Roux, A. 116-R
Rovenskii, I. I. 121-B
Rovinskii, B. M. 661-M, 478-N,
. . . . . 207-Q, 640-Q, 1495-Q
Rovirosa, C. 11-J, 12-J
Rowan, G. E. 440-R
Rowe, E. H. 727-Q
Rowe, G. W. 454-G,
. . . . . 457-Q, 1337-Q, 1407-Q
Rowe, John P. 893-Q, 1049-Q
Rowe, Leonard C. 415-R
Rowland, J. A. 423-Q
Roy, D. H. 317-S
Roy, Tuhin K. 26-C
Royez, A. 460-Q, 822-Q, 344-R
Rozenfel'd, S. E. 66-E
Rozenfeld, I. L. 21-R, 709-R
Rozentreter, A. B. 139-A
Rozic, E. J. 590-N
Rozsival, Miroslav 363-M
Rtishcheva, N. I. 240-P
Rub, Friedmund 312-L
Rubel, I. S. 563-N
Ruben, Ardys. 337-A
Rubenkova, L. A. 127-Q
Rubenstein, C. 224-Q
Rubenstein, H. 441-M
Rubenstein, L. S. 163-F,
. . . . . 518-Q, 343-R, 660-R
Rubin, A. I. 625-Q
Rubin, B. I. 432-C
Rubin, E. L. 143-M
Rubinshtein, F. I. 709-R
Rubinshtein, I. B. 159-F
Rubio, L. A. 86-L
Rublevsky, I. N. 154-K, 520-K
Rubo, E. 710-K
Rucker, J. P. 251-M
Rudchenko, A. V. 262-Q
Ruddle, R. W. 250-E
Rudee, M. L. 1272-Q
Rudenko, B. I. 391-C
Rudenko, L. N. 586-D
Rudin, William L. 585-M
Rudinger, Klaus 787-Q
Rudkov, A. K. 90-B, 112-B
Rudneva, A. V. 537-D, 601-D
Rudnich, Alfred 734-Q
Rudnick, A. 148-Q
Rudnitskii, A. A. 491-M
Rudnitskii, L. S. 1304-Q
Rudoi, V. S. 88-F
Rudolphy, E. C. 213-D, 245-D
Rudy, John F. 285-K,
. . . . . 332-K, 451-K, 617-K
Rudyi, E. R. I. 70-S
Ruehle, Archie E. 260-C
Ruetschi, Paul 195-R
Ruettiger, Karl 324-D
Ruff, P. E. 592-Q, 163-T
Ruff, Wolfram 81-S
Ruge, J. 221-K
Ruhmann, Jeno. 77-F
Ruiz, Alfonso. 226-S
Rul'kov, C. V. 229-K
Rummele, F. 11-X
Rumyantsev, B. F. 272-F
Rundqvist, Stig. 667-M
Runnalls, O. J. C. 319-C
Runoich, N. A. 171-P
Runov, A. E. 638-K
Rusina, Jan 458-N
Ruske, W. 296-P
Russ, J. J. 153-F
Russell, Edward B. 454-K
Russell, James B. 170-C
Russell, R. B. 2-M, 75-M
Russiyan, A. V. 72-K, 464-K
Russo, V. L. 215-K, 171-N
Rust, Gerhard 938-Q
Rutes, V. S. 219-D, 239-D,
. . . . . 427-D, 676-D, 42-N

Ruther, W. E. 452-R
Rutherford, J. L. 698-Q
Rutherford, John J. B. 257-K
Rutkowski, W. 136-C,
. . . . . 60-H, 70-H, 110-H
Rutt, Paul A. 121-E
Rutter, C. M., Jr. 124-R
Rutter, J. W. 193-M, 679-M, 63-N
Ruttewit, K. 680-R
Ruttiger, Karl 287-D, 682-D, 685-D
Ruttmann, W. 791-R
Rutzler, John E., Jr. 274-K
Ruza, Viliam 249-K, 672-K, 688-K
Ryabchenkov, A. V. 341-R
Ryabinin, Yu. N. 1538-Q, 192-T
Ryabinkin, V. P. 229-K
Ryabov, V. R. 524-K
Ryabov, Yu. F. 438-C
Ryabov, Z. I. 281-D
Ryabtsev, S. I. 565-N
Ryabuchin, S. I. 217-E
Ryan, J. L. 66-C
Ryan, J. P. 64-A
Ryan, N. 739-L
Rybakov, L. M. 93-M, 640-Q
Rybakow, L. 57-R
Rybnikov, V. A. 36-B
Ryder, D. A. 352-N
Rykalin, N. N. 6-K, 700-K
Ryrne, B. R. 407-S
Rys, Premysl 316-Q, 1537-Q
Rysava, Marie 128-N
Ryss, B. A. 548-K
Rytikov, A. M. 282-F
Ryumshin, V. M. 628-P
Ryvkin, S. M. 229-P
Ryzhavskii, A. Z. 338-W
Ryzhikov, A. A. 217-E
Ryzhikova, A. P. 81-J, 436-W
Ryzhkov, P. Ya. 208-D

S

Saada, G. 500-M
Saarivirta, M. J. 1118-Q
Sabiev, M. P. 205-D, 496-D, 661-D
Sachko, N. S. 203-A
Sachs, G. 264-F, 165-Q,
. . . . . 925-Q, 1188-Q, 1438-Q
Sachs, K. 329-M
Sadovskii, V. D. 111-N, 134-N
Sadowski, E. P. 186-M
Sadowski, S. 271-W
Safranek, W. H. 391-L, 627-L
Safronov, Yu. D. 872-Q
Saga, Toshirou. 179-J, 201-J
Sagel, Hans 322-L
Sagel, K. 210-A, 622-M
Sahaw, John D. 165-H
Sai, N. F. 272-F
Saikawa, S. 587-M, 594-M
Sainfort, G. 529-N
St. Bloeck 393-R
St. Clair, Hillary W. 225-C
Saint-James 259-C
St. John, Harry M. 459-E
St. John, John M. 272-S
St. Pierre, George R. 475-D, 129-D
Saito, Heikichi 64-B
Saito, K. 445-E
Saito, Seizo 387-Q
Saito, Tunezo. 45-D, 236-D
Saji, T. 412-L
Sakae, Yukio 507-L
Sakagami, Rokuro. 54-P
Sakaguchi, Susumu 459-C
Sakai, Seisuke 35-G
Sakala, Bronislaw. 116-C
Sakharov, V. F. 1358-Q
Sakharova, N. S. 689-Q
Sakui, Seita 659-N, 1375-Q
Sakuma, E. 377-N
Sakurai, Takemaro. 458-S
Salagean, Traian 429-K, 346-P
Salbaing, J. L. 572-E
Salier, N. 1064-Q
Salka, A. 48-S
Saller, H. A. 20-H
Salokangas, Jaakko 1522-Q
Salomatov, N. K. 416-C
Salpeter, E. W. 14-X
Saltykova, V. S. 141-S
Samanow, B. 57-R
Samans, C. H. 631-L
Samarin, A. M. 359-C, 480-C,
. . . . . 132-D, 174-D, 206-D,
. . . . . 355-D, 362-D, 446-D,
. . . . . 447-D, 638-D, 665-D,
. . . . . 667-D, 668-D, 332-E,
. . . . . 547-N, 655-N, 506-P
Samariti, A. M. 148-D
Sambell, R. A. J. 571-M
Samelson, Harold. 656-N
Samkov, E. A. 340-C
Sammour, H. M. 84-L, 85-L, 248-P
Samoilov, V. V. 47-J
Samoilova, A. Ya. 728-Q
Samolov, I. V. 282-J
Samonov, E. B. 49-H
Samotryasov, M. S. 463-K
Sample, Macbeth 293-W
Sampou, Andrew P. 382-W
Samsahl, K. 44-S
Samson, Sten. 87-M

Samsonov, G. V. 369-A, 236-C,
. . . . . 106-M, 113-M, 149-M,
. . . . . 43-N, 72-N, 256-N,
. . . . . 170-P, 826-R, 481-R
Samsonowicz, Zdzislaw 462-S
Samuel, R. L. 231-L, 747-L, 273-R
Samuels, L. E. 530-L,
. . . . . 182-M, 278-M, 375-M
Sanbongi, Koji 520-D, 612-D, 464-P
Sanchez, F. 423-S
Sanchuk, Ya. E. 571-N
Sandenaw, Thomas A. 502-P
Sander, M. P. 701-K
Sanders, C. A. 325-E, 330-E
Sanders, E. F. 27-C
Sanders, E. H. 548-A
Sanders, J. V. 182-M
Sanderson, F. L. 4-B
Sanderson, L. 20-A, 148-A,
. . . . . 260-A, 335-A, 568-A
Sandford, E. J. 85-C
Sandin, Anders. 640-M
Sandor, E. 632-Q
Sandor, J. 363-A
Sandoz, George 278-N
Sands, Donald E. 428-M, 653-M
Sandus, Oscar 21-B
Sanghi, Indra 745-L, 331-P
Sano, Kokichi. 621-D
Sano, Tadao. 789-R
Sansom, D. J. 616-P
Sanyal, B. 426-R, 446-R
Sapiro, L. S. 400-K, 521-K
Sapozhnikov, Yu. A. 81-X
Sappak, V. I. 851-Q
Saraeva, I. M. 701-M
Saraeva, N. F. 158-S
Saratovkin, D. D. 188-N
Sargent, K. H. 158-W
Sarjant, R. J. 415-A
Sarkisov, E. S. 225-R
Sarrak, V. L. 1541-Q
Sartan, Ya. Kh. 109-F
Sartell, J. A. 602-R
Sasagawa, M. 378-N, 15-Q
Sasaki, Kiyokazu . . . 11-E, 103-E, 139-L
Sasaki, Tokio. 274-G
Sasaki, Yasuo 474-R
Sata, Tomoo 627-N
Sata, Toshio 272-G, 920-Q
Satch, Kunihiko 350-K
Sato, Akira 285-F
Sato, H. 650-P, 651-P
Sato, Kaoru. 362-E, 154-N
Sato, Kiyoshi 93-Q, 790-Q, 1530-Q
Sato, Masayoshi 714-P
Sato, Norio 416-R
Sato, Ryoitiro 183-N
Sato, Ryozo. 623-D
Sato, S. 462-N, 233-R
Sato, Tomo-O 261-C,
. . . . . 693-M, 640-N, 1460-Q
Sato, Toshikazu 15-J
Sato, Yasuo. 255-Q
Satoh, Shiro. 470-R
Satyanarayana, S. 317-S
Sauberlich, Kurt. 60-B, 679-D
Saubestre, E. B. 298-L, 401-L
Sauer, F. M. 557-Q
Saulnier, A. 378-A,
. . . . . 369-M, 412-M, 443-M,
. . . . . 575-M, 696-M, 84-Q
Saunders, C. A. 708-L
Saunders, H. L. 304-T
Saunders, N. T. 247-K
Saur, Gunter 107-J
Sautter, F. 198-C
Savage, A. W., Jr. 256-C
Savage, W. F. 632-K, 620-Q
Savage, William R. 143-P
Savchenko, M. K. 114-M, 68-P
Savill, J. 76-X
Savin, A. V. 173-H
Savina, N. M. 528-Q
Savitskii, E. M. 67-J, 121-M,
. . . . . 356-M, 493-M, 494-M,
. . . . . 551-M, 336-N, 344-N,
. . . . . 394-Q, 995-Q, 1382-Q
Savitskii, K. V. 363-Q
Savitskii, V. G. 1358-Q
Savitsky, F. S. 34-Q, 309-Q
Savitt, Jacob 285-G
Savornin, F. 399-P
Savranskya, A. P. 141-A
Savvinkh, S. K. 12-P
Sawada, Yoshinobu 409-R
Sawamura, Jun. 632-D
Sawano, Iwakichi 117-Q, 890-Q
Sawato, Eiichi . . . 177-M, 178-M, 228-R
Sawato, Yoshikazu 177-M, 178-M
Sawhney, B. C. 95-S
Sawyer, H. F. 238-F
Sax, Stanley P. 616-L
Sayun, M. G. 235-S
Sazhin, V. S. 552-D
Sazhina, L. A. 471-S
Sazonov, M. L. 428-D
Sazonov, V. G. 103-J
Sazonova, A. A. 604-M
Scace, R. I. 592-P
Scalise, M. 15-X
Schaaber, Otto. . . . 147-J, 403-N, 400-W
Schackmann, H. 240-C
Schadler, H. W. 269-C, 500-N

Schaefer, A. O. 776-Q, 78-S
Schaefer, Alfred. 364-N
Schaefer, F. C. 199-W
Schaefer, Harold 177-C
Schaer, Glenn R. 740-L
Schafer, A. 31-N, 32-N
Schafer, Friedrich 136-D
Schafer, G. J. 249-R, 721-R
Schaffbit, W. O. 678-Q, 688-Q
Schaller, F. W. 1224-Q
Scharf, E. J. 174-C
Scharfstein, L. R. 67-R, 220-R
Scharnberg, John 347-L
Schattman, Stephan E. 229-A
Schatz, W. 171-K
Schaub, C. 1017-Q
Schauers, J. A. 95-L
Schaum, Jack H. 571-A
Scheidegger, R. 403-R
Scheil, Erich. 324-M,
. . . . . 492-N, 408-P, 1267-Q
Scheil, Merrill A. 551-R, 617-R
Scheitl, Erich 386-P
Schellhorn, B. 247-N, 293-N
Schemmer, K. 39-N
Schenck, Hermann 30-B, 198-D,
. . . . . 571-D, 227-M, 55-N,
. . . . . 264-N, 617-P, 89-Q,
. . . . . 498-R, 554-R, 600-R, 388-S
Schenck, K. H. 142-G, 31-W
Schepers, Alexander 205-G, 53-J
Scherb, Johannes 747-Q
Scherrer, Carl E. 38-T
Scheruhn, H. 155-K
Schestopal, W. M. 19-E
Scheuble, W. 698-P
Scheuerman, W. 213-L
Scheven, Ernst F. 206-G
Schicke, Horst. 214-S
Schickling, J. 14-T
Schifferli, L. M., Jr. 61-H, 161-H
Schileo, G. 529-M
Schilling, Werner 135-D,
. . . . . 229-D, 278-D
Schillmoller, C. M. 365-R
Schindler, M. J. 625-P
Schiniaev, A. Ia. 8-N
Schittenhelm, R. 75-S
Schlager, H. 378-S
Schlegel, H. 30-E, 106-J, 323-K
Schlinkmann, Paul E. 531-E
Schmahl, Norbert G. 287-R,
. . . . . 498-R, 554-R, 600-R
Schmale, Herbert. 26-F
Schmalhaus, Gerhard 152-W
Schmatz, D. J. 267-J,
. . . . . 189-M, 562-N, 656-R
Schmecken, H. 132-R
Schmid, A. 657-K
Schmid, E. 445-M, 458-P, 324-Q
Schmid, Erich V. 385-L
Schmidt, A. O. 185-G
Schmidt, Alfred 183-K
Schmidt, C. B. 304-D
Schmidt, D. G. 320-P
Schmidt, G. L. 193-W
Schmidt, Georg 106-A
Schmidt, Gerhard K. 317-M
Schmidt, Gyorgy. 159-D
Schmidt, H. 355-K
Schmidt, Joseph P. 70-W
Schmidt, M. J. 53-T
Schmidtmann, Eugen. 208-N,
. . . . . 246-N, 89-Q, 244-Q
Schmit, W. 1302-Q
Schmithals, Peter. 246-N
Schmitt, R. W. 315-P
Schmitt, Werner. 289-L
Schmitt-Thomas, Karlheinz G. . . . 227-Q
Schmitz, Klaus-Gunther. 388-S
Schnable, G. L. 823-L
Schneider, A. 415-N, 419-N
Schneider, F. 73-L
Schneider, Fred C. 647-D
Schneider, G. 1052-Q
Schneider, Gunther. 511-M
Schneider, H. E. 313-K
Schneider, R. A. 23-S
Schnorr, W. 273-J
Schoeck, G. 1502-Q
Schoeffer, E. A. . . . 3-A, 577-Q, 313-R
Schoffmann, Ernst 33-S
Schofield, M. 52-A, 238-A
Schofield, T. H. 502-M
Scholefield, H. H. 142-C, 535-E
Scholes, R. P. H. 88-S
Scholz, Werner 235-D, 376-G
Schomer, Robert T. 9-T
Schonert, Dieter. 183-F
Schonfeld, F. W. 188-C,
. . . . . 41-M, 623-M
Schoof, H. 516-K
Schore, George 497-L
Schossberger, Fredric V. . . . 197-C,
. . . . . 1010-Q
Schottky, G. 705-M
Schottner, Lajos. 1070-Q
Schrader, Angelica. 130-M,
. . . . . 57-N, 383-N
Schrader, C. F. 171-D
Schraidt, J. H. 43-C
Schramme, W. 39-T
Schreiber, W. 486-P, 359-S
Schreiner, Horst 90-H

Schroder, K. 667-Q
Schrodl, Werner. 59-L
Schroter, G. 40-G
Schtolts, E. V. 14-P
Schubert, H. R. . . . 159-A, 193-A, 550-A
Schubert, H. V. 20-X
Schubert, Jochen 479-P
Schubert, Konrad 319-M,
. . . . . 371-M, 616-M, 312-N
Schuckher, Franz 761-Q
Schueller, Hans-Jurgen 502-R
Schuermans, R. S. 133-W
Schuhmann, R., Jr. 614-P
Schulenburg, A. 98-E
Schuler, Fred G. 41-F
Schulta, Frank J. 121-C
Schulte, H. F. 243-A
Schulte, W. C. 339-Q, 952-Q
Schultheisz, Gyula 108-F, 139-F
Schultz, Hermann 451-M, 377-P
Schultze, H. W. 154-L, 681-L
Schultze, W. 395-R
Schulz, L. G. 244-P
Schulz, Otto. 296-C
Schulz, W. 405-W
Schulze, K. J. 18-L
Schumacher, Volker 234-N
Schumacher, W. 644-K, 698-K
Schumann, H. 12-Q, 411-S
Schumar, James F. 150-T
Schur, Ya. S. 8-M, 4-P, 14-P
Schurmann, Eberhard 126-B,
. . . . . 39-D, 284-P
Schuster, H. J. 775-R
Schuster, R. 5-K
Schuster, W. 214-G
Schwaab, Paul 502-R
Schwartz, A. A. 341-T
Schwartz, Charles M. 634-M, 727-R
Schwartz, E. G. 351-K
Schwartz, Mel 337-K, 625-K
Schwartz, Milton 30-P
Schwartzbart, Harry . . . 281-K, 285-K,
. . . . . 332-K, 451-K, 615-K, 617-K
Schwartzberg, F. R. 495-Q,
. . . . . 1087-Q, 1128-Q, 1236-Q
Schwartzman, L. A. 81-P
Schwarz, A. 345-A, 628-R
Schwarz, Gerhard. 50-E, 277-E
Schwarz, H. 323-K
Schwarz, Ruth F. 536-P
Schwarzman, L. A. 221-D, 232-D
Schwarzwalder, R. 615-M,
. . . . . 130-N, 423-N, 424-N
Schweighofer, Augustin 471-K
Schweikert, J. W. 280-S
Schweisheimer, W. 51-A
Schwenk, Wilhelm. 331-R
Schwerdtfeger, W. J. 730-R
Schwoegler, E. J. 306-R
Schwope, A. D. 114-H
Schwuttke, G. H. 302-M, 21-X
Sciulli, E. B. 538-Q
Scloeck, Gunther 499-Q
Scobie, Herbert F. 516-Q
Scorchelletti, V. V. 254-R
Scott, Allen B. 744-R
Scott, Bruce E. 355-L
Scott, C. N. 99-J
Scott, D. B. 304-L
Scott, David. 357-G
Scott, E. H. 727-Q
Scott, Fremont L. 372-L
Scott, J. L. 7-T
Scott, K. P. 5-Q
Scott, L. D. 28-S
Scott, Nancy J. 674-P
Scott, Stephen Y. 130-R
Scott, V. D. 307-L, 226-R
Scott-Young, P. 46-N
Scuri, Luigi. 187-R
Seager, J. 760-Q
Searcy, A. W. 593-P
Searles, C. B. 553-E
Sebastian, I. 17-A
Sebilleau, Francois. 47-N, 333-N
Secciani, Alfredo 93-J, 120-J
Secrest, Arthur C., Jr. 193-C
Sedlacek, R. 337-A
Sedlatschek, K. 127-M,
. . . . . 396-M, 545-M
Sedor, P. 765-R
Seebold, R. E. 10-R, 364-R, 381-R
Seed, R. G. 94-N
Seeger, Alfred K. 433-M,
. . . . . 705-M, 1502-Q
Seegmiller, R. 449-L
Seeling, Richard P. 152-L
Seely, Nigel. 47-R
Seeman, H. J. 124-Q
Seemann, Hugo Josef. 280-N
Seferian, D. 209-K
Segal, H. S. 823-L
Segall, R. L. 597-M, 706-M
Seghezzi, Hans-Dieter. . . . 758-Q, 503-R
Seifert, H. 30-K, 511-K
Seifert, Harold C. 335-G
Seifert, J. W. 702-R
Seigle, L. 12-H, 15-H, 172-H,
. . . . . 177-H, 50-K,
. . . . . 681-K, 36-N, 121-N
Seils, A. 392-R
Seitz, Frederick. 513-M, 6-P
Sejournet, Jacques 191-F

Sekerka, Ivan. 528-R
Seki, Yachiho. 350-R
Sekiguchi, H. 504-K, 52-Q
Seklemian, Haig Verne 468-C
Selak, Patrick J. 606-D
Seldenthuis, J. 649-K
Self, M. A. 347-L, 735-L
Seliger, H. 366-C, 155-F
Selivanov, I. M. 383-C
Sell, R. 1188-Q
Sella, C. 258-M
Sellier, E. 93-G
Sellos, W. W. 194-R
Selmer, Ed. 124-G
Seltenhammer, L. 1114-Q
Semchenko, O. A. 95-F
Semchysen, M. 354-N, 1026-Q
Semenchenkov, A. T. 492-M
Semenkovich, S. A. 71-N
Semenov, G. N. 271-Q
Semenov, V. M. 73-K
Semenova, H. A. 415-P
Semenova, N. V. 375-P, 297-T
Semin, V. 567-L
Semmel, J. W. 573-R, 657-R
Semple, J. 451-L
Sendler, Hans-Jorg. 86-A
Sen Gupta, H. R. 587-N
Sen-Ke, Bao 360-Q
Septier, L. 134-D, 162-D, 320-D
Serebrennikov, G. Z. 307-Q
Serebryakov, V. V. 146-P
Seredynski, F. 197-W, 198-W
Serensen, S. V. . . . 64-Q, 209-Q, 1494-Q
Sergeant, R. M. 120-N
Sergeev, G. I. 1282-Q
Sergeev, G. Y. 630-P, 394-Q
Sergeev, L. N. 784-R
Sergeev, P. V. 417-C
Sergeev, S. I. 1500-Q
Sergeev, V. V. 477-C
Sergeeva, Z. L. 265-F
Sergeichev, I. M. 69-J
Sergienko, N. E. 348-K
Sergienko, V. Ya. 424-C
Serin, B. 47-P, 570-P
Serota, L. . . . . 49-L, 66-L, 192-L, ... 219-L, 405-L, 499-L, ... 608-L, 634-L, 703-L, 756-L
Serpov, V. I. 349-C
Sertour, G. 52-M
Sery, R. S. 528-P
Seshadri, M. R. 254-C
Sessler, John G. 166-Q, 925-Q
Sestak, Bohdan. 553-N
Sesyuk, G. S. 547-D, 548-D
Setapen, A. M. 263-K
Sevastyanov, N. G. 117-M
Sevast'yanov, V. Ya. 587-Q
Sevbo, P. I. 519-K
Severing, Herbert. 58-F
Seward, W. K. 366-G
Sewell, R. 237-A, 9-D
Seyb, Edgar J., Jr. 682-L, 722-L
Seybolt, A. U. . . . . 384-M, ... 389-P, 199-R, 773-R
Seyer, C. L. 761-R
Seymour, D. H. 1-G
Seymour, E. F. W. 34-P
Shabalin, V. I. 65-Q
Shadrina, N. D. 584-D
Shaevich, A. B. 239-S
Shaffer, Bernard W. 1415-Q
Shaha, A. K. 260-D
Shahinian, P. . . . 381-Q, 407-Q, 1031-Q
Shakely, H. H. 261-W
Shakh-Buragov, A. L. 156-F
Shakhovskaya, G. V. 94-F
Shakhtovich, V. A. 399-N
Shaler, A. J. 164-H
Shalgosky, H. I. 12-S
Shalon, R. 649-R
Shalygin, L. M. 370-C
Shanahan, C. E. A. . . . . 99-D, 102-D, ... 197-Q, 126-S, 292-S
Shangareev, F. L. 108-N, 125-N
Shannon, D. W. . . . 772-L, 535-R, 536-R
Shapiro, Harold 197-R
Shapiro, I. S. 292-G
Shapiro, M. M. 84-M, 265-M
Shapovalov, S. I. 165-N, 568-N
Sharapin, E. F. 228-F, 1257-Q
Sharapov, V. A. 352-C, 790-L
Sharma, S. S. 705-K
Sharov, B. V. 1495-Q
Sharov, M. V. 308-C, 487-E, 146-P
Sharp, C. 348-G
Sharp, W. H. 645-R, 245-T
Sharshatkina, A. V. 164-M, 197-M
Shashin, D. M. 639-K
Shashin, M. Ya. 159-G
Shavanova, T. N. 434-R
Shavrin, S. V. 487-D, 213-P
Shaw, D. 64-G
Shaw, F. M. 13-A, 353-A
Shaw, Frederick D. 642-L
Shaw, Kenneth 41-B
Shaw, M. P. 148-W
Shaw, Milton C. . . . . 5-G, 20-G, ... 156-G, 173-T
Shaw, P. 329-K
Shaw, R. E. 244-L
Shaw, R. J. 292-T
Shaw, S. W. K. 910-Q

Shaw, Van E. 208-C
Shaw, Vincent G. 91-S
Shchanov, N. P. 1495-Q
Shchedrovitskii, Ya. S. 123-D
Shchenkin, N. P. 224-D
Shcherbedinskii, G. B. 671-N
Shcherbina, G. Z. 875-Q
Shcherbov, D. P. 135-S, 233-S
Shchirenko, N. S. 544-D
Shchukin, E. D. 1540-Q
Shea, John J. 591-P
Shearer, Andrew W. 29-K, 18-T
Shearer, Thomas W. 263-W
Shebakin, Yu. F. 265-F, 282-F
Shedden, J. W. 276-K, 118-Q
Sheehan, J. M. 580-M
Sheely, W. F. 472-N, 1172-Q
Sheer, Charles. 392-C
Sheka, A. 92-C
Shekhtova, V. Sh. 551-M
Shelest, A. E. 220-F
Shelley, R. C. 138-K
Shepard, A. P. 670-L
Shepard, L. A. 147-Q,
. . . . . 185-Q, 772-Q, 1220-Q
Shepard, Spencer W. 497-R
Shepelyakovskii, K. Z. 77-J
Shephard, O. C. 326-N
Shepherd, C. C. 407-G
Shepherd, D. M. 859-Q
Shepstane, B. J. 289-P
Sherman, B. P. 349-C
Sherman, C. W. 104-D, 293-J
Sherman, P. E. 413-S
Sherstyuk, V. N. 57-K
Sherwood, P. W. 165-R, 209-R
Sheshenev, M. F. 717-Q
Shestakov, S. N. 294-F
Shestopalov, L. M. 210-P
Shevakin, Yu. F. 274-W
Shevandin, E. M. 267-Q, 573-Q
Shevchenko, L. 322-W
Shevernitskii, V. V. 525-Q, 607-Q
Shevlin, T. S. 2-H, 1058-Q
Shewman, P. G. 274-M
Shewmon, Paul. 276-N
Shibata, H. 111-A
Shibata, Kizo 1-C, 481-N, 16-Q
Shibata, Shozi 1016-Q
Shibuya, Yoshio 262-P, 267-P
Shi-Chan, Chzhou 1481-Q
Shidara, H. 151-A, 84-P
Shields, J. R. 98-W
Shigeno, Hayata 423-R
Shikhova, V. V. 312-C
Shimakov, H. S. 149-R
Shimamura, Shoji 4-G, 357-Q
Shimamura, Tetsuo. 323-A
Shimanuki, R. 236-D
Shimaoka, Goro 527-M, 528-M
Shimelevich, I. L. 267-Q
Shimizu, Akira. 146-W
Shimizu, Ken'ichi 330-M,
. . . . . 442-M, 691-M
Shimodaira, Saburo. 409-R
Shindel'man, R. I. 411-C
Shindo, Yoshitane 357-Q
Shiniaev, A. Ia. 144-N
Shinn, D. A. 1439-Q
Shinoda, Gunji 324-N
Shinozaki, Ichiro 29-R
Shirakawa, Yuki 318-P, 547-P
Shirokova, Z. I. 84-K
Shirokovskii, V. P. 133-M
Shishkin, V. Yu. 642-Q
Shishkov, N. A. 150-R
Shishmarev, O. A. 269-Q, 364-Q
Shishmareva, L. A. 831-L
Shishokin, V. P. 1230-Q
Shivrin, O. H. 159-M, 945-Q
Shizawa, S. Yo. 607-P
Shklovskii, S. M. 110-W
Shkol'nik, L. M. 921-Q
Shlepyanov, N. E. 470-S
Shlychkov, L. A. 390-C
Shmidt, K. P. 318-T
Shnay, R. C. 513-E
Shneerov, M. S. 406-C
Shneerov, Ya. A. 146-D, 441-D
Shober, Fred R. 236-M
Shon, J. 1177-Q
Shono, Shiro 632-D
Shor, E. R. 137-F
Shorin, A. F. 491-D
Shorshorov, M. Kh. 72-K, 636-K
Short, H. G. 89-S
Short, H. M. 30-J
Shozi, Yukiyoshi. 1016-Q
Shpichinetskii, E. S. 435-C
Shrager, Jack J. 61-X
Shreir, L. L. 352-R
Shreyder, A. V. 140-Q, 292-R
Shtein, V. K. 668-M
Shteinberg, B. Sh. 825-R
Shternov, M. M. 321-W
Shtrapenina, R. B. 448-C
Shtremel, M. A. 266-J
Shtsherbedinsky, G. V. 176-N
Shtol'ts, E. B. 158-P
Shu, H. 565-Q
Shubert, F. L. 163-F, 343-R
Shubin, V. A. 451-C
Shubina, L. A. 248-Q
Shuh-Cho, Li 374-S

Shukhobitskii, A. A. 49-N
Shulaev, I. P. 116-F, 196-F
Shuldener, Henry L. 55-P
Shulepov, V. I. 332-J
Shuler, Fred G. 43-L
Shulte, W. C. 24-Q
Shumaker, M. Byron 245-R
Shuman, William H. 45-E
Shundo, Akio 1430-Q
Shuper, A. S. 425-E
Shur, A. B. 68-D, 303-D, 381-D
Shur, Ya. S. 107-N, 71-P,
. . . . . 145-P, 155-P, 158-P,
. . . . . 164-P, 165-P, 167-P,
. . . . . 178-P, 207-P, 248-Q
Shuralev, M. V. 156-W
Shurin, A. K. 325-Q
Shustova, M. B. 134-S
Shuttleworth, R. 272-P, 709-P
Shvachkin, A. K. 209-J
Shvartsenau, N. F. 162-C
Shvartsman, L. A. 428-D,
. . . . . 535-D, 602-D
Shvartz, G. L. 708-R
Shved, M. M. 645-Q
Shveikin, G. P. 300-C, 122-M
Shyne, J. C. 267-J, 562-N, 1224-Q
Sibert, Merle E. 28-L, 584-L
Sibley, C. B. 437-W
Sibley, L. B. 702-Q
Sicha, F. 567-K
Sicha, Miroslav 366-S
Sickbert, A. 311-D, 359-D, 686-D
Siddall, G. 386-L
Sidebottom, O. M. 724-Q
Sidelnikova, L. N. 471-S
Sidlyarenko, V. A. 301-L, 109-M
Sidorov, B. A. 311-Q
Sidorov, V. P. 341-R
Sidorovskii, V. A. 371-C
Siebel, G. 317-N
Siebel, Henning 261-G, 843-Q
Siebel, M. P. L. 169-G
Sieber, K. 215-G, 221-G, 170-W
Siebert, Clarence A. 140-J, 1184-Q
Siebold, R. 22-T
Siegfried, W. 182-D, 1013-Q
Siegfriedt, J. 419-N
Siekmann, H. J. 71-G, 296-G, 87-W
Siergiej, John M. 219-T
Siewierski, J. 27-X
Sifferlen, R. 655-R
Siftar, J. 81-R
Signora, M. 614-D
Signorelli, R. A. 1022-Q
Sigov, A. A. 146-B
Sigut, Z. 77-X
Silaev, A. F. 717-Q
Silbereisen, H. 159-H
Silberg, P. A. 15-N
Silcox, J. 59-M, 378-M
Silin, L. L. 6-K
Silina, G. F. 99-A, 448-C
Silk, James J. 552-E
Silliman, M. A. 804-Q
Sills, R. M. 5-F
Silman, H. 259-L
Silman, R. 153-T
Silver, E. G. 268-N
Silver, I. R. 1095-Q
Silver, J. 685-R
Silverman, Louis 342-S
Silverman, S. J. 192-P
Silverstein, S. M. 131-W, 330-W
Silvester, D. R. 181-R
Sim, P. J. 64-X
Simak, Vilem. 543-R
Simakova, M. S. 186-P
Simakovski, A. P. 307-G
Simanov, Yu. N. 359-M
Simasheva, N. P. 522-M
Simenz, Rod 375-R
Simmons, Howard. 494-E
Simmons, J. G. 174-L
Simmons, W. 957-Q
Simnad, M. T. 11-A
Simoens, W. 971-Q
Simon, Bela. 200-S
Simon, Ralph 244-G, 245-G, 247-G
Simon, Rene 525-P
Simon, Richard 186-W
Simon, Sandor 157-A
Simonov, E. I. 422-D
Simonov, V. I. 616-D
Simonov, V. K. 586-D
Simons, Eric N. 163-A, 228-A,
. . . . . 244-F, 287-J,
. . . . . 289-J, 62-M, 114-Q,
. . . . . 1330-Q, 726-R, 258-S
Simons, J. C., Jr. 440-C
Simonova, M. I. 17-R
Sims, Chester T. 309-N,
. . . . . 1239-Q, 433-R, 770-R
Sims, Clarence E. 504-D
Sims, R. B. 280-F
Sinaiskii, V. M. 207-Q
Sinani, S. S. 232-P
Sinason, Henry H. 53-C, 211-C
Sinchuk, B. I. 355-S
Sinclair, G. M. 496-Q,
. . . . . 514-Q, 520-Q, 764-Q
Sinclair, K. N. 254-L
Sinel'nikov, K. D. 74-C, 700-R
Sines, George 340-Q, 346-Q, 359-Q

Singer, A. R. E. 90-F
Singer, Felix 33-T, 274-T
Singer, Joseph 357-P
Singer, Sonja S. 33-T, 274-T
Singh, Sampooran 1092-Q
Singh, T. P. 1334-Q
Singleton, J. B. 192-P
Singleton, Jerry 251-E
Singleton, O. R., Jr. 243-K
Singleton, R. H. 529-D
Singley, W. J. 667-R
Sinha, H. N. 344-C, 73-H, 588-N
Sinitsyn, A. A. 222-W
Sinizer, D. I. 68-C
Sinnott, R. K. 100-B
Sinott, M. J. 308-N, 603-P
Sinyagov, A. A. 306-C
Sirazitdinov, N. I. 196-F
Sirel, I. A. 376-D
Sirenko, A. F. 1542-Q
Sisler, H. H. 909-Q
Sison Bienvenido, C., Jr. 738-L
Sistiaga, J. M. 263-Q, 453-Q
Sittard, Johann. 83-A
Sittel, K. 146-Q, 932-Q
Sivak, V. I. 801-L
Sivak, V. M. 524-L
Sivertsen, J. 349-N
Sivryukova, M. A. 66-Q
Sjoberg, J. W. 305-R
Skakov, Yu. A. 280-J,
. . . . . 164-M, 197-M, 1253-Q
Skala, Jiri. 505-P
Skeet, T. H. H. 480-A
Skelly, Joseph F. 246-W
Skevington, H. C. 199-M
Skewes, H. R. 446-P
Skinner, E. N. 112-A, 124-A
Skirstymonskaia, B. I. 517-L
Sklyarenko, D. V. 81-J
Skobel'tsyna, N. A. 351-M
Skobkin, V. S. 215-P
Skoblo, S. Yn. 91-F
Skold, R. V. 37-R
Skolnick, L. 661-N
Skop, S. L. 87-J
Skorik, N. S. 82-D
Skornyakova, O. N. 214-R
Skorokhod, S. D. 480-D
Skorskii, E. I. P. 436-R
Skriniar, Jan 49-K
Skudnova, E. V. 554-M, 669-M
Skul'skii, M. K. 993-Q
Skvortsov, A. A. 562-D
Slack, G. A. 592-P
Slade, Frank H. . . . 432-L, 797-L, 421-W
Slater, D. 484-K
Slater, J. M. 367-A
Slater, Morris N. 474-L
Slaughter, G. 667-K, 439-W
Slepak, E. S. 401-K, 546-K
Slichter, Charles P. 454-P, 456-P
Slivinskii, P. M. 436-W
Slobodchikov, S. V. 123-P
Slodek, S. T. 636-L
Slonim, D. M. 182-Q, 604-Q
Slonimskii, B. I. 447-C
Sloope, Billy W. 803-R
Slunder, Charles J. 850-Q, 806-R
Slysko, Pavel. 428-K, 541-K
Slyusar, B. F. 309-M, 495-M
Smack, John C. 256-S
Smajic, Niaz 58-B
Smakhlin, L. A. 411-P
Small, V. G. 488-P
Smallman, R. E. 430-M, 435-M,
. . . . . 862-Q, 1196-Q, 1284-Q, 1519-Q
Smarcan, A. 194-K
Smart, Alan. 176-R
Smeltzer, W. W. 383-R, 407-R
Smetana, O. 178-C
Smialowski, Michael 754-R
Smiley, S. H. 7-C, 8-C, 456-C
Smilga, V. P. 108-M
Smirnov, B. I. 382-C,
. . . . . 291-G, 224-K, 490-M
Smirnov, L. S. 208-M
Smirnov, M. P. 443-C
Smirnov, M. V. 35-C, 108-C, 735-P
Smirnova, N. K. 147-R, 606-R
Smirnova, Z. M. 553-M
Smith, A. A. 601-K, 71-S
Smith, A. I. 435-Q, 455-Q
Smith, A. J. 87-E, 245-E
Smith, B. A. 18-M, 570-M
Smith, B. O. 23-D
Smith, D. C. 136-W, 157-W, 408-W
Smith, D. Valerie 88-S
Smith, D. W. 538-L, 676-L
Smith, E. 341-M, 582-M
Smith, E. L. 206-L
Smith, F. H. 433-E, 175-K
Smith, G. 386-L
Smith, G. B. 301-R
Smith, G. C. 74-H, 132-H, 133-H
Smith, G. P. 140-M
Smith, G. V. 1137-Q
Smith, H. 1019-Q
Smith, H. J. 541-R
Smith, H. L. 558-Q
Smith, Hugh R. . . . 134-C, 223-C, 441-C
Smith, J. E. 287-W
Smith, J. F. 508-M, 598-N,
. . . . . 29-P, 418-P, 250-Q

Smith, James M. 265-T
Smith, Karl F. 403-P
Smith, Knowles B. 748-L
Smith, L. A. 16-A
Smith, L. W. L. 586-N
Smith, M. F. 473-N
Smith, P. A. 5-G, 173-T
Smith, R. B. 606-N, 607-N
Smith, R. C. 818-Q, 1345-Q
Smith, R. L. 41-L
Smith, R. P. 120-A, 515-N
Smith, R. W. 682-N
Smith, Richard M. 1153-Q, 265-T
Smith, Robert L. 589-M
Smith, Sigmund L. 94-B
Smith, Theodore B. 121-G, 1280-Q
Smith, W. J. Burling 287-L
Smith, W. K. 119-Q
Smith, W. O. 331-W
Smith, W. Shearer 353-G
Smith, William R. 288-K
Smithson, G. L. 167-S
Smits, Paul 50-L
Smolen, H. 315-S
Smolin, M. D. 84-N, 549-N
Smolinski, A. K. 332-P, 363-P
Smolka, B. 557-E
Smolovikov, B. D. 322-W
Smoluchowski, R. 431-M
Smolyakov, A. N. 417-E
Smolyanitskii, Ya. A. 64-E
Smolyarenko, D. A. 846-Q
Smornova, I. D. 636-K
Smout, D. D. 709-K
Smucker, Richard A. 147-H
Smutz, M. 42-C
Smythe, R. L. 418-P
Snavely, Earl S., Jr. 190-R
Sneck, T. 443-R, 521-R
Snedden, A. 135-G
Snelson, D. H. 70-E
Sniegon, Karol 537-K
Snikeris, P. 306-L
Snook, J. M. 410-S
Snowden, K. U. 203-Q
Snyder, M. Jack 395-A
Sobol', S. I. 372-C
Sobolev, V. 120-D
Sobotina, E. A. 194-C
Sochan, I. F. 248-D
Sochor, Bretislav . . . . . 471-E, ... 28-W, 213-W
Soddu, G. 614-D
Soderberg, C. R., Jr. 594-Q
Soderberg, K. S. 530-R
Soete, W. 83-J, 305-Q, 37-T
Soeters, D. H. 346-W
Soffa, Leo 221-Q
Sofroni, L. . . . . 76-E, 78-E, 257-E, ... 21-N, 199-N, 584-N, 461-P
Sogrishin, Yu. P. 160-G
Sohn, Jesse S. 361-K
Sohngen, R. 711-K
Soifer, V. M. 361-D
Soisson, H. E. 260-K
Soja, Joseph 327-G
Sokolikov, A. I. 292-R
Sokolkov, E. N. 97-M
Sokolov, A. E. 391-D
Sokolov, B. V. 122-P
Sokolov, D. D. 234-A, 234-F
Sokolov, G. A. 510-D, 601-D, 675-D
Sokolov, L. D. 352-C
Sokolov, P. S. 432-Q
Sokolov, V. E. 391-D
Sokolov, V. M. 110-M
Sokolova, A. M. 399-K
Sokolovskii, P. A. 176-H, 262-Q
Sokursky, Y. N. 630-P, 908-Q
Solacolu-Nicolaid, Maria 247-E
Solaja, V. 277-G
Solc, Ivan 512-M
Solc, Jan. 386-A
Soldatenko, V. I. 373-E, 412-E
Sole, Alberto 172-M
Solodikhin, T. P. 480-D
Sologub, S. L. 441-D
Solomon, A. 601-Q
Solov'ev, J. G. 276-P
Solov'ev, N. A. 331-L
Solov'eva, V. V. 228-N
Solti, M. 134-E, 780-R
Solursii, Yu. N. 898-Q
Somers, D. L. 165-W
Somers, Lewis S. 225-F
Somigli, Guglielmo 386-W
Sommacal, B. 340-N
Sommer, A. H. 724-P, 285-W
Sommer, A. W. 139-B
Sommer, F. 956-Q
Sommer, George F. 169-H
Sommer, K. 22-N
Sommerkorn, G. 67-M
Somosi, Istvan 198-S
Son, Chol Yun 210-D
Sonchik, L. S. 236-S
Songer, L. W. 349-K
Songina, O. A. 132-S
Sonntag, A. 897-Q
Sono, Kin'ya 23-C
Sopena, J. A. Boned 83-B
Soper, Frank 203-L
Sopher, R. P. . . . . 407-K, ... 612-K, 131-W, 330-W

Sopp, A. L., Jr. 409-P
Sorace, K. J. 619-L
Sorel, Micheline. 392-M
Sorokin, A. A. 272-W
Sorokin, P. Ya. 70-D, 29-X
Sorokin, V. A. 162-W
Sorokina, K. P. 521-M
Soroko-Novitskaya, A. A. 321-T
Sos, F. L. 95-X
Sosin, A. 680-N
Sosnina, E. I. 6-M
Sotskov, A. D. 179-N
Souriou, Guy 75-W
Souske, R. 396-R
Soustre, Lucien 404-S
Southwell, C. R. 533-R
Souviron, J. 144-K
Sovesi, Paul 19-A
Sovikova, Zora. 603-L
Sowman, H. G. 60-T
Soznacki, Wladyslaw 335-W
Spachner, S. A. 530-M, 778-Q
Spahn, H. 275-L, 787-L
Spainhour, C. D. 321-G
Spalaris, C. N. 229-F, 622-K
Spalding, D. B. 634-P
Spalensky, V. 249-J
Sparrow, L. R. 210-R, 278-R
Spasskii, A. G. 213-C, 482-P
Spath, W. 91-Q
Spaulding, E. H. 354-Q
Spear, Peter 480-E
Specht, Hansgeorg 383-K, 324-M
Spector, O. Sh. 237-G
Spedding, F. H. 276-C, 293-M,
. . . . . .46-P, 243-P, 494-P
Spee, A. 648-K
Speich, G. R. 473-N, 19-X
Speiser, Rudolph 177-P, 359-P
Speith, K. G. 58-D,
. . . . . 199-D, 453-D, 499-D
Spektor, Ya. I. 610-N
Spencer, Lester F. . . .163-G, 200-G,
. . . . . 167-J, 223-J, 256-J, 25-K,
. . . . . 579-K, 64-L, 462-L, 606-L,
. . . . . .653-L, 700-L, 142-W, 192-W
Spendlove, M. J. 297-C
Spengler, H. 582-R
Speranskii, G. V. 60-D, 672-D
Spescha, M. 25-T
Spetzler, Edgar 211-D
Spicer, W. E. 724-P
Spiegel, F. 171-G
Spiegl, Fred 183-G
Spiegler, P. 244-P
Spiers, H. R. 465-L
Spiewak, M. 268-P, 455-P
Spindler, H. 74-A, 480-R
Spiridonova, M. Z. 433-C, 1383-Q
Spirkov, Alexander 357-M
Spitsyn, V. V. 294-K
Spitzer, Horst 26-D, 43-D
Spitzin, A. V. 208-M
Spivak, G. V. 701-M, 702-M
Spizig, J. S. 101-G
Splitek, Rudolf 96-S
Spokas, John J. 454-P
Spooner, H. M. 102-R
Spooner, R. C. 241-L
Sprague, T. P. 120-A
Spreadborough, J. 21-M
Sprencl, A. 366-W
Sprenger, Bertold. 105-W
Spretnak, J. W. 369-N,
. . . . . 488-N, 359-P, 1245-Q
Sprigg, W. N. 281-S
Springmeyer, Allan. 737-Q
Sproat, Robert L. 166-T
Spurgeon, W. M. 282-S
Spurny, Jiri. 117-B
Spurr, J. C. 692-R
Spyra, Wolfgang 209-N
Squire, N. F. 40-J
Squires, A. M. 131-D, 263-D
Srawley, J. E. 1044-Q, 1488-Q
Sree, V. 675-L
Srinivasan, T. M. 340-P, 341-P
Sryvalin, I. T. 309-C, 601-P
Stablein, Helmut. 226-M, 400-P
Stacey, R. D. 97-Q
Stadelmaier, Hans H. 424-L,
. . . . . 372-M, 506-M, 365-N
Stadler, M. H., Jr. 286-W, 288-W
Stadler, V. 336-S
Stadtman, Hans 9-G
Staehle, R. W. 563-R
Stafford, J. A. 167-T, 249-T
Stahler, Albert. 446-N
Stakovic, P. 67-F
Stalevich, P. K. 539-L
Stalker, K. W. 396-G
Stambler, Irwin 14-G, 92-T
Stambler, P. 507-A
Stammler, Manfred. 261-E
Stancovic, P. 18-F
Stancu, Gh. 285-P
Stander, Robert A. 144-L
Stangler, F. 463-P, 767-Q
Stanishevskii, B. A. 18-B
Stankevich, O. F. 871-Q
Stanley, J. S. 691-R
Stanley, M. E. 512-R
Stanton, W. E. 198-Q
Stanyukovich, A. V. 517-K

Stanzione, Louis A. 311-T
Stapen, A. M. 581-K
Stapleton, B. 611-K
Staraoubov, Ya. D. 69-N
Stareck, Jesse E. 583-L
Starikova, G. V. 550-N
Stark, Ira A. 122-B
Stark, L. E. 699-K
Starks, Eberhard 493-N
Starling, C. W. 276-F
Starlipe, A. G. 151-D
Starodubov, K. F. 604-M,
. . . . . 274-N, 605-P
Starr, C. 35-T
Starr, John 96-E
Starratt, Weston. 246-C, 452-D
Startsev, V. A. 558-D
Startseva, I. E. 165-P, 207-P
Stassin, Gaston 545-D
Stato, Akira 628-N
Staubwasser, W. 549-Q
Stauffer, W. A. 190-K
Stauss, H. E. 707-P
Stavig, W. E. 340-S
Stearns, L. B. 180-G
Stech, W. 253-J
Steck, Alfred B. 517-E
Steclai, A. 117-D
Stedman, R. F. 539-R
Steeb, Siegfried 558-M
Steel, G. K. 197-W
Steele, M. C. 28-P
Stefan, Mihaly 1071-Q
Stefan, O. 155-H
Stefaniuk, S. L. 39-C
Steffens, H. D. . . . 355-G, 429-Q, 618-Q
Steidl, P. 444-K
Steiger, A. J. 164-L
Steijn, R. P. 2-Q, 3-Q
Stein, E. M. 530-Q
Stein, F. 935-Q, 1486-Q
Stein, W. 224-L, 365-L
Steinegger, A. 22-A
Steiner, J. E. 974-Q, 1191-Q
Steinherz, H. A. 65-X
Steininger, Zygmunt 61-F, 232-Q
Steinitz, Robert 477-A,
. . . . . 105-H, 1131-Q
Steinkamp, W. I. 255-K
Steinrath, Heinrich 345-R
Stembera, Jaroslav. 46-K
Stepanov, F. P. 17-Q
Stepanov, I. A. 254-R
Stepanova, A. A. 593-M
Stepanova, A. N. 48-J
Stepanova, A. V. 403-D, 156-F
Stepanova, G. I. 74-C, 124-N
Stepath, Myron D. 390-G
Stephens, F. M., Jr. 77-B
Stephenson, J. 141-C
Stephenson, V. 356-W
Stepin, P. I. 218-E, 122-N, 552-N
Stepina, L. A. 636-M
Sterk, E. 95-X
Sterl, K. 65-G
Sterlikov, I. I. 160-F
Sterling, F. T. 66-B
Stern, Milton 14-R, 180-R,
. . . . . 661-R, 745-R, 746-R
Stetsenko, B. A. 285-J, 137-Q
Steunenberg, R. K. 21-B, 14-C
Steurer, Wolfgang H. 204-N
Steven, G. 340-T
Steven, Gary 754-Q
Stevens, G. J. 259-G
Stevens, John. 76-R
Stevens, L. D. 599-L
Stevens, L. K. 59-Q
Stevenson, C. E. 9-C
Stever, K. R. 36-S
Stewart, D. A. 169-Q
Stewart, M. A. A. 181-C
Stieler, C. 233-K
Stinhauer, Otto. 116-B
Stirland, D. J. 645-M
Stloukal, Josef 215-W
Stobie, John J. 15-E
Stoch, C. M. 367-A
Stock, A. J. 520-A
Stock, J. E. 329-W
Stockdale, J. F. 487-K
Stocker, William M., Jr. 49-W
Stockes, R. J. 1091-Q
Stockwell, Richard E. 191-G
Stohr, J. A. 187-F, 556-N
Stoianovici, Petre. 249-W
Stoker, O. A. 377-L
Stokes, R. J. 602-R
Stokowiec, Z. 534-D, 561-D
Stolica, Nikolas D. 471-R
Stoll, J. H. 172-D,
. . . . . 404-D, 500-D, 546-D
Stoll, R. E. 245-D
Stolyarova, G. I. 213-R
Stone, A. J. 86-E
Stone, C. C. 506-K, 6-T
Stone, J. D. 288-W
Stone, L. J. 88-E
Stonebrook, E. E. 584-M
Storchheim, Samuel 33-H
Stordy, J. J. 609-L
Storek, M. 657-N
Storhok, Victor W. 295-M
Storing, O. 648-L

Stoss, D. R. 413-S
Stoter, J. 108-W
Stout, R. D. 625-Q
Stout, Roy 717-R
Stover, E. R. 194-M
Stradley, J. G. 2-H
Stradley, N. H. 662-L
Stragand, G. L. 561-N, 308-R
Stranski, I. N. 678-D, 89-H
Stransky, K. 466-E
Straschill, Max 148-S
Strashun, K. Z. 273-S
Strassburg, W. 558-K
Strasser, Alfred A. 328-T
Strasser, Federico 70-G,
. . . . . 456-G, 398-W
Stratfull, R. F. 542-R
Strathmann, Ortrud. 360-P
Strauber, M. 45-J
Straughan, B. W. 15-M
Straumanis, M. E. 532-R
Strauss, S. W. 457-L, 713-L, 751-L
Strauss, W. 300-L
Streatfield, E. L. 282-R
Strebenz, Ferenc 304-S
Street, R. 22-M
Streets, G. A. 395-G
Streicher, Michael A. 279-R
Strelets, Kh. L. 376-C
Strelka, Vaclav 510-P
Strel'nikova, N. S. 170-P
Stremsdoefer, J. 1329-Q
Streska, E. 286-F
Stribling, J. B. 354-A
Stricker, Freidrich. 283-S, 422-S
Stringer, R. A. 14-K
Strobl, Rudolf 978-Q
Stroev, A. S. 485-C
Strohl, Gerhard 309-S
Strong, H. M. 687-P
Stross, W. 170-S
Strug, E. M. 1259-Q
Strunin, B. M. 1471-Q
Strunkin, V. A. 255-R
Struthers, J. D. 191-P
Stubbington, C. A. 29-Q
Stubbles, C. J. R. 523-P
Stubbs, F. J. 350-N
Stubbs, Frederick L. 94-B
Stuben, F. 952-Q
Studlar, Karel 54-S, 335-S
Studnits, M. A. 148-E, 320-N
Stuhlmann, W. 273-J
Stulen, F. B. 24-Q, 339-Q, 1139-Q
Stuligross, R. G. 474-Q
Stumpf, A. 137-D
Stupel, H. 520-R, 682-R, 683-R
Stupishina, O. V. 377-E
Sturge, M. D. 159-N
Sturgeon, G. Mch. 119-L
Sturrock, A. G. 163-J, 416-W
Sturtzkopf, Wilfried 197-L
Stutzman, M. J. 1170-Q
Suarez, Ramon. 116-S
Subbarayudu, G. V. 94-S
Subbotina, A. P. 182-S
Such, T. E. 533-L, 595-L, 658-L
Sucharev, A. M. 225-E
Suchilnikov, S. I. 214-C
Suchkov, A. B. 434-C
Suchkova, A. D. 546-N
Suciu, I. 203-C
Sucksmith, W. 1-P, 51-P
Suda, Tetsuo 357-Q
Sudasch, Erich. 89-K
Sudermann, Heinz. 475-P
Sudo, Kingo 173-C, 364-C
Sugawara, Hideo. 68-R
Sugier, M. P. 29-C
Sugiyama, Takashi 234-L
Suiderskaya, Z. A. 151-M
Suiter, J. 355-C, 6-D, 1163-Q
Sukhanov, E. L. 269-J
Sukharchuk, Yu. S. 382-E
Sukharina, N. N. 1499-Q
Sukhotin, A. M. 58-R, 148-R
Sukonnik, M. A. 80-D
Sulc, J. 1456-Q
Sulff, J. 636-L
Sulinski, H. V. 128-S
Suliteanu, M. 367-S
Sullivan, Arden C. 59-A, 60-A
Sullivan, John W. 412-S
Sullivan, P. M. 90-L
Sullivan, R. M. E. 337-W
Sullivan, William F. 121-C
Sully, A. H. 367-A
Sulmont, A. 181-N, 564-P
Sulonen, Martii 12-N
Sultanyan, T. A. 12-M, 13-M
Sumida, W. K. 297-M
Sumino, Koji 49-M
Sumner, G. 1339-Q
Sundararajan, J. 237-R
Sundberg, Y. 84-F
Sunderman, D. N. 387-A
Sundermann, Heinz 162-S,
. . . . . 249-S, 250-S
Sundquist, B. E. 89-X
Supek, I. 609-P
Suppus, H. F. W. 290-L, 390-L
Suprun, A. S. 220-E
Suprunenko, P. D. 374-N
Surikova, E. E. 309-Q

Surov, V. E. 428-D
Surovov, I. I. 435-W
Susano, C. D. 218-S
Suseki, Akizi 666-Q, 1389-Q
Susskind, H. 4-T
Sussmann, Nathan. 764-L
Suter, P. 136-T
Sutherland, F. S. 145-S
Sutherland, W. J. 379-W
Sutina, Yu. A. 132-Q
Sutoki, Tomiya. 102-Q
Sutton, C. R. 154-H
Sutton, Roger. 384-K
Suvorovskaia, H. A. 73-S
Suvorovskaya, N. A. 312-C
Suyama, F. 617-K
Suyama, Hiroshi. 676-M
Suye-Tszy, Ni. 553-D
Suzuki, A. 51-C
Suzuki, Haruyoshi. 526-K
Suzuki, Shin. 454-S
Suzuki, Shizuo 33-M, 241-N
Suzuki, Tetsuro 649-N
Suzuki, Tonoya. 624-D
Svanstrom, K. A. 187-C
Svechnikov, V. N. 253-N, 325-Q
Sventsinskii, V. G. 272-K
Svercl, Josef 478-K
Sveshnikov, D. A. 1483-Q
Svet, D. Ya. 506-P
Svetchnkov, V. N. 32-Q
Svetlitskii, E. A. 46-F
Svetlov, I. L. 285-N
Sviderskaya, Z. A. 246-Q
Svinarenko, I. T. 605-Q
Sviridenko, F. F. 559-D
Svirina, E. P. 208-P
Svirskii, M. S. 223-P
Svistunov, N. V. 348-C
Svistunova, Z. V. 13-M, 629-N
Svitnikov, I. S. 701-M
Swainson, E. 188-W
Swales, G. L. 324-R, 388-R, 74-T
Swalin, R. A. 101-M
Swan, David. 96-K
Swann, L. W. 29-T
Swarts, E. L. 498-N
Sweeny, W. O. 301-A
Swenson, C. A. 45-P
Swett, E. H. 380-D
Swica, J. J. 131-H
Swindeman, R. W. . . . 179-Q, 231-Q,
. . . . . 1059-Q, 1120-Q, 1426-Q
Swing, Eldon 316-S
Swinn, W. J. 402-W
Sychev, A. P. 446-C
Syk, J. M. 277-J
Sykes, E. C. 663-M
Symonds, A. E., Jr. 620-L
Synorov, V. F. 219-P
Syre, R. 257-A, 378-A
Syrovegin, A. G. 347-C, 429-C
Syshchikov, V. I. 1000-Q
Sysocki, Helmut 207-D
Sysoev, A. V. 57-W
Sysoeva, V. V. 329-N
Sytchev, Yu. D. 13-P
Syutkin, N. F. 294-Q
Szajda, T. J. 253-E, 292-E
Szalajda, Z. 99-F
Szanto, I. S. 671-Q
Szczedrin, W. M. 264-P
Szekely, Gustav 145-A
Szeki, P. 782-R
Szele, M. 464-D, 497-D
Szermek, Otto 237-Q
Szidarovszky, J. 1428-Q
Szilagyi, Imre 205-W
Szkudlapski, Alfons. 226-A
Szmidt, K. 47-S
Szoke, Laszlo 258-D
Szombatfalvy, Arpad. 164-J, 469-S
Szonyi, Gabor 95-M
Szpunar, Kazimierz 633-P
Szreniawski, Janusz 556-E
Szues, E. 19-K

T

Tabata, Nofu 623-D
Tabata, Saburo. 169-C
Tabeling, R. W. 259-S
Taburinskii, G. S. 78-W
Tachihara, N. 89-R
Taebel, W. A. 255-G
Taeubert, Paul. 1006-Q
Tagaya, Masayoshi. 102-L, 625-R
Tai, L. C. 475-M
Tainsh, R. J. 637-P
Taira, Shuji. 887-Q, 916-Q,
. . . . . 917-Q, 918-Q, 1431-Q
Tajima, Kikuo 631-D
Takagi, Shushi 32-L
Takahashi, Hiroo 146-F, 292-F
Takahashi, Naoaki 1394-Q
Takahashi, Noboru 312-M, 406-N
Takahashi, T. 60-F
Takahashi, Teruji. 1016-Q
Takaishi, Tetsuo 416-R
Takamuku, M. 307-W
Takamura, Jin-Ichi. 254-N, 474-R
Takao, Z. 374-M
Takata, H. 374-M
Takats, Laszlo. 189-A

Takehara, Katsujiro 313-T
Takei, Takeshi. 445-Q
Takemura, Y. 482-N
Takeo, Yokobori. 60-Q
Takeuchi, Sakae 474-M,
. . . . . 627-Q, 1034-Q
Takeuchi, Y. 358-M, 587-M, 594-M
Takeyama, Hidehiko 3-G, 4-G,
. . . . . 45-G, 89-G, 387-G, 430-G
Talati, Y. D. 269-R
Talboom, F. P., Jr. 177-R
Talbot, D. E. J. 55-S
Talbot, Jean 539-N, 311-P, 567-Q
Talbott, C. P. 483-E
Tamagawa, S. 10-W
Tamai, Yasukatsu. 480-Q
Tamamoto, S. 307-W
Tamarova, L. M. 439-P
Tamehiro, Shigeo. 35-S
Tamhankar, R. 648-Q
Tamura, Kiyoshi 1104-Q
Tanaka, Eihachiro 120-F, 774-L
Tanaka, Hideki. 918-Q
Tanaka, Hirokichi. 348-L
Tanaka, K. 115-E, 887-Q,
. . . . . 916-Q, 917-Q, 918-Q, 1431-Q
Tanaka, M. 377-N
Tanaka, Ryohei 285-F, 628-N
Tanaka, Takashi. 410-R
Tanaka, Tetsuo 195-Q
Tananaev, N. A. 426-S
Tanangev, I. V. 474-C
Tanczyn, Harry 473-Q
Tandon, D. S. 824-L, 825-L, 826-L
Tangerman, E. J. 645-L
Tangle, O. F. 77-B
Tangman, E. P., Jr. 243-A
Tanigawa, Eideo. 348-L
Taniguchi, Satoshi 194-J
Tanimura, H. 12-E
Tanner, J. 49-E, 153-E
Tanner, L. E. 596-M, 544-Q
Tanuma, Seiichi. 711-P
Taoka, Tadami. 1100-Q, 1242-Q
Taran, V. D. 56-K
Taran, Ya. N. 1304-Q
Taranenko, I. T. 154-S
Tarara, S. 52-C
Tarasov, L. P. 122-G
Tarasov, N. M. 550-K
Tarasov, N. T. 798-R
Tarasova, A. A. 444-L
Tardif, H. P. 153-G, 364-G
Tarjan, Gustav. 92-B
Tarnotsi, T. 73-P
Tarnovskii, I. Ya. 1255-Q, 1256-Q
Tarnowski, Ladyslaw 567-A
Tarr, Philip V. 41-H
Tarwater, J. P. 1164-Q
Tarzwell, Clarence M. 343-A
Tasaka, Kohji 358-N
Tasegawa, Taro. 1397-Q
Tashkinov, G. A. 430-W
Tashlitskii, N. I. 443-G
Tasker, E. 9-B, 65-B, 126-C
Tasuku, Fuwa 581-P
Tate, F. G. 742-R
Tate, R. E. 188-C
Tateishi, Kanichi 178-J
Tatsienko, P. A. 14-B, 119-B
Tatsumoto, Eiji 522-P
Tatur, Andre. 151-E
Taub, Ariel. 183-A
Taub, J. M. 148-F, 669-K,
. . . . . 449-L, 460-L, 253-W
Taubert, E. 168-L, 594-L
Tauer, K. J. 98-P
Taurit, G. B. 330-L
Tauschek, M. J. 109-L
Tavadze, F. N. 439-N, 204-R
Tavernelli, J. F. 1403-Q
Tayler, M. W. 392-S
Taylor, A. F. 487-K
Taylor, Alfred A. 162-J
Taylor, D. B. C. 820-Q
Taylor, D. W. 79-T
Taylor, Dean, Jr. 274-K
Taylor, Donald M. 95-K, 329-R
Taylor, H. Austin. 252-P
Taylor, Howard F. . . . 2-E, 5-E, 81-E,
. . . . . 145-E, 460-E, 508-E,
. . . . . 514-E, 544-E, 575-E
Taylor, J. 351-E
Taylor, J. W. 612-P
Taylor, John K. 197-R
Taylor, K. C. 637-D
Taylor, R. J. 41-Q
Taylor, R. W. 461-A, 563-A,
. . . . . 405-D, 486-D, 286-K
Taylor, T. A. 910-Q, 1039-Q
Taylor, W. H. 690-L
Tchukhrova, M. V. 51-E
Tebble, R. S. 37-M
Tedds, D. F. B. 167-E
Teder, L. I. 401-D
Tefankjian, D. A. 97-R
Tegart, W. J. M. 115-Q, 979-Q
Teindl, Josef 118-J, 810-L
Telegina, I. V. 906-Q
Telesov, S. A. 428-D, 688-D
Telis, M. Ya. 388-E
Temperley, H. N. V. 619-N
Templeton, Harold C. 321-R
Templeton, I. M. 427-P

Tendeloo, K. 444-P
Tenenbaum, M. 113-D, 171-D
Ten Have, A. H. M. 527-A, 528-A
Tenkovtsev, V. V. 77-P
Tennison, R. 284-R
Teodorovich, V. P. 86-J,
. . . . . 87-J, 992-Q, 1359-Q
Tepletskiy, B. E. 7-M
Tepminasov, Yu. S. 277-M
Tepohl, Walter. 368-L
Teragaki, Masaaki 389-Q
Terai, Shiro 222-A
Terai, Shoji. 313-T
Terasawa, Masao 34-R
Terder, O. 194-W
Terekhonova, V. F. 493-M
Terekhova, A. I. 54-J
Terekhova, V. F. 121-M, 494-M,
. . . . . 336-N, 995-Q, 1382-Q
Terent'ev, S. G. 163-W
Terentev, V. V. 215-P
Ter Haar, D. 519-N
Terminasov, Yu. S. 672-L,
. . . . . 223-M, 380-N, 390-Q, 486-Q
Terminello, Louis C. 758-L
Terminet, R. 144-K
Ternes, Helmut 345-R
Ternisien, Jean A. 233-C, 155-T
Terpilowski, Janusz 9-P, 297-P
Terrat, S. 134-D, 320-D
Terraza, J. 451-P
Terry, Jack H. 226-T
Terwilliger, G. E. 599-D, 5-F,
. . . . . 164-F, 381-W
Tesmen, Arthur B. 658-D
Tesar, S. 1410-Q
Tesmen, Arthur B. . . . 342-D, 566-D,
. . . . . 119-K, 255-K, 341-S
Tester, M. E. 671-R
Testerman, M. K. 267-S
Teterin, P. K. 45-F
Tetzner, Hermann 483-D
Tevihhyi, A. F. 65-S
Thielmann, H. 666-D
Thielsch, Helmut 658-K
Thellman, Edward L. 28-C
Thellung, A. 498-P
Theodossiou, A. 109-P
Thiele 869-Q
Thielmann, Herbert 288-D, 790-R
Thivin, M. 525-R
Thoburn, W. C. 46-P
Thomann, Hans Joachim 146-S
Thomas, C. O. 473-L
Thomas, D. A. 553-Q
Thomas, D. E. 1126-Q
Thomas, Earl B. 231-A
Thomas, G. 389-M, 415-M
Thomas, G. F. 323-N
Thomas, Hans 575-N
Thomas, Idris J. 34-E
Thomas, J. P. 174-K
Thomas, K. 390-M, 436-M
Thomas, M. 36-X
Thomas, P. 195-D
Thomas, Pierre-Julien 79-S
Thomas, Richard 19-M
Thomasson, H. 210-G, 64-K,
. . . . . 65-K, 168-K, 217-K, 522-L
Thome, P. 195-C, 457-P
Thompson, A. G. 17-G, 87-G,
. . . . . 149-G, 126-W
Thompson, A. Lloyd 723-R
Thompson, D. H. 639-R
Thompson, D. O. 683-Q
Thompson, J. 333-L
Thompson, J. E. 1-P
Thompson, James A. 14-S
Thompson, M. W. 379-M
Thompson, Milton A. 744-R
Thompson, N. 10-Q
Thompson, R. B. 539-R
Thomsen, E. G. 53-F, 236-F,
. . . . . 237-F, 78-G, 79-G, 296-G,
. . . . . 385-G, 389-G, 450-G, 814-Q
Thomson, R. F. 256-E,
. . . . . 665-Q, 1342-Q, 83-T
Thorn, Fritz 359-S
Thornton, A. E. 24-E, 513-Q
Thornton, H. R. 338-R, 622-R
Thring, M. W. 395-W
Throp, Arnold 54-G
Thum, Ernest E. 1119-Q,
. . . . . 1246-Q, 1510-Q
Thum, F. Charles. 115-T
Thummler, F. 139-H
Thun, Rudolf 686-M
Thurber, W. C. 152-M, 77-S, 217-T
Thurman, Astor L. 196-W
Thurston, R. C. A. 808-Q
Thuston, George H. 151-C
Thwaites, M. C. J. 138-L, 342-L
Tiba, Kimi 271-L
Tibor, L. 460-C, 461-C
Tichler, P. 650-K
Tichy, Oldrich 353-E, 1127-Q
Tiedema, T. J. 34-N
Tiefholz, K. H. 514-K
Tierney, J. Paul. 683-L
Tietig, Rudolph, Jr. 606-D
Tietze, Alfons 879-Q
Tigeot, J. 130-K
Tighe, Nancy J. 433-Q
Tikhonov, G. F. 185-N

Tikhonov, V. N. 426-S
Tili, T. 74-S
Tiller, W. A. 323-C, 574-M,
. . . . . 64-N, 499-N, 618-N
Timbrell, James 171-E
Timerbulatov, M. G. 707-R
Timmerbeil, Helmut 16-E
Timmons, George A. 831-Q
Timofeev, A. A. 257-P
Timofeev, V. M. 273-K
Timonova, M. A. 471-S
Timoshenko, V. V. 320-W
Timoshpol'skii, I. S. 272-W
Timoshuk, L. T. 316-G
Tingley, Irvine I. 256-R
Ti Nguyen, Quat 532-M, 467-N
Tinklepaugh, J. R. . . 86-H, 130-H, 131-H
Tipper, A. 180-E
Tippman, Melvin 714-L
Tippmann, H. 275-L
Tipton, Clyde R. 394-A
Tishkin, S. T. 381-N
Tisinai, C. F. 631-L
Tissen, K. P. 148-P, 397-P
Titchener, A. L. 307-N, 1046-Q
Titov, V. K. 453-P, 973-Q
Titova, V. V. 630-P
Titterington, Y. W. 108-R
Titus, R. 8-X
Titus, W. F. 695-P
Titze, H. 335-T
Tix, A. 311-D, 359-D, 686-D
Tixier, H. 559-L
Tkachenko, F. K. 1353-Q
Tkachenko, I. A. 66-D, 282-D
Tkeuchi, S. 56-W
Tlusty, Jiri 71-W
Toaz, M. W. 94-X
Tobiyama, Kazui 191-J
Toda, Hidenori. 3-P
Todd, H. F. 249-R
Todorov, R. P. 76-E, 78-E,
. . . . . 305-E, 199-N, 615-N
Toft, L. H. 1183-Q
Toguri, J. M. 275-C
Toker, A. M. 629-K
Tokizawa, Mitsugu 665-N
Tokunaga, Y. 114-E
Tokuzo, Tsumimoto 609-R
Tolkachnik, S. V. 176-Q
Tolomasov, V. A. 251-N
Tolstaya, M. A. 800-R
Tomashov, N. D. 140-L, 90-R,
. . . . . 259-R, 290-R, 459-R,
. . . . . 604-R, 756-R, 757-R, 758-R
Tominaga, Arihiro 632-D
Tomino, Shinichiro 227-L
Tomizuka, C. T. 13-N, 77-N
Tomkins, A. A. 30-L
Tomlin, D. H. 394-N
Tomlinson, Heather M. 17-M
Tomlinson, J. E. 186-K,
. . . . . 239-K, 369-K
Tomono, Rihei 229-L
Tomono, Yuzo 649-N
Tomory, M. 373-R
Tomov, V. A. 569-R
Tomson, G. I. 385-N, 1282-Q
Tonay, Bela. 197-K
Toner, D. F. 345-M
Tong, K. N. 1438-Q
Toomey, R. D. 245-C
Topchiashvili, L. I. 53-M
Topfer, Edelhard 59-B
Tordeax, J. 588-D
Toropov, A. I. 329-Q
Toropov, V. A. 74-K, 637-K, 512-Q
Torpanova, G. A. 172-J
Torrey, M. 961-Q
Torti, M. L. 124-C
Tote, L. D. 8-Q
Totoescu, D. 117-D
Tottori, T. 7-N
Touguet, Aleth. 481-P
Touloukian, Y. S. 720-P
Tour, Sam 689-L, 799-L
Tournaire, M. 25-J, 527-R
Touze, J. 69-T
Tovrenets, E. S. 430-N, 875-Q
Towle, H. J. 254-P
Towndrow, R. P. 308-D
Townshend, Benjamin 616-K
Toye, T. C. 499-P
Toyoshima, Isoji 485-L
Tozer, Alfred 458-K
Trachuk, S. V. 153-W
Tragert, W. E. 772-R
Traina, V. P. 82-A
Trajkov, Stevo 211-N, 534-N
Tramer, Gilbert. 647-L
Travin, O. V. 602-D
Travisano, P. A. 296-D
Trefilov, V. I. 299-J, 345-N
Trehan, Y. N. 95-Q
Treiger, I. N. 141-A
Treister, Yu. Ya. 411-D
Trekalo, S. K. 381-D
Tremmel, C. 29-S
Trenkler, Herbert 185-D
Trent, E. M. 121-H
Trentini, B. 178-D, 201-D,
. . . . . 233-D, 295-D, 364-D,
. . . . . 436-D, 458-D, 465-D, 507-D
Treppschuh, Helmut 207-G

Tret'yakov, F. E. 552-K
Tretyakov, E. V. 441-D
Tret'yakov, Yu. O. 417-P
Tret'yakova, G. S. 585-L
Treuting, R. G. 18-N
Trifonov, A. G. 299-D
Trigger, K. J. 231-T
Trillat, J. J. 258-M
Trilli, L. J. 378-D
Triner, N. H. 325-T
Tripathi, Jai Beni Prasad 164-C
Tripler, Arch B., Jr. 395-A
Triplett, W. B. 738-Q, 1133-Q
Tripp, H. P. 782-L
Trippe, Peter 461-E, 99-G,
. . . . . 121-G, 96-K, 126-K
Trishevskii, I. S. 310-W
Trivedi, A. M. 269-R, 349-R
Trivich, Dan 738-L
Trofimova, K. G. 506-D
Troiano, A. R. 93-A, 31-J,
. . . . . 304-Q, 647-Q
Troitskaya, M. P. 1309-Q
Trojanek, Frantisek 587-R
Tromel, G. 25-B, 100-D, 572-D
Troneva, N. V. 136-M
Troskunov, Ya. L. 688-D
Trotter, L. R. 80-R
Trought, Mary E. 59-A, 60-A
Troughton, A. G. H. 110-P,
. . . . . 120-P, 189-P
Troutner, V. H. 158-R, 174-R
Trubetskova, R. I. 1381-Q
Trudeau, L. P. 1316-Q
Truell, J. 1486-Q
Truell, R. 935-Q
Truesdale, R. S. 131-H
Trukhina, K. I. 375-C
Trumbore, F. A. 405-N
Trunin, I. I. 245-Q
Trunschitz, Valentin 114-G
Truszkowski, W. 47-Q
Trutia, Ath. 353-P
Tsal'man, L. B. 151-J
Tsang, Shillings 230-G
Tsarenkov, B. V. 96-M
Tsar'kov. 552-K
Tschappat, C. 23-R
Tschorn, Gerhart 222-E
Tsegel'skii, V. L. 343-K
Tseidler, A. A. 435-W
Tseitlin, I. B. 1305-Q
Tseitlin, K. L. 255-R, 293-R
Tseitlin, V. Z. 431-Q
Tselikov, A. I. . . . 109-A, 142-A, 137-F
Tselikov, V. K. 131-Q
Tsen-Woo, Wang 199-P
Tsen-Yen, Shu 198-P, 199-P
Tseplyaeva, A. V. 81-X
Tsitsiliano, D. D. 109-N
Tsivirko, D. E. 281-T
Tso-Mei, Chang 892-Q
Tsukanov, G. E. 362-D, 79-W
Tsukanov, V. P. 320-W
Tsukuda, Makoto 1395-Q, 1306-Q
Tsuprun, L. J. 694-R
Tsushima, Kunveo 713-P
Tsutsui, Asei. 331-J
Tsuya, K. 111-A, 50-C, 171-J
Tsvetkov, Yu. V. 2-C
Tsvftnenko, K. U. 426-E
Tsyb, P. P. 428-C, 235-S
Tsylev, L. M. 537-D, 601-D
Tsypin, M. I. 704-M
Tucker, Austin H. 62-A
Tucker, C. W., Jr. 290-M
Tucker, J. T., Jr. 927-Q
Tufte, O. N. 562-P
Tugarinov, N. I. 290-R
Tulkina, M. A. 356-M
Tull, E. 515-K
Tully, Patrick A. 219-R, 534-R
Tuma, Hanus 162-M, 246-M,
. . . . . 586-M, 314-N, 669-N, 428-Q
Tumarev, A. S. 209-D
Tumbakov, V. A. 737-P
Tummers, G. E. 83-J
Tunder, S. 438-E
Tunik, A. A. 413-E
Tunkov, V. P. 1305-Q
Turbadar, T. 195-P
Turbovskii, M. M. 303-E, 344-E
Turchinetz, W. 197-P
Turco, T. A. 217-L, 269-L
Turillon, P. 50-H
Turk, Th. 236-J
Turkdogan, E. T. . . . 7-D, 509-D, 416-N
Turkebaev, E. A. 617-D
Turnbull, David 61-M, 243-M,
. . . . . 305-M, 455-N, 686-N
Turnbull, G. K. 236-Q
Turnbull, H. F. 5-T
Turnbull, J. S. 44-E
Turner, A. 228-T
Turner, C. A. 165-W
Turner, F. 460-R
Turner, G. H. 284-T
Turner, N. H. 74-D
Tuthill, E. J. 467-R
Tuthill, R. 666-K
Tuvek, Charles G. 316-L
Tuzlukova, V. A. 68-G
Tuzzolino, A. J. 44-P
Tweet, A. G. 29-M

Twitchell, Frank A. 285-A
Tyagun, A. A. 605-Q
Tyayar, Kh. A. 703-K
Tychowski, Feliks 866-Q
Tylecote, R. F. 152-D
Tyler, J. W. A. 22-Q
Tyler, W. W. 534-P
Tylkin, M. A. 67-J, 524-L,
. . . . . 525-L, 801-L, 344-N
Tyszko, Zbigniew 534-E
Tyte, H. 330-K
Tytell, B. H. 805-R
Tytgat, Denis. 159-C
Tyumova, V. V. 394-Q
Tyzack, C. 696-R
Tzao-Chin, Lin 198-P
Tze-Ming, Gau. 892-Q
Tzu-Liang, Wu. 99-N
Tzy-bao, Huang 198-P

U

Uchida, Sohsuke 199-J
Uchiyama, Hiroharu 777-L
Uchiyama, Michira 1448-Q
Udy, Marvin J. 340-A, 451-D
Udy, Murray C. 451-D
Ueda, Shigetomo. 228-L,
. . . . . 621-L, 646-L, 341-N
Ueda, Shiroh 253-L
Ueda, Yoshisada. 80-N, 601-N
Uehara, Torazo 203-E
Uelitz, Herbert F. G. 127-C
Ueno, Manabu 622-D, 476-N
Uhlig, H. H. 193-R, 335-R, 658-R
Uhlitzsch, Heinz. 462-P, 368-Q
Ukhabin, G. A. 232-T
Ukrainskii, Yu. M. 359-M
Ulam, J. B. 240-L
Ulmer, H. 590-D
Ulrich, Werner 314-M, 315-M
Ulybin, G. N. 577-L
Umanskii, Ia. 222-M, 600-M,
. . . . . 699-M, 451-N, 289-R
Umeyama, Hidemi 179-C
Umhau, John B. 65-A
Umrikhin, P. V. 558-D, 579-E
Underhill, Earl M. 395-P
Underwood, E. E. 181-Q
Ungar, Eric E. 1415-Q
Unger, Klaus-Dieter 388-S
Unno, Masao 93-Q, 117-Q,
. . . . . 790-Q, 890-Q, 1530-Q
Unterberger, M. 404-W
Unterweiser, P. M. . . . 49-J, 332-Q,
. . . . . 470-Q, 27-W
Uny, Clement. 665-P
Upson, U. L. 177-S
Urbain, G. 588-D,
. . . . . 90-P, 467-P, 683-P
Urbain, Michel. 287-Q
Urinskii, A. I. 489-D
Urlage, Stanley H. 387-L
Usatenko, Yu. I. 7-S
Ushakova, I. I. 70-S
Usher, R. 706-R
Usikov, M. P. 261-J
Usoskin, G. I. 238-S
Uspenskaia, T. A. 484-C
Uspenskii, N. F. 389-C
Ustenko, Yu. I. 152-S
Ustianov, V. I. 281-P
Usui, Eiji 4-G,
. . . . . 45-G, 89-G, 430-G
Usui, T. 72-E
Utevskii, L. M. 380-M, 141-N
Utkin, N. I. 302-C
Utz, J. J. 294-L
Uusitalo, Eino 137-R,
. . . . . 252-R, 285-R, 665-R
U-Yung, Shu 892-Q
Uzhik, G. V. 821-Q
Uzienko, A. M. 66-D

V

Vacek, J. 104-H, 151-H, 548-Q
Vach, Antonin 215-F
Vachet, Pierre. 75-A, 379-A, 398-A
Vagi, J. J. 282-K, 696-K
Vagramyan, A. T. 62-L, 67-L
Vaidyanath, L. R. 376-K
Vail', E. I. 236-S
Vail', Iu. S. 127-P
Vainboim, D. I. . . . 117-K, 297-K, 641-K
Vainshtein, B. K. 271-M
Vainshtok, M. I. 443-D
Val'dma, L. E. 1421-Q
Valentiner, Siegfried. 316-M, 86-P
Vallet, P. 95-D, 103-D, 588-D
Valluri, S. R. 902-Q
van Beghem, J. 343-P
van Beijeren Bergen en Henegouwen, J.G.
. . . . . 177-K
van Bleyenberghe, P. 307-A,
. . . . . 474-E
Van Bueren, H. G. 72-Q
Vanci, Gh. 7-B
Vancleave, A. B. 167-S
v. d. Woude, C. A. A. 647-K
Vandamme, J. 392-K
Van Delinder, L. S. 310-R
van de Moortel, Denis G. . . . 1441-Q,
. . . . . 1444-Q, 290-T

Vanden Berg, R. V. 673-L
van der Bruggen, B. 189-L
Van der Horst, J. M. A. 395-R
van der Linde, J. 327-J
Vandermeer, R. A. 509-N, 87-X
Vander Wall, E. M. 64-C
van Douwen, A. A. 1082-Q
Vandyschev, B. A. 34-Q
Vanecho, John A. 121-Q
Van Eeghem, J. 291-P
van Ewijk, L. J. G. 82-J,
. . . . . 507-N, 57-Q
Van Gundy, D. A. 1274-Q
Van Hammersveld, John A. 188-F
Van Houten, G. R. 66-K, 441-K
Vanin, V. S. 453-P
Van Itterbeek, A. 685-P
van Kann, Helmut 387-K
van Kleef, A. 529-A
van Lint, Victor A. J. 568-P
Van Muylder, J. 321-P,
. . . . . 503-P, 86-R, 87-R
Van Neste, J. 133-W
van Oeteren-Panhauser, K. A. . 80-L,
. . . . . 477-L, 503-L, 140-R
van Reuth, E. C. 333-M
Van Rysselberghe, Pierre 156-L,
. . . . . 415-L
van Schaick Zillesen, G. 141-K
Van Vlack, L. H. 324-E, 403-M
Vanyukov, A. V. 302-C, 653-D
Van-Zhun' 261-J
Varfoldmeev, N. M. 442-G
Varfolomeyev, H. M. 387-W
Varga, C. 356-D
Varga, Ferenc 97-E, 334-E, 210-W
Varich, N. I. 601-M
Varshavskii, A. P. 66-D
Vartanyan, A. M. 340-C, 387-C
Vashchenko, K. I. 305-E
Vasicek, Antonin 508-P
Vasil'chenko, N. I. 64-D
Vasil'chenko, N. S. 33-J
Vasile, Ilie 248-W
Vasilenko, G. I. 565-N
Vasil'ev, A. I. 625-D
Vasil'ev, D. M. 212-M, 1495-Q
Vasil'ev, G. A. 367-D
Vasil'ev, K. V. 409-W
Vasil'ev, L. I. 360-Q
Vasil'ev, M. M. 230-J
Vasil'ev, N. V. 305-K
Vasil'eva, A. G. 210-Q
Vasil'eva, N. P. 12-M
Vasilieva, V. A. 700-K
Vasl'eva, I. P. 13-M
Vassel, C. R. 104-P, 1248-Q
Vassel, Karl Robert 596-Q, 786-Q
Vasserman, A. M. 150-M
Vasudevan, P. 87-N, 388-N
Vaughan, A. H. 75-J, 37-P, 376-P
Vaughan, D. A. 727-R
Vaughan, H. G. 168-Q
Vaughn, Robert L. 188-G
Vaultier, R. 525-A
Vavilov, V. S. 208-M, 575-P
Vayssiere, P. 436-D, 465-D, 507-D
Vazhenin, S. F. 306-C, 453-C
Vebing, Dietrich. 24-A
Vecera, Zdenek 414-S
Vecher, A. A. 405-P
Vecsey, Bela 163-D, 257-D
Vedeneeva, M. A. 756-R, 757-R
Vegman, E. F. 477-S
Veh, P. O. 289-W
Veiler, S. Ya. 104-G
Veits, I. V. 240-P
Vejmelek, Bohus 414-S
Veleker, Thomas J. 285-S, 442-S
Venkatakrishnan. 12-X
Venkataratnam, G. 93-S
Venturello, G. 69-H, 376-M
Veprintsev, V. I. 482-P
Verchenko, V. R. 271-K
Verderber, R. R. 687-M
Verdickt, J. 65-F
Vereshchagin, L. F. 750-Q, 1538-Q
Vereskoi, Janos 97-E
Verheijke, M. L. 506-R
Verkerk, B. 257-L
Verkhoglyadova, T. S. 256-N
Verkhovtsev, E. V. 414-D
Verma, M. R. 705-K
Verner, E. E. 998-Q
Vernon, C. W. J. 112-F
Vero, J. A. 19-K, 247-M
Vershinin, N. P. 374-C
Ver Snyder, F. L. 462-A, 1208-Q
Verstraate, K. 527-A, 528-A
Vert, Zh. L. 192-C
Vertes, P. 286-C
Vertman, A. A. 480-C, 600-P
Verzijlberg, C. J. 413-W
Veselago, L. I. 67-S
Viallon, Maurice 329-D
Viatskin, A. Ia. 124-P
Vickers, C. 679-L
Vickery, R. C. 337-A
Victor, Andrew C. 17-P
Victor, Maurice 88-T
Vidal, G. 108-Q, 462-Q, 711-Q
Videm, Ketil 697-R, 737-R
Vidrma, Jaroslav 236-W, 296-W
Vidts, J. 971-Q

Viens, J. A. 931-Q
Vieregg, Gustav 158-G
Vigdorovich, V. N. . . . 107-M, 196-M,
. . . . . 139-N, 319-N, 335-N
Viglin, A. S. 732-P, 733-P
Vigness, Irwin 818-Q
Vikhoreva, N. A. 1230-Q
Vil'dt, E. O. 1424-Q
Villain, Jaques 715-P
Villette, P. 588-D
Villner, Lars 164-A, 182-A
Vilnyansky, Ya. E. 107-C
Vincent, B. J. 839-Q
Vinckier, A. 1324-Q
Vineyard, George H. 80-M
Vingas, G. J. 392-E, 542-E
Vinograd, M. I. 923-Q, 113-S
Vinogradov, V. S. 719-K
Vinogradskii, F. M. 306-K
Vinokurov, V. P. 45-X
Viochna, V. 365-W
Virdis, Piero 255-E
Virolle, Xavier 57-E
Vishkarev, A. F. 683-D
Visi, T. 292-J
Viskanta, R. 720-P
Visnyovszky, Laszlo 80-B,
. . . . . 106-B, 266-W
Vitkin, A. I. 518-L,
. . . . . 165-M, 139-P, 183-R
Vitkina, M. A. 7-S
Vitovec, F. H. 338-Q,
. . . . . 691-Q, 953-Q, 1299-Q
Vlahos, C. J. 373-G
Vlannes, P. N. . . . 457-L, 713-L, 751-L
Vlasov, E. I. 420-P
Vlasov, K. B. 145-P
Vlasov, V. I. 384-C
Vlasov, V. S. 119-M
Vlasov, V. V. 2-S, 3-S,
. . . . . 166-S, 211-S
Vlcek, Adolph, Jr. 154-G, 381-G
Vliegenthart, Jan 704-L
Voboril, J. 34-K, 553-K, 364-M
Voce, E. 295-A, 327-A, 214-N
Vodar, Boris 367-P
Vodop'yanov, G. V. 36-B
Vodsedalek, J. 1176-Q
Voelker, C. H. 254-W
Vogel, F. L. 321-M
Vogel, G. J. 21-B
Vogel, R. 484-M
Vogel, R. C. 14-C, 212-T
Vogel, Rudolf 270-M,
. . . . . 424-M, 559-M, 360-P
Vogels, H. A. 590-D
Vogt, E. 731-P
Voice, E. W. 79-B
Voigt, Heinz 152-W
Voiloshnikova, A. P. 132-S
Voitov, A. O. 491-D
Voitselenok, S. L. 180-N
Voityshen, S. Iu. 125-P
Voith, Marton 237-Q
Vojta, R. 288-F, 53-S
Volchek, F. P. 1054-Q
Volek, C. W. 283-K
Volf, Zdenek 115-F
Vol'fson, S. I. 348-T
Volikanova, T. A. 1500-Q
Volkenshtein, N. V. 24-P,
. . . . . 277-P, 718-P
Volkhova, L. M. 626-R
Volkonov, G. M. 572-Q
Volkov, D. I. 76-P
Vollers, C. 178-K, 1463-Q, 296-R
Vollmer, L. W. 675-R
Volobvev, I. V. 988-Q
Vologdin, I. V. 720-K
Volokh, I. A. 120-B
Voloshchenko, M. V. 329-Q
Voloshenko, Klimovitskii Yu. Ya. .
. . . . . 266-Q, 821-Q
Volotskaya, V. G. 184-P
Volpe, Milton L. 220-K
Volynskii, E. A. 36-B
vom Ende, Hans . . . 249-D, 453-D, 501-D
von Bogdandy, Ludwig 53-D,
. . . . . 184-D, 678-D
von Burg, E. 76-Q
von der Forst, Peter 222-T
von der Warth, Hans 181-W
von Engelmann, S. 55-R
von Heimendahl, Manfred 617-M
von Moos, Rudolf 121-W
Vonsovski, S. V. . . . 24-P, 223-P, 277-P
von Struve, Georg 114-D, 202-D
von Szantho, Eugen 63-B
von Uslar, Horst 343-W
Von Voss, W. D. 706-P
Voorhees, H. R. 314-Q,
. . . . . 507-Q, 1437-Q
vor dem Esche, Wilhelm . . 116-B, 207-D
Vodredalek, J. 1477-Q
Vorob'ev, V. S. 118-M
Voronin, N. N. 153-W
Voronov, F. D. 299-D
Voronov, I. I. 27-F, 46-W
Voronov, S. M. 52-E, 319-W
Voshchanov, K. P. 60-K
Voskoboinikov, S. I. 381-P
Vostovitch, B. A. 92-C
Votava, E. 501-M
Voznesensky, V. D. 702-K

Vreeland, T., Jr. 381-M
Vrsek, Jaroslav 476-D
Vrzal, Vladimir 317-Q
Vsevolodov, G. N. 1096-Q
Vsevolodov, V. A. Bykovandgn . . . 468-K
Vuckovic, S. 314-R
Vvedensky, Dimitri. 96-K
Vyaznikov, N. V. 104-J
Vyazkin, A. Ya. 112-M
Vyklicky, Miloslav 162-M,
. . . . . 246-M, 586-M
Vyslouzil, Stanislav 478-K
Vystyd, M. 984-Q

W

Waber, James T. 300-R
Waburek, Helmut 26-X
Wache, X. 1468-Q
Wachtel, Ernst. . . 324-M, 386-P, 1267-Q
Wada, J. 368-E, 378-N, 2-P, 15-Q
Wada, Kamekichi 325-A
Wada, Ryocho 781-R
Waddams, J. A. 421-R
Wadsley, A. D. 100-M
Wadsworth, L. H. 170-S
Wadsworth, N. J. 1-Q, 476-Q
Wagner, C. 107-D
Wagner, C. N. J. 157-M
Wagner, C. P. 81-Q
Wagner, H. J. 1245-Q
Wagner, K. 510-A
Wagner, K. S. 88-M
Wagner, Karl. 44-J, 203-W
Wagner, R. A. 355-Q
Wagner, R. K. 1209-Q
Wahlster, M. 145-D, 304-D
Waide, C. H. 4-T
Waidelich, D. L. 52-S
Wain, A. H. 17-F
Wainfan, N. 674-P
Waisman, J. L. 221-Q,
. . . . . 340-Q, 341-Q, 359-Q
Wait, John D. 283-G
Waite, R. G. 384-D
Wajszel, Dominik 402-R
Wakelin, R. J. 13-J, 46-T
Walde, H. 482-D
Waldo, C. T. 7-H
Waldron, C. R. 1367-Q
Waldron, M. B. 431-A, 405-M,
. . . . . 355-N, 250-P, 201-Q, 285-Q
Wales, Charles P. 771-R
Walker, J. Stubbs 230-A
Walker, J. W. 1-B
Walker, James L. 65-N
Walker, P. B. 1508-Q
Walker, R. J. 73-L
Walker, R. M. 606-N,
. . . . . 607-N, 685-N, 6-P
Walker, Thomas. 119-W
Wall, P. H. 659-R
Wallace, A. J. 797-R
Wallace, E. 178-L
Wallace, Edgar C. 56-J, 158-J
Wallace, J. F. 495-E, 583-M,
. . . . . 367-N, 236-Q, 240-Q, 313-Q
Wallack, Stanley. 530-P
Wallden, S. J. 283-C
Waller, J. A. 54-W
Wallgren, Per-Ake 255-L
Walling, M. T. 21-C
Wallisch, Krystyna 51-R
Wallquist, G. 135-F, 107-G
Wallwork, G. R. 167-R
Walsh, D. F. 423-Q
Walston, K. R. 60-R
Walter, J. L. 464-N, 495-P
Walter, Kurt 277-D
Walter, L. 407-L
Walton, D. 463-N
Walton, G. N. 275-A, 629-P
Walton, J. D., Jr. 77-H
Walton, L. H. 74-D
Wambold, J. 1048-Q
Wang, C. C. 123-N
Wankat, Charles. 539-R
Wanklyn, J. N. . . . 181-R, 729-R, 738-R
Wanner, John. 201-S
Wappler, H. 88-G
Warczewski, Z. 441-W
Ward, Chester E. 365-P
Ward, E. D. 205-Q
Ward, E. W. 211-F
Ward, R. G. 466-D
Waring, H. W. A. 518-D
Warren, Donald 370-R, 510-R
Wartmann, Rolf 330-S
Washburn, E. 127-C
Washburn, J. 770-Q
Wassermann, Gunter. 757-Q
Watanabe, Denjiro 90-M, 368-N
Watanabe, H. T. 678-Q
Watanabe, Hanju. 18-W
Watanabe, Hisafuji 690-M
Watanabe, Masaki. 350-K
Watanabe, Masao 485-L
Watanabe, Naoyuki 484-L
Watanabe, Teruhisa 137-J
Watanabe, Toru 1103-Q
Watanabe, Toshio 464-S
Waterfall, F. D. 92-J
Waters, B. H. C. 10-D, 922-Q
Watkins, M. T. 817-Q

Watkinson, F. 694-Q
Watkinson, J. F. 116-H
Watmough, T. 250-F
Watson, George W. 124-B
Watson, Robert G. 471-D, 649-D
Watson, T. S. 98-R
Watt, W. 579-R
Watts, E. H. 173-K
Wauchope, K. L. 167-H
Wazewska-Riesenkampf, W. 462-C
Weare, N. E. 331-K, 366-K, 653-K
Weaton, George F. 328-C
Weaver, C. 488-L, 202-Q
Weaver, C. W. 331-Q
Weaver, Charles 21-P
Webb, F. B. 4-H
Webb, M. B. 290-M
Webb, W. W. 36-M
Webber, H. M. 31-H
Webber, Jack E. 96-X
Webberle, F. J. . . . 256-E, 665-Q, 1342-Q
Weber, C. E. 76-T
Weber, E. P. 114-H
Weber, Eduard. 650-L
Weber, F. J. 108-T, 188-T
Weber, Franz 78-D, 354-D
Weber, Gunter 90-G
Weber, Jozsef 70-C
Weber, K. 543-K
Weber, Th. 421-N
Webster, C. B. 350-N
Wechsler, M. S. 154-P
Weed, E. I. 280-L
Weed, J. Arthur 191-L
Weeks, D. A. 708-K
Weeks, John R. 114-R
Weertman, J. 200-Q, 1405-Q
Weeton, J. W. 156-Q, 1022-Q
Wegiel, Jerzy 7-R
Wegman, R. F. 594-K
Wegmann, Ludwig. 93-W
Wegner, Paul. 42-A
Wegst, Jorg. 319-M
Wei, Weng-Ling 445-W
Weibull, I. 708-Q
Weibull, W. 50-Q
Weigand, Hans Herman 881-Q
Weigel, K. 194-Q
Weightman, William 98-K
Weik, H. 320-A, 95-H,
. . . . . 482-Q, 948-Q, 1121-Q
Weil, R. 623-N
Weilandt, Bernhardt 155-A,
. . . . . 377-A, 86-B
Weilinger, Karl 24-A
Weill 426-G
Weill, A. R. 804-L, 315-N
Weill, R. 12-G
Weill-Couly, Pierre 352-A, 200-T
Weimer, D. E. 363-L, 678-L
Weimer, Floyd S. 324-C
Weimer, Lars 305-G
Weinberg, J. G. 214-Q
Weinberger, W. 68-T
Weiner, Charles 256-J, 192-W
Weiner, D. 688-P
Weiner, Robert 540-L,
. . . . . 615-L, 788-L, 147-S
Weinig, S. 768-Q
Weininger, Joseph L. 198-R
Weinreich, O. A. 21-X
Weintroub, S. 659-M
Weir, J. R. 105-N, 163-Q
Weiser, Kurt. 107-P, 176-P
Weismantel, E. E. 151-K
Weiss, R. J. 306-M, 98-P
Weissmann, G. 960-Q
Weissmann, Sigmund. 588-M
Weisz, M. 52-M, 51-Q,
. . . . . 465-Q, 825-Q
Weitzer, Helmut P. 390-D
Wejnoha, Roman. 1068-Q
Weldon, Brian 737-Q
Weldon, T. H. 331-C
Welkens, Tadeusz. 537-E
Welker, H. 532-P
Wellborn, William W. 271-A
Wellensiek, Gert 270-W
Wellinger, K. 204-G, 314-G
Wellington, J. R. 228-T
Wells, A. A. 133-K
Wells, C. 738-Q, 1133-Q
Wells, R. A. 153-C
Wells, R. R. 66-B
Welsh, N. C. 16-M
Welter, G. 623-Q
Wennik, J. H. A. 651-K
Wentzell, J. M. 549-A
Wenzel, Werner 136-B
Werber, Teodor 155-N,
. . . . . 51-R, 74-R, 402-R
Werkema, R. G. 121-A
Werner, F. E. 1210-Q
Werner, R. 134-K
Wernick, J. H. 132-C, 79-M,
. . . . . 205-M, 292-M,
. . . . . 321-M, 649-M, 333-P
Wernicke, Max. 154-E
Wernz, Donald E. 337-K, 625-K
Wert, C. 192-M, 349-N
Werthebach, Paul. 68-J
Wertheim, G. K. 723-P
Wertz, Z. 557-E
Wesemann, Friedrich 12-B

Wessel, E. T. 1211-Q
Wessel, F. W. 32-A
West, Bartlett 436-G
West, D. R. F. 198-M
West, J. M. 271-R
West, K. B. C. 581-N
West, L. H. 94-R
Westbrook, J. H. . . . . 675-M, ... 647-N, 1047-Q
Westerholm, Roland J. 425-L
Westfall, Vene W. 293-L
Westhoff, Gert 454-R
Westlake, D. G. 518-P
Westmacott, K. H. 430-M, 435-M
Westphal, Herbert 294-N
Westrum, Edgar F., Jr. 22-P
Wetmore, F. E. W. 173-P
Wetzger, J. 203-G, 343-G
Wetzlar, Karlernst 469-N
Wever, G. T. 133-C, 324-C
Weyand, H. 454-M
Weyel, A. 183-D
Weyerer, Hermann 617-M
Weyermuller, Gordon . . . . . 128-R, ... 766-R, 777-R
Weyers, J. W. 622-K
Whalen, J. M. 81-A
Whalley, G. R. 19-C
Wharen, Harry S. 398-G
Wharton, P. B. 145-L
Whatley, M. E. 12-C
Wheat, J. Allen 187-S
Wheatley, C. 610-Q
Wheelahan, Edmund J. 726-Q
Wheeler, C. R. 1-D
Wheeler, John A., Jr. 92-X
Wheeler, R. G. 206-R
Wheeler, W. H. 394-R
Wheelright, E. J. 66-C
Whelan, M. J. 389-M, 564-M
Whelan, P. F. 108-B
Whetzel, J. C., Jr. 106-F
Whitaker, Marjorie. 760-L
White, C. E. T. 237-C
White, D. 1518-Q
White, E. E. 734-R
White, E. P. 544-A, 276-T
White, Earl L. 99-T
White, G. K. 48-P, 323-P, 604-P
White, J. 149-E
White, J. C. 97-C
White, J. G. 724-P
White, J. L. 349-P
White, R. A. 658-R
White, R. H. 331-W
White, W. H. 352-W
Whitehead, D. J. 136-E
Whiteley, R. L. 345-G
Whitener, E. M. 64-C
Whiteside, W. C. 69-R
Whiteson, Bennet V. 404-G
Whitfield, J. F. 375-W
Whiting, Kempton A. 12-F
Whiting, L. R. 565-L
Whiting, Lloyd A. 10-F, 29-F
Whitman, A. 4-C
Whitman, C. I. 48-C
Whitmore, G. F. 614-L
Whitney, F. L., Jr. 514-R, 652-R
Whittenberger, E. J. 295-W
Whittington, W. E. 24-H
Whitton, P. W. 282-G
Whitwham, D. 14-F, 218-N
Wiberg, Martin 47-D
Wicher, Adalbert 358-D, 542-D
Wick, R. 5-L, 398-L
Wicke, Edward. 130-C
Wickham, D. G. 142-P
Widmer, R. 673-Q
Wiedemann, G. 47-T
Wiederholt, W. 451-A, 79-L, 56-R
Wiedersich, H. 616-N
Wiedersum, George C., Jr. 1364-Q
Wiedmann, H. 58-S, 59-S, 300-S
Wiegand, Ernst 240-W
Wiegand, H. . . . . 146-G, 313-J, ... 314-J, 785-L, 786-L, ... 659-Q, 1411-Q, 1412-Q
Wieghardt, Guenther 363-N
Wiegmann, K. 92-M
Wiener, G. W. 709-Q
Wiesche, H. in. der. 41-G
Wiesner, Frantisek. 35-F
Wiesner, Harold J. 356-L
Wiest, P. 698-P
Wiest, Rudolph. 195-S
Wiester, Hans Joachim . . . . . 590-D, ... 501-R, 502-R
Wiethoff, Gert 331-S, 479-S
Wikle, K. G. . . . . 176-A, ... 319-A, 19-H, 152-G
Wilbur, Donald E. 454-L
Wilcock, Donald F. 279-T
Wilcock, J. 502-E
Wilcox, R. J. 282-G
Wilcox, W. L. 578-K
Wild, M. 209-L
Wild, R. 79-B, 279-M
Wildschut, A. J. 225-L
Wilensky, Lester E. 281-Q
Wiles, D. R. 814-R
Wilhelm, H. A. 512-A, 16-H
Wilk, M. B. 961-Q
Wilke-Dorfurt, Ursula. 575-N

Wilkenson, F. J. 941-Q
Wilkinson, H. N. 16-B
Wilkinson, T. J. 360-R
Wilkens, Manfred 312-N
Wilkins, Th. 73-E
Wilks, J. 298-Q
Willems, Jakob . . . . . 125-B, 128-B, ... 147-B, 39-D, 217-D, 680-D
Willey, A. R. 15-S
Willey, L. A. 197-J, 240-J
William, T. R. G. 68-Q
Williams, A. E. 350-A
Williams, A. I. 89-S
Williams, A. J. 14-M
Williams, Clarke 9-T
Williams, Clyde 532-A, 589-Q
Williams, D. D. . . . 252-K, 261-P, 608-P
Williams, D. N. . . . 390-P, 762-Q, 1236-Q
Williams, E. C. 286-M
Williams, E. J. 526-L
Williams, F. A. 76-B
Williams, G. I. 647-M
Williams, J. . . . . 241-A, 337-C, ... 54-H, 124-H, 129-H, ... 571-M, 163-R, 40-T
Williams, J. H. 4-F
Williams, J. M. 216-F
Williams, J. T. 541-E
Williams, Josephine L. 229-Q
Williams, K. J. 401-Q
Williams, L. 228-T
Williams, L. S. 100-H
Williams, Lynn A. 186-G
Williams, M. K. 423-K
Williams, Robin O. . . . . 137-G, ... 573-M, 392-N
Williams, W. 32-P
Williamson, D. R. 252-A, 675-Q
Williamson, G. K. 234-M, 548-M
Williamson, R. 80-A, 114-A
Willis, A. H. 388-P, 656-P
Willis, B. T. M. 48-M, 650-M
Willis, P. B. A. 759-Q
Willmer, T. H. 510-A
Wills, Frank 91-H
Wilmot, Richard C. 60-A
Wilms, G. R. 1084-Q, 1161-Q
Wilsdorf, H. G. F. 342-M, 940-Q
Wilson, C. 236-R, 420-R, 504-R
Wilson, C. G. 648-M
Wilson, G. L. 586-P
Wilson, G. W. 19-R
Wilson, Harold C. 464-L
Wilson, J. C. 1142-Q, 1286-Q
Wilson, J. E. 513-E, 4-J
Wilson, J. M. 128-C, 155-C
Wilson, M. W. 78-J
Wilson, P. R. 182-N
Wilson, R. A. 261-K
Wilson, R. E. 86-H
Wilson, W. L. 561-P
Wilz, G. 102-C
Wims, G. R. 141-Q
Winchell, P. G. 633-N
Wincierz, Peter 129-M
Winegard, W. C. . . . . 288-N, ... 457-N, 578-N, 1169-Q
Winfield-Smith, S. C. 177-F
Wingerath, J. 122-K
Winget, J. G. 443-W
Wink, Wilhelm 19-N, 36-P
Winkel, P. 257-L
Winkler, Otto. 125-H
Winogradzki, A. 108-G, 530-N
Winsch, I. O. 212-A
Wintenberger, M. 631-M
Winter, Christiane 193-Q
Winter, H. . . . . 86-K, 346-K, ... 412-K, 596-K, 183-S
Winter, W. 39-G
Wintermute, Glenn E. 654-L
Winters, S. F. A. 297-J
Winterton, K. 411-Q
Wirt, J. R. 231-K
Wirta, R. W. 189-T
Wirth, Hans Jurgen. 81-S
Wirths, G. 248-C
Wise, S. 608-K
Wiskel, S. J. 637-N
Wiskin, P. 465-S
Wissenberg, Herman. 745-R, 746-R
Wistreich, J. G. 85-F, 167-F
Withers, B. D. 26-B
Wittebort, J. I. 696-P
Witteman, F. G. 429-G
Witthof, J. 165-T
Wittig, Franz Eberhard . . . 274-P, 432-P
Wittmann, A. 275-P
Wittmoser, A. 37-E, 487-M, 266-N
Wittstruck, Heinz 41-D, 690-D
Witzke, W. R. 272-C
Wohinz, Janez 342-C
Wojciechowski, K. F. . . . . 453-N, ... 521-N, 580-N
Wojcik, Z. 91-M
Wojtasik, Jan. 558-E
Wolf, Friedrich 408-P
Wolf, H. 429-Q
Wolf, Josef 195-F
Wolf, L. 302-G
Wolf, Paul J. 33-G
Wolf, Wilhelm 207-D, 252-D
Wolfe, Thomas F. 106-R
Wolfe, R. A. 247-K

Wolfer, G. C. 1524-Q
Wolff, U. E. 536-M
Wolford, Don S. 27-Q
Wolfstieg, Ulrich 510-M, 670-Q
Wolkoff, J. 212-A
Wollenberger, Heinrich . . . . . 331-M, ... 215-N, 239-N, 394-P
Wolsky, Sumner P. 623-R
Woo, D. M. 356-G
Wood, D. R. 122-E, 189-Q
Wood, Donald E. 498-D
Wood, G. B. 164-Q
Wood, J. G. 1234-Q
Wood, Nat 516-D, 172-G, 547-Q
Wood, R. A. 390-P, 1116-Q
Wood, W. A. 765-Q
Woodhead, J. H. 760-Q
Woodilla, John 633-N
Woodriff, R. A. 635-M
Woods, S. B. 48-P, 323-P, 604-P
Woods, S. E. 329-C
Woods, W. O. 531-A
Woodward, I. 238-M
Woodward, R. R. 265-E
Woody, R. J. 144-C
Wooley, J. C. 18-M
Woolf, A. A. 67-C
Woolfall, R. 4-H
Woollard, Christopher S. 349-L
Woolley, J. C. 569-M, 570-M
Wormleighton, A. N. 212-E
Wormwell, F. 205-R
Woolsey, C. C. 221-T
Wooster, W. A. 632-Q
Workman, G. M. 2-B
Worley, R. W. 634-D
Worn, D. K. 123-H, 134-H, 154-H
Worth, John S. 928-Q
Woskoboinikow, W. G. 218-D
Wozniak, Jiri. 299-P
Wranglen, G. 188-R
Wrene, Torsten 105-A
Wright, E. A. 479-A
Wright, E. B. 526-D
Wright, E. C. 564-D
Wright, H. C. 206-P
Wright, J. C. 421-R
Wright, K. H. 85-E
Wright, P. W. 838-Q
Wright, W. B. 117-A
Wright, W. J. 129-H
Wrigley, F. K. 9-C, 329-T
Wrobbel, Werner 16-L
Wrycza, Walter 34-S
Wu, Tin Ming. 301-G
Wukusick, C. S. 18-G
Wulff, John 575-E, 194-M
Wullenweber, K. 333-E
Wundt, B. M. 646-Q
Wunsche, G. 106-J
Wurm, J. G. 742-L
Wurts, Thomas C. 342-A
Wurz, W. 621-M
Wusatowski, R. 237-D
Wusatowski, Zygmunt . . . . 2-F, 19-F, ... 99-F, 242-F, 867-Q, 1269-Q
Wyatt, James L. 28-C, 73-C
Wyatt, L. M. 629-P, 66-T, 152-T
Wyman, W. L. 255-K
Wynne, E. J. 152-D
Wyss, U. 248-J

X

Xheiker, D. M. 11-M

Y

Yabuki, S. 150-A
Yaffe, R. P. 654-P
Yager, L. D. 286-W
Yagi, Sakae 179-C
Yagi, Yoshiro 3-P
Yagn, Ya. I. 269-Q
Yaguchi, Go. . . . . 93-Q, 117-Q, ... 790-Q, 890-Q, 1530-Q
Yagunova, V. A. 1314-Q
Yaji, Shiro 440-G
Yajima, E. 402-M
Yajima, Nobuaki. 1015-Q
Yakhimovich, D. E. 175-G
Yakimova, A. M. . . . . 161-N, ... 260-Q, 907-Q, 1543-Q
Yakovchuk, Yu. E. 253-N
Yakovlev, A. P. 582-Q
Yakovlev, N. I. 84-K
Yakovlev, P. Ya. . . . 22-J, 263-J, 231-S
Yakovlev, V. V. 556-D
Yakovtchuk, Yu. B. 32-Q
Yakubtsiner, N. M. 381-D
Yakushin, M. V. 340-C, 418-C
Yamada, Atsushi 253-Q
Yamada, Toshio. 227-L, 234-L
Yamagata, Kazuo 664-P
Yamaguchi, S. 603-M, 1414-Q
Yamakawa, Kazuo. 521-P
Yamamoto, Chiaki 659-N
Yamamoto, Harutoshi 362-E
Yamamoto, Harutosi 154-N
Yamamoto, Kentaro . . . . . 13-Q, ... 14-Q, 1015-Q
Yamamoto, Mikio . . . . . 484-P, ... 546-P, 95-T
Yamamoto, Y. 72-E, 28-R

Yamanaka, Naomichi. . . . . 640-N, ... 641-N, 658-N
Yamane, Toshimi 1390-Q
Yamanouchi, Teruo. 61-S
Yamasaki, H. 200-J
Yamasaki, Yoshino 112-R
Yamazoe, H. 412-L
Yamazoe, M. 62-D
Yampolskii, A. M. 110-N
Yanagihara, Tadashi 477-N
Yanagisawa, Masaaki 240-N
Yang, C. T. 1416-Q
Yang, L. 88-D, 563-D
Yang, Tseng Yung. 161-L
Yanis, N. A. 67-B
Yano, Hiroshi 13-Q, 1015-Q
Yans, F. M. 570-A, 144-Q
Yao, Y. L. 674-M
Yario, W. R. 466-N
Yarovinskii, L. M. 70-K
Yasuda, Kazuo 363-E
Yasuda, Masabumi 137-J
Yasukochi, Ko. 1100-Q, 1242-Q
Yates, B. 109-T
Yates, H. H. 157-R
Yatsimirskii, K. B. 230-S
Yatsura, V. K. 47-F, 180-F
Yatsuzuka, Takeo. 632-D
Yatsyuk, A. I. 645-Q
Yavoiskii, V. I. 688-D
Yawata, K. 89-R
Yazawa, Shigehiko . . . . 93-Q, 117-Q, ... 790-Q, 890-Q, 1530-Q
Yeager, Ernest 414-L
Yeager, John. 414-L
Yearly, B. C. 533-N
Yeh, T. H. 925-Q
Yen, C. S. 221-Q
Yerkovich, L. A. 149-Q, 1511-Q
Yocom, John E. 715-R
Yoda, Renpei . . . 1101-Q, 1103-Q, 1391-Q
Yokobori, T. 218-Q, 1143-Q, 1175-Q
Yokoyama, Yasumasa 1-C
Yoneyama, Takanori. 61-S
Yonezaki, Shigeru. 32-R
Yorgiadis, Alexander J. 1140-Q
Yoshida, Akira. 11-E, 103-E
Yoshida, H. 210-N, 501-N
Yoshida, Susumu 263-C
Yoshida, Tohro 196-J
Yoshikawa, Seimi. 253-Q
Yoshiki, Tadatsugu. . . . . 120-F, ... 774-L, 489-N, 1144-Q
Yoshinaga, Oka 50-S
Yoshino, Toshio. 1462-Q
Yoshioka, Takashi 179-C
Yoshizawa, Shiro 459-C
Youdelis, W. V. 637-N
Young, Arthur P. . . . . 634-M, ... 559-Q, 1406-Q
Young, J. G. 590-K, 601-K, 71-S
Young, John P. 711-L
Young, L. 173-L, 702-P
Young, R. C. 136-R
Young, R. S. 320-M, 326-R
Younger, D. G., Jr. 954-Q
Yuchen, Liang 179-S
Yudelevich, I. G. 424-C
Yudina, I. N. 476-C
Yudovitch, S. Z. 102-J
Yue, A. S. 681-P
Yuganson, E. Yu. 522-K
Yugelson, B. G. 468-K
Yuguchi, M. 89-R
Yukawa, S. 308-N, 926-Q, 1365-Q
Yukawa, Toru 3-P, 389-Q
Yukhvid, M. E. 249-F
Yukin, G. I. 578-L
Yulanovskii, I. B. 151-R, 798-R
Yu-Me, Wang. 374-S
Yung-Chao, Chu. 198-P, 199-P
Yupko, L. D. 140-A
Yurasova, V. E. 94-M, 702-M
Yur'ev, S. F. 281-J, 113-N
Yushin, F. A. 164-D, 407-D
Yushina, L. D. 108-C
Yuuku, Amane 177-J
Yuzhaninov, I. A. 370-C
Yuzvenko, Yu. A. 463-K

Z

Zabaikin, A. V. 29-X
Zabaluev, I. P. 108-A
Zaberezhnyi, I. I. 349-C
Zabludovskii, I. E. 436-N
Zabotin, P. I. 403-C
Zabrodsky, Jaromir 265-G
Zachariasen, W. H. 652-M, 290-P
Zachwatkin, W. K. 28-B
Zackay, Victor F. . . . . 244-D, ... 267-J, 562-N, 1224-Q
Zaeytydt, J. 181-D
Zagabura, F. Ya. 62-F, 132-G
Zagrebennikova, M. P. . . 363-Q, 1499-Q
Zahn, E. A. 88-L, 417-L
Zahoransky, Frantisek 108-H
Zaidel, A. N. 144-S
Zaidelman, R. L. 1497-Q
Zaikova, V. A. 8-M, 71-P, 164-P
Zaikovskii, F. V. 66-S
Zaima, S. 482-N, 5-R, 760-R
Zaimovsky, A. S. 630-P
Zaitsev, K. I. 307-K

Zaitsev, Kh. P. 120-B
Zaitsev, M. P. 118-K, 225-W
Zak, H. 150-H, 254-J
Zak, T. 100-A,
. . . . . 584-A, 47-S, 807-L
Zakharov, E. K. 610-P
Zakharov, E. L. 221-S
Zakharov, O. A. 29-X
Zakharov, V. A. 147-E
Zakharova, G. V. 671-P
Zakharova, M. I. 3-N
Zakson, R. I. 702-K
Zakowa, H. 55-D
Zaleski, Frank I. 163-H
Zalkin, Allan. 428-M, 653-M
Zambrow, John L. 18-H
Zamirca, Stefan. 585-N,
. . . . . 110-R, 298-R, 317-R
Zanbrow, J. L. 417-K
Zapletalek, Alois 480-K, 92-Q
Zarembo, Y. I. 99-A, 484-C
Zarezankov, T. Kh. 353-S
Zaroshchinskit, M. L. 162-F
Zaruba, Milos 38-K
Zarubin, N. M. 254-M
Zasetskii, G. F. 399-N
Zasimchuk, E. E. 257-N
Zastera, Anton. 358-R
Zaustin, Michael V. 1008-Q
Zaveta, K. 675-P
Zavel'skii, V. S. 465-R
Zavershinskii, Yu. V. 317-W
Zay'yalov, A. M. 413-E
Zbikowski, M. 332-P, 363-P
Zdziennicki, Tadeusz 453-K
Zebroski, E. L. 40-P
Zedin, N. I. 1433-Q, 784-R
Zegler, S. T. 488-M
Zehnder, Charles 422-E
Zehringer, Pierre 147-D
Zeiger, H. 597-R
Zeke, Julius 45-K, 536-K
Zel'bert, B. M. 252-N
Zel'din, V. S. 204-C
Zelenskii, V. D. 442-D
Zelensky, V. F. 700-R
Zelikman, A. N. 142-B
Zellars, G. R. 358-P
Zello, A. Richard. 737-Q
Zeman, K. P. 873-Q
Zemany, P. D. 122-S
Zemel, J. N. 542-P
Zemskii, S. V. 408-D
Zemzin, V. N. 517-K, 636-K
Zenchenko, F. E. 124-J
Zeno, R. S. 18-G, 8-Q
Zepernick, H. 373-W
Zeuner, Hans. 52-J, 766-Q
Zeunert, Fritz 258-W
Zeyen, K. L. 184-K, 434-K, 503-M
Zezulova, Marcela 386-A,
. . . . . 61-D, 577-D, 154-M
Zharovskii, F. G. 157-S
Zhdan, I. T. 61-K
Zhdanov, A. K. 210-C
Zhdanov, G. S. 117-M, 63-P
Zhdanov, I. M. 49-X
Zhebrovskij, V. V. 709-R
Zheleznov, A. I. 411-C
Zheltukhin, D. V. 216-R
Zhemchuzhikov, G. V. 525-Q
Zhemchuzhina, E. A. 104-C,
. . . . . 310-C, 311-C
Zherebin, B. N. 161-W
Zhetvin, I. P. 1305-Q
Zhigach, A. F. 578-L
Zhigalova, K. A. 340-R
Zhigulev, P. G. 165-D
Zhilo, N. L. 601-D
Zhirnov, D. F. 435-N
Zhivotinskii, L. A. 62-W
Zhorova, L. P. 671-P
Zhoukhovitsky, A. A. 599-N
Zhuk, G. V. 437-R
Zhuk, N. P. 758-R
Zhukhovitskii, A. A. 83-M,
. . . . . 381-N, 670-P
Zhukhovitskii, E. M. 10-P
Zhukhovitsky, A. A. 179-N
Zhukov, A. A. 217-M, 1002-Q
Zhukov, A. M. 36-Q
Zhukov, D. G. 283-D, 255-M
Zhukov, L. L. 297-T
Zhukovskii, B. D. 551-K, 705-K
Zhun', Van 576-N
Zhuravlev, A. C. 181-S
Zhuravlev, N. N. 593-M,
. . . . . 63-P, 64-P
Zhuravlev, V. K. 670-P
Ziaja, G. 640-P
Zidek, Milan 37-F
Ziegfeld, R. L. 168-H
Ziegler, Gunther 189-C
Ziegler, Mark A. 140-G
Zielasek, G. 207-N
Zielinski, S. 35-D, 335-W
Ziembinski, S. J. 739-Q
Ziethe, H. 395-Q
Zikalov, V. A. 493-M
Zil'berg, Yu. Ya. 58-T
Zilbershtein, L. M. 551-K
Zimakov, I. E. 391-C
Ziman, J. M. 426-P
Zimkina, T. M. 215-R

Zimmer, W. 583-A
Zimmerman, W. F. 10-B, 1097-Q
Zimnawoda, Henry W. 234-E
Zinck, E. 258-R
Zingerman, A. S. 822-R
Zinov'ev, N. V. 59-W, 134-W
Zinovich, N. S. 998-Q
Ziolowski, Z. 237-D, 234-Q
Zirinsky, Stanley 615-Q
Zischka, Bruno 387-S
Zisman, W. A. 1203-Q
Zitka, B. H. 1122-Q
Zitter, Herbert 462-R
Ziv, D. M. 294-R
Zlatin, Norman 184-G, 286-G
Zlatnik, Ivan 204-J
Zldchevskii, M. I. 361-W
Zmihorski, E. 26-G, 278-L, 409-L
Zmudzinski, Bronislaw . . . 116-C, 117-C
Zoethout, G. 606-K
Zoja, R. 332-D
Zolotavin, A. V. 221-P
Zolotukn, B. I. 119-G
Zolotykh, B. N. 444-G
Zoltan, H. 794-R
Zommer, E. F. 322-T
Zonis, Irwin S. 457-C
Zorkoczy, B. 19-K
Zorn, E. 279-G
Zorner, Paul 79-K
Zorowski, Carl F. 834-Q
Zot'ev, Yu. A. 356-M
Zotos, John 640-D, 964-Q, 1247-Q
Zsak, Viktor 188-A
Zubarev, V. F. 1353-Q
Zubeldia, F. 449-K
Zudin, V. M. 510-D
Zuech, R. A. 124-M
Zuer, B. N. 463-C
Zuev, N. M. 404-C
Zuev, P. P. 196-Q
Zuev, S. S. 316-J
Zuffa, Pavel 233-W
Zuhike, Peter 200-P
Zuideveld, R. 759-L
Zuikova, A. A. 585-Q
Zukas, Eugene G. 567-N
Zuliani, G. 30-C
Zumstein, H. 778-R
Zurawski, Leszek. 434-W
Zusman, Sh. I. 48-J, 168-P
Zuts, K. A. 299-D
Zver'kov, A. I. 225-R
Zver'kov, B. V. 398-Q
Zvyagintsev, O. E. 582-A
Zwade, Walter 60-B
Zwerenz, G. 99-C
Zwicker, Ulrich . .395-N, 1162-Q, 1271-Q
Zyaitseva, L. P. 522-M
Zyikova, A. A. 661-P
Zykov, V. Z. 278-C
Zylstra, S. C. 61-G
Zyryaov, P. S. 202-P
Zysset, H. 125-T

SUBJECT INDEX

Since the annotations in this book are grouped into broad classes on the basis of process or property, the major emphasis in the index has been placed on materials, products and applications. Entries under the names of processes and properties usually refer only to general treatments of the subject. Wherever possible, items have been indexed under the name of the material or the type of material (metals, alloys, and metal forms) or product. For example, material on the rolling of aluminum appears as a subhead under the main entry "Aluminum alloys," and not under the main entry "Rolling."

The ASM-SLA Metallurgical Literature Classification, International (Second) Edition, has been used as an authority list, since this contains generally accepted and standardized metallurgical terminology and concepts. Index headings, therefore, fall mainly into the categories of materials (or products), forms of materials, properties, processes, and influencing factors, arrayed in approximately that order.

A

Abrasives, 248-L, 270-L
  wear, 229-Q
Actinium
  extraction and refining, 166-C
    ion exchange, 161-C
Addition agents
  for heat treatment, 249-J
  magnesium, 257-E
  silicon, 257-E
Adherence tests, 208-Q
Adhesive joining
  metal-to-metal, 1-K, 41-K, 75-K, 86-K, 97-K, 323-K, 346-K, 459-K, 13-T
Adsorption, 771-Q, 1468-Q
Age hardening, 226-N, 262-Q
  effect of composition, 135-N
  effect of deformation, 135-N
  volume and dimensional changes, 212-N
Agricultural equipment, 344-E, 45-L, 381-L, 259-T
  spot welding, 513-K
Aircraft, 57-A, 45-Q
  design, 341-T
  electroplating on, 815-L
Aircraft (cont.)
  fatigue, 1508-Q, 164-T
  flaw detection
    ultrasonic, 247-S
  forming and machining, 154-G
  fretting, 1508-Q
  materials
    alloy steel, 713-Q, 168-T
    cobalt alloys, 181-T
    magnesium, 314-T
    magnesium castings, 525-E
    nickel alloys, 233-T
    sandwich structures, 320-T
    stainless steel, 713-Q, 1452-Q, 168-T
    steel castings, 411-A
    titanium, 379-A, 260-T
    toolsteel, 163-T
  pumps, 56-J
  tensile properties, 1147-Q
Aircraft engines, 112-G, 1023-Q, 1024-Q, 63-T
  arc welding
    gas shielded, 170-K
  brazing, 345-K
  corrosion
    effect of high temperature, 355-L

Aircraft engines, corrosion (cont.)
stress, 458-R
creep
strength, 199-T
fatigue, 355-Q, 199-T
materials, 145-T, 157-T, 175-T
cermets, 356-S
molybdenum, 219-T
molybdenum alloys, 467-L, 215-T
titanium, 245-T
oxidation, 458-R, 599-R
stress-rupture properties and tests, 1022-Q
welding, 214-K
Airframes, 13-T, 337-T
aluminum, 110-T
bonding
plastic-to-metal, 174-K
brazing, 263-K, 422-K
design, 354-Q, 308-T
fatigue, 355-Q
tests, 350-Q
forming
distortion, 327-G
heat treatment, 129-J
machining
chemical, 257-G, 407-G
materials, 308-T, 312-T
aluminum alloys, 330-K
nickel alloys, 663-Q
stainless steel, 730-Q
sandwich structures, 119-T, 127-T
spot welding, 147-K, 447-K, 674-K
titanium
stretch forming, 98-G
AISI steel 1010, 49-J
AISI steel 1015, 49-J
Alkali metal alloys
thermodynamic properties, 237-P
Alkali metals
atomic structure, 209-M, 239-M
electrical properties
effect of low temperature, 426-P
extraction and refining
electrolytic, 35-C
magnetic properties, 121-P, 716-P
Alkaline earth metals
atomic structure, 149-M
reduction by metals, 366-C
Allotropy
low temperature, 69-N
Alloy steel, 8-A, 436-A, 217-S, 237-W
aluminizing, 631-L
anelastic properties, 1012-Q, 1065-Q
annealing, 34-J, 198-J, 235-J, 417-P, 366-W
applications, 444-A, 511-A
Alloy steel, (cont.)
arc welding, 99-J, 61-K, 248-K, 276-K, 379-K, 399-K, 569-K, 658-K, 685-K
coated electrode, 104-K, 526-K, 627-K, 230-N
cracks, 504-K
design, 1011-Q
gas shielded, 395-K, 481-K, 511-K, 671-K
submerged arc, 458-K, 535-K, 658-K, 671-K
atomic structure, 1012-Q
austenite
retained, 358-N, 476-N
austenite formation and decomposition, 713-K, 163-N, 208-N, 230-N, 327-N, 339-N, 434-N, 458-N, 484-N, 488-N, 514-N, 494-Q, 682-Q, 1303-Q
austenitizing, 99-J, 198-J, 207-J, 298-J
bend properties and tests, 53-Q, 1536-Q
bend tests
notched
slow, 1516-Q
brazing, 641-K
brittle transition temperature, 776-Q
effect of radiation, 1516-Q
carbides in, 236-N, 431-N, 572-N
carburizing, 160-J, 283-J
case hardening, 248-J
cathodic protection, 461-R, 818-R
cementite and cementite reaction, 476-N
centrifugal casting, 511-E
ceramic mold casting, 391-E
clad, 40-A
cladding on, 561-L
cold drawing, 166-G
colorimetric analysis, 366-S, 415-S
composition analysis, 385-S
compression properties, 1188-Q
corrosion, 153-A, 499-A, 682-Q
atmospheric
marine, 819-R
by molten metals, 1041-Q
by sulphur compounds, 330-R, 675-R
by waters
sea, 525-R, 818-R, 819-R
chemical
by inorganic acids, 391-R
inorganic, 407-W
organic
effect of radiation, 751-R
fatigue
effect of stress, 373-R
inhibition, 461-R
stress, 640-R, 675-R, 818-R
cracks, 461-K, 607-K
creep, 121-Q, 435-Q, 1384-Q, 1401-Q

Alloy steel, creep (cont.)
effect of high temperature, 228-Q
rate, 322-M, 1193-Q
strength, 1193-Q
creep properties and tests, 1065-Q
creep tests
stress relaxation, 764-Q
crystal structure, 344-G
dislocations, 600-M
imperfections, 207-J
damping properties and tests, 458-N
data books, 223-A
dendritic growth, 514-E, 316-N
diffusion, 990-Q
carbon, 458-N
hydrogen, 290-N, 391-N
interfacial, 195-N
diffusion coating on, 21-L
ductility, 558-A, 305-J, 125-Q, 625-Q, 1247-Q, 1366-Q, 1535-Q, 1536-Q
effect of high temperature, 182-T
elastic properties, 990-Q, 1450-Q
shear modulus, 1494-Q
elastic properties and tests, 263-T
electrical conductivity, 261-J
electro-slag welding, 468-K
fracture
brittle, 713-L
electroplating on, 282-J, 713-L, 1004-Q
electroslag welding, 244-K
extrusion, 48-W
impact and cold, 411-G, 279-W
fatigue
thermal, 1494-Q
fatigue life, 764-Q, 1184-Q, 1185-Q
fatigue properties and tests, 144-J, 160-Q, 1041-Q, 1365-Q, 1401-Q
fatigue strength, 358-Q, 618-Q, 926-Q, 952-Q, 969-Q, 989-Q, 1188-Q, 1327-Q, 1474-Q
fatigue tests
variable stress, 764-Q
flakes, 248-F
flame cutting, 265-G, 618-Q
flash welding, 652-K
flaw detection, 411-S
for forging dies, 108-W
forge welding, 441-L
forgeability, 135-F
forging practice, 248-F, 411-S, 223-T
tests, 1535-Q
formability, 1535-Q
forming
cold, 215-G
foundry practice
molding, 391-E
radioactive tracer study, 544-E

Alloy steel, foundry practice (cont.)
structure control, 474-E
fracture, 236-K, 605-Q, 926-Q, 1331-Q, 640-R
brittle, 367-K, 12-Q, 434-Q, 456-Q, 494-Q, 647-Q, 776-Q, 863-Q, 988-Q, 1211-Q, 1360-Q, 1541-Q
effect of deformation, 17-Q
effect of heat treatment, 17-Q
crack propagation, 647-Q, 738-Q, 1011-Q, 1096-Q, 1488-Q, 1541-Q
microcrack formation, 738-Q
friction, 1436-Q
gas welding
pressure, 444-K
gases in, 248-F, 409-N
grain boundaries, 195-N
graphitization, 274-J, 33-N, 279-N
grinding
surface
lubricants and oils, 269-G
hard surfaced, 21-L, 302-L, 345-L
hardenability, 43-J, 171-J, 248-J, 274-J
hardness, 436-A, 558-A, 43-J, 248-J, 261-J, 274-J, 283-J, 461-K, 1185-Q, 1327-Q
heading
cold, 411-G
heat treated, 469-A
heat treatment, 247-F, 303-J, 1528-Q
flame, 274-J
fused bath, 99-J
induction, 95-J, 687-N
quenching media, 183-J
heating for working, 224-W
high-strength, 268-A
hobbing
cold, 312-G
hydrostatic tests, 1195-Q
impact properties and tests, 605-Q, 1247-Q, 1331-Q
impact strength, 283-J, 738-Q, 863-Q, 989-Q, 1327-Q, 1366-Q, 1474-Q
inclusions, 512-D, 544-E, 926-Q, 952-Q, 385-S
liquid surface tension, 505-P
low
castings, degassing, 461-E
ceramic coating on, 642-L
corrosion, chemical
organic, 631-L
impact tests
shock, 805-Q
investment castings, 306-E
machining, 242-G
machinability, 18-G, 286-G, 344-G, 387-G, 426-G

Alloy steel, (cont.)
machining
mechanical, 223-G
macrostructure, 579-E, 491-Q
magnetic properties, 211-P, 271-P, 417-P, 584-P
effect of heat treatment, 451-P
tests, 429-P
martensite and martensite reaction, 587-N, 610-N, 687-N, 418-Q, 1350-Q
mechanical properties, 444-A, 445-A, 469-A, 321-D, 389-D, 675-D, 198-J, 378-K, 273-N, 491-Q, 593-Q, 682-Q, 713-Q, 1283-Q, 1316-Q, 206-T, 223-T, 340-T
effect of composition, 8-Q
effect of heat treatment, 476-N
effect of high temperature, 4-Q, 570-Q
effect of impurities, 476-N
effect of low temperature, 736-Q
metal spraying, 21-L
metal spraying of, 511-L
metallography
diffraction, 197-M
microstructure
primary, 62-M
nitriding, 19-J, 144-J, 282-J, 292-J
normalizing, 298-J
notch sensitivity, 625-Q, 925-Q, 1331-Q
nuclear properties, 701-P
painting, 819-R
pearlite and pearlite reaction, 213-N, 1353-Q
phase diagrams, 391-M
pitting corrosion, 331-R, 577-R
plastic deformation, 387-G, 733-Q, 784-Q, 1436-Q, 1536-Q
plastic properties, 1065-Q
polishing
electrolytic, 335-L, 585-L, 615-L
precipitation, 391-M, 458-N
precipitation hardening
aging, 261-J
quenching, 298-J, 291-T
interrupted, 267-J
radioactive tracer methods
metallography, 316-N
resistance welding, 25-K, 215-K, 523-K, 658-K, 708-K
rolling, 102-F, 171-F, 247-F, 248-F, 34-J, 156-W
seam welding
cracks, 415-K
segregation, 316-N
shell mold casting, 242-E
soldering
furnace, 642-K

Alloy steel, (cont.)
solid solutions
recrystallization, 273-N
solidification, 151-N
sonic properties, 274-J
sorting and identification, 413-S
specific heat, 484-N, 417-P
spectrographic analysis, 119-S, 374-S, 375-S, 413-S
spectrographic determination, 268-S
spheroidization, 33-N
standards and specifications, 135-K, 480-K, 53-Q
strain aging, 600-M
stress relief heat treatment, 83-J, 148-J, 235-J, 461-K
stress rupture properties and tests, 925-Q 926-Q, 927-Q, 994-Q, 313-T
stress-strain laws, 733-Q, 764-Q
stresses, 511-A
residual, 235-J, 367-K, 735-Q
thermal, 1353-Q
transformation, 735-Q
stud welding, 641-K
submerged arc welding, 357-K
synthetic resin coating on, 577-R
tempering, 198-J, 226-J, 298-J, 305-J, 358-N
tensile properties, 514-E, 226-J, 303-J, 305-J, 582-K, 488-N, 12-Q, 925-Q, 1185-Q, 1188-Q, 1195-Q, 1303-Q, 1350-Q, 1366-Q, 1474-Q, 1528-Q
effect of composition, 184-Q
high-temperature, 236-N
tensile properties and tests, 135-K, 267-J, 53-Q, 625-Q, 784-Q, 994-Q, 1536-Q
tensile strength, 1327-Q
tension test
notched, 647-Q
thermal conductivity
effect of low temperature, 322-P
torsion properties, 1195-Q
torsion properties and tests, 135-F
transformations, 191-N
isothermal, 431-N
stress induced, 990-Q
transition structure, 1353-Q
tubemaking
rolling, 97-F
turning, 97-G, 233-G
use in aircraft, 713-Q, 168-T
use in aircraft engines, 265-P
use in airframes, 312-T
use in boilers, 307-T
use in chemical processing equipment, 53-Q
use in fasteners, 182-T

Alloy steel, (cont.)
use in forming dies, 423-W
use in missiles, 61-T
use in nuclear reactors, 701-P
use in steam turbines, 349-K
use in tanks and pressure vessels, 206-T
volume and dimensional changes, 163-N
wear, 274-J
wear properties and tests, 153-A
weld tests, 378-K, 439-K
weldability, 19-K, 132-K, 135-K, 236-K, 367-K, 378-K, 443-K, 466-K, 490-K, 582-K, 607-K, 708-K, 713-K, 206-T
welding, 122-K, 261-K, 443-K, 480-K, 572-K, 584-K
welding
cracks, 434-N
electroslag welding, 73-K
physics, 526-K
quality control, 104-K, 461-K
tests, 150-K
wire drawing, 109-F
Alloy steel castings
applications, 287-A
arc welding
gas shielded, 682-K
corrosion, 922-Q
design, 349-K
fluidity and castability, 682-Q
mechanical properties, 435-A, 922-Q
microstructure
primary, 555-K
solidification phenomena, 514-E, 579-E
weldability, 555-K
Alloy steel forgings
brittle transition temperature, 1191-Q
cracks, 265-G
fracture, 693-Q
brittle, 1119-Q, 1246-Q
impact strength, 693-Q, 1191-Q
stress rupture
properties and tests, 693-Q
tensile properties, 1191-Q
use in turbine blades and rotors, 776-Q
Alloy steel ingot casting
degassing
vacuum, 608-D
Alloy steel ingots
ladle practice, 608-D
pouring, 414-D
Alloy steel plate, 306-D
annealing, 156-J
flame cutting, 156-J
fracture
brittle, 1099-Q
grinding, 156-J
normalizing, 156-J
Alloy steel plate (cont.)
notch sensitivity, 1099-Q
tensile properties, 1099-Q
use in tanks and pressure vessels, 1099-Q
Alloy steel powder
mixing and blending, 75-H
Alloy steel strip
grain size, 1068-Q
mechanical properties, 1068-Q
rolling
hot, 179-F
Alloy steel tubing and pipe
arc welding, 257-K, 313-T
gas shielded, 496-K
bend properties
strength and ductility, 307-G
corrosion
by inorganic acids, 454-R
by sulphur compounds, 39-R
stress, 344-R
electroplating, 344-R
grain size, 1068-Q
mechanical properties, 1068-Q
oxidation, 313-T
passivation, 454-R
tensile properties and tests, 942-Q
welding, 296-K
Alloy steel weldments
cracks, 248-K, 439-K, 443-K, 466-K
fatigue properties and tests, 941-Q
fatigue strength, 468-K
fracture, 605-Q
brittle, 420-Q, 1359-Q
hydrostatic tests, 685-K
impact properties and tests, 605-Q
impact strength, 399-K, 466-K, 1098-Q
mechanical properties, 642-Q
peening, 569-K
spectrographic analysis, 523-K
stress relief
heat treatment, 276-J
tensile properties, 642-K
Alloy steel wire
arc welding, 381-K
Alloying agents, 409-N, 413-D
ferrous
extraction and refining, 244-C
specifications, 312-S
Aluminum, 60-A, 135-A, 294-A, 326-A, 317-T
adhesive joining
metal-to-metal, 628-K, 717-K, 119-T
adhesives
airframes, 119-T
age hardening, 252-M
analysis, 320-S
anelastic properties, 134-M, 360-Q, 1212-Q, 1539-Q

Aluminum, anelastic properties (cont.)
effect of heat treatment, 795-Q
annealing, 58-M, 243-M
recrystallization, 682-P
anodized
corrosion, 384-L, 241-R
crystal structure, 645-M
design, 384-L
electrical conductivity, 564-L
electrical properties, 384-L
inspection and control, 430-S
size, thickness and mass measurement, 314-S
optical, 244-S
use in electrical and electronic equipment, 274-L
wear properties and tests, 1003-Q, 430-S
anodizing, 338-L, 430-L, 461-L, 506-L, 622-L, 623-L, 659-L, 726-L
automation, 762-L
sulfuric acid, 564-L, 653-P
applications, 5-A, 5-R, 5-W, 23-W
arc cutting, 302-G, 403-G
arc welding, 251-K, 369-K, 476-K, 630-K, 635-K
equipment, 304-T
gas shielded, 242-K, 403-K, 409-K, 602-K, 633-K, 634-K, 657-K, 679-K
standards and specifications, 23-K
submerged arc, 272-K, 462-K
atomic structure, 63-M
austenitic
crystal structure
dislocations, 564-M
bend properties and tests, 661-M
blanking, 27-G
blasting, 775-L
bonded
heat transfer, 324-P
boring and broaching, 311-G
brazing
dip, 581-K, 625-K
bridges, 131-T
buffing, 700-L
bulging, 216-G
cavitation corrosion, 394-R
ceramic coating of, 699-L, 637-L, 780-L
chemical conversion coating, 338-L, 666-L, 725-L
chemical reduction coating on, 393-L, 625-L
cladding, 147-F, 440-L, 822-L
cleaning, 723-L
cleaning and polishing
chemical, 485-L, 725-L, 778-L
electrochemical, 48-L, 726-L
mechanical, 724-L
coating by, 466-L
cold treatment
distortion, 240-J
colorimetric analysis, 408-S
colorimetric determination, 188-S, 426-S
composition analysis, 221-S
compression properties and tests, 1075-Q, 1437-Q
continuous casting, 81-C, 203-C, 415-C, 460-C, 461-C
equipment, 170-C
corrosion, 186-R, 495-R
alkaline
inorganic, 691-R
atmospheric, 300-P, 11-Q, 426-R, 712-R
industrial, 529-R
by alcohols, 5-R, 760-R, 807-R
by foods, 198-T
by organic acids, 291-R, 477-R
by sulphur compounds, 426-R
by waters, 1-R, 739-R, 34-W
effect of high temperature, 111-R
effect of radiation, 424-R
fresh, 593-R
steam
effect of radiation, 479-R
chemical
inorganic, 377-R, 455-R, 528-R, 576-R, 739-R
organic, 824-R
effect of radiation, 751-R
erosion, 822-R
galvanic, 4-R, 314-R, 315-R, 597-R
inhibition, 414-R, 455-R, 772-R, 807-R
intergranular, 478-R
stress, 151-Q, 478-R
corrosion tests, 597-R
electrochemical, 257-R
creep, 500-Q, 1073-Q, 1220-Q, 1318-Q, 1437-Q
activation energy, 239-P
creep rate, 708-M
crystal structure, 176-C, 63-M, 504-M, 509-M, 601-M, 661-M, 683-M
dislocations, 59-M, 216-M, 252-M, 341-M, 342-M, 377-M, 390-M, 430-M, 496-M, 612-M, 620-M, 631-M, 706-M, 708-M, 146-Q, 1212-Q, 1220-Q
effect of impurities, 440-Q
imperfections, 58-M, 132-M, 134-M, 243-M, 309-M, 327-M, 430-M, 436-M, 495-M, 392-P
texture and preferred orientation, 259-M, 260-M, 425-M, 519-M, 617-M, 680-M,

Aluminum, crystal structure (cont.)
texture and preferred orientation (cont.) 259-N, 317-N, 357-N, 501-N, 651-N
degreasing, 778-L
vapor, 388-L
determination, 88-S, 137-S, 156-S, 175-S
die casting, 59-E, 90-E, 179-E, 201-E, 265-E, 368-E, 483-E, 518-E, 527-E, 569-E, 316-W, 333-W
vacuum, 207-E
diffusion, 523-N, 527-N
gallium, 471-N
interfacial, 525-N
self, 353-N, 686-N
diffusion bonding, 22-K, 301-K, 382-K, 681-K
effect of heat treatment, 50-K
effect of pressure, 50-K
diffusion coating, 228-L, 231-L, 273-R
diffusion in iron, 429-N
diffusion in nickel, 656-N
diffusion in uranium, 737-P
dip coating, 102-L, 180-L
dip coating of, 777-L, 808-L
drawing
cupping, 92-G
deep, 37-G, 254-G, 391-G
lubricants and oils, 251-G
drilling and reaming, 118-G
elastic properties, 584-Q
Poisson's ratio, 711-Q
electrical conductivity, 378-E, 631-M, 353-N, 686-N, 239-P, 570-P, 682-P
effect of deformation, 31-P
effect of low temperature, 440-P
effect of temperature, 347-P
electrical properties, 378-Q
effect of radiation, 458-P, 463-P
electrical resistivity, 104-P
electrochemical properties, 254-P, 378-P, 438-P, 257-R
ionization potential, 653-P
electron beam welding, 264-C, 715-K
electron emission, 510-P, 525-P, 706-P
electron microscopy, 252-M, 341-M, 342-M, 683-M
electroplated, 281-L
electroplating, 294-L
electroplating of, 440-L, 497-L, 544-L, 569-L, 740-L
electroplating on, 98-L, 395-L, 478-L, 635-L, 676-L, 714-L, 715-L, 778-L, 824-L, 825-L, 826-L
electrorefining, 411-C, 412-C, 413-C, 477-R
electrowinning, 52-B, 76-C, 104-C,

Aluminum, electrowinning (cont.)
105-C, 106-C, 306-C, 307-C, 310-C, 350-C, 390-C, 430-C, 432-C, 436-C, 452-C, 453-C, 454-C, 221-S
books, 217-A
equipment, 201-R, 431-W
process control, 185-S
evaporation
vacuum, 673-N
extraction and refining, 279-C
chemical, 430-C
continuous casting, 254-G
degassing, 1-C
distillation, 169-C
electrolytic, 196-C
leaching, 116-C, 117-C
melting and casting, 31-C
equipment, 131-B
separation, 233-C, 254-C
extrusion, 28-F, 41-F, 136-F, 147-F, 289-F, 680-M
impact and cold, 235-F, 282-G, 412-G, 432-G, 1154-Q, 1351-Q
fatigue life, 439-M, 43-Q, 775-Q
fatigue properties and tests, 11-Q, 146-Q, 151-Q, 742-Q
fiber metallurgy, 112-H
flame cutting, 302-G
flash welding, 469-K
flaw detection
chemical and electrochemical, 340-S
foamed, 206-A
forge welding
die, 375-K, 377-K
roll, 107-F, 376-K
forging practice, 16-F, 53-F, 176-F, 204-F, 138-Q
drop, 290-F, 817-Q
upsetting, 1297-Q
formability, 1297-Q
foundry practice, 51-E, 52-E, 82-E, 83-E, 127-E, 161-E, 169-E, 359-E, 369-E, 378-E, 433-E, 453-E, 1110-Q
chilling, 74-E, 508-E, 61-J
coremaking, 101-E
crucible, 281-E
degassing, 522-E
fluidity and castability, 555-A, 502-E
gating, 400-E
melting, 15-E, 190-E, 300-E
fluxes and slags, 388-E
molding, 101-E, 134-E, 542-E
rigging, 574-E
risering, 400-E
fracture
brittle, 630-K, 151-Q
effect of low temperature, 15-Q

Aluminum, fracture (cont.)
microcrack formation, 775-Q
friction, 1425-Q
gas analysis, 55-S
gas welding, 410-K, 500-K, 630-K, 635-K
gases in metals, 523-N
gear cutting and screw cutting, 280-G
grain boundaries, 46-M, 367-M, 612-M, 683-M, 495-N
grain growth, 390-M, 317-N, 468-N, 495-N
grain size
statistical analysis, 509-M
halide decomposition, 138-C
hardness, 262-F, 601-M, 517-N
micro-, 496-M, 525-N
scratch, 102-Q
hardness tests
diamond pyramid, 102-Q
heat resisting alloys, 143-C
heat treatment, 52-E
in iron and steelmaking, 86-D
in steel, 666-Q
inclusions in, 340-S
inorganic compounds, 252-P
intermetallic compounds
crystal structure, 648-M, 654-M
mechanical properties, 1368-Q
investment casting, 75-E
lacquering, 727-L
liquid
effect of temperature, 89-N
liquid metal
electrical conductivity
effect of temperature, 347-P
machinability, 387-G
machine parts, 303-T
machining, 65-G
chemical, 422-G
equipment, 338-G
electrochemical, 13-G
mechanical, 236-G
macrostructure, 138-Q, 1318-Q
magnetic properties
nuclear magnetic resonance, 454-P, 456-P
mechanical properties
effect of high temperature, 335-Q
effect of impurities, 440-Q
effect of radiation, 1510-Q
melting and casting, 53-C
metal products, 137-T
metal spraying, 77-L, 128-L, 172-L, 276-L
metal spraying of, 392-L, 507-L, 508-L, 572-L, 775-L, 776-L, 789-L, 799-L

Aluminum, (cont.)
metal spraying on, 676-L
metallography, 92-M, 232-N
etching, 46-M
polishing, 341-M, 390-M
microstructure
primary, 408-N
mosaic structure, 327-M
neutron diffraction
effect of deformation, 434-M
nucleation, 468-N
optical properties
emission, 300-P
reflection, 613-L, 508-P
oxidation, 1368-Q, 149-R, 393-R, 410-R, 813-R, 824-R
effect of radiation, 494-R
painting, 727-L
painting on, 33-L
passivation, 240-R, 291-R
permanent mold casting, 90-E, 107-E, 397-E, 483-E
physical properties, 111-P
effect of impurities, 440-Q
pitting corrosion, 571-R
plastic deformation, 387-G, 462-N, 36-Q, 388-Q, 560-Q, 816-Q, 817-Q, 1073-Q, 1075-Q, 1357-Q
effect of grain size, 550-Q
effect of low temperature, 15-Q
heterogeneous, 1296-Q
lines and bands, 342-M, 775-Q
slip, 216-M, 110-Q, 334-Q, 1113-Q
plasticity
effect of deformation, 1066-Q
polishing
electrolytic, 509-L, 510-L, 541-L, 613-L, 615-L, 702-L, 781-L, 332-N
mechanical, 700-L
porosity, 527-E
powder metallurgy, 38-H, 94-H, 165-H
precipitation hardening
aging, 55-J
presswork, 219-G
recovery, 26-N, 353-N, 517-N, 548-N
after deformation, 468-N, 728-Q
recrystallization, 262-F, 504-M, 680-M, 26-N, 224-N, 232-N, 259-N, 317-N, 332-N, 468-N, 501-N, 509-N, 548-N, 665-N, 674-N, 682-P
effect of composition, 331-N
resistance welding, 708-K
riveted
tensile properties, 645-K
roll bonding, 376-K, 290-L
roll forming, 235-F
rolling, 170-C, 216-F, 266-F, 254-G, 816-

Aluminum, rolling (cont.)
cold, 262-F, 263-F
defects
surface, 425-M
hot, 263-F
safety, 180-A
sand casting, 81-E, 201-E, 240-E, 483-E
segregation, 31-C, 77-S
shear properties and tests
ultrasonic, 560-Q
shell mold casting, 38-E
single crystals
creep, 772-Q
crystal structure
imperfections, 250-M
texture and preferred orientation, 210-N
ductility, 1417-Q
growth, 352-N, 357-N
plastic deformation, 10-Q, 544-Q, 772-Q, 856-Q, 1501-Q
lines and bands, 1417-Q
slip, 55-Q
recovery
effect of deformation, 282-N
recrystallization, 210-N, 478-N
strain aging, 856-Q
structure
dislocations, 1501-Q
tensile properties, 856-Q, 1112-Q, 1501-Q
torsion properties, 1501-Q
work hardening capacity, 544-Q, 549-Q, 1501-Q
x-ray diffraction, 432-M, 620-M
effect of deformation, 438-M
size, thickness and mass measurement
electrical, 395-S
soldering, 243-K, 407-K, 411-K
brazing and soldering metal, 285-T
solidification, 467-K, 367-M, 120-N, 408-N, 651-N
solidification shrinkage, 641-P
solubility of
ultrasonic, 436-P
solubility of lithium, 427-N
specific heat, 569-P
spectrographic determination, 57-S, 70-S, 108-S, 239-S, 285-S
spinning, 293-G
spot welding, 413-K, 476-K, 674-K
equipment, 59-K
sprayed
corrosion
atmospheric, 486-R
spraying, 206-L, 347-L

Aluminum, (cont.)
standards and specifications, 45-S, 313-S, 448-S
statistics and economics, 59-A, 91-A
strain aging, 661-M, 462-N, 517-N
stress rupture properties and tests, 1095-Q
stress-strain laws, 36-Q
surface roughness
measurement, 485-L
surface tension, 501-E, 414-P
systems
binary, 60-M, 78-M, 295-M, 345-M, 351-M, 410-M, 465-M, 493-M, 516-M, 557-M, 584-M, 585-M, 654-M, 693-M, 5-P
complex, 554-M
ternary, 14-M, 23-M, 60-M, 189-M, 236-M, 246-M, 297-M, 315-M, 406-M, 515-M, 537-M, 538-M, 539-M, 540-M, 541-M, 542-M, 543-M, 598-M, 669-M, 690-M, 700-M
tempering
distortion, 240-J
tensile properties, 601-M, 138-Q, 775-Q, 894-Q, 1351-Q
tensile properties and tests, 1437-Q
thermal conductivity, 635-K
thermal properties, 696-P
thermodynamic properties, 392-P
thin films
adherence tests, 488-L
optical properties, 195-P
treating liquid metal, 143-C
tubemaking
drawing, 268-F
rolling, 272-F
welding, 107-F, 110-F, 209-F
equipment, 140-F
ultrasonic welding, 6-K, 11-K, 231-K, 715-K
use in aircraft, 145-T
use in automobiles, 52-T
engines, 83-T
use in bearings, 58-T
use in buildings, 175-L, 314-R, 10-T, 14-T, 15-T, 22-T, 24-T, 26-T, 38-T, 59-T, 126-T
use in cable
electrical, 69-T
use in cranes and elevators, 216-W
use in electrical and electronic equipment, 16-T
use in electrowinning equipment, 167-C
use in furniture, 53-T
use in kitchen equipment, 314-K
use in marine equipment, 55-T

Aluminum, (cont.)
use in missiles, 162-T
use in nuclear reactors, 118-T, 183-T, 34-W
use in packaging and wrapping, 54-T, 198-T
use in ships, hulls, 27-T
use in structures, 23-T, 39-T, 86-T, 278-T
use in tanks and pressure vessels, 99-K, 116-T, 128-T
vacuum deposition of, 735-L
vapor deposition coating of, 82-L, 456-L, 481-L, 537-L
vapor deposition of, 488-L
vapor pressure, 593-P, 81-X
wear, 378-Q, 1425-Q
weldability, 576-K, 630-K, 708-K
welding, 275-K, 494-K, 590-K
wiredrawing, 1-F, 49-F, 69-F, 76-F, 235-F
x-ray diffraction, 617-M, 332-N, 102-Q
effect of deformation, 300-M, 434-M
effect of irradiation, 430-M
effect of stress, 436-M, 439-M
yield point mechanism, 933-Q
zone melting, 132-C, 135-C, 176-C, 477-R
Aluminum alloy castings
mechanical properties, 467-Q
quality control, 240-E
segregations, 363-E
solidification phenomena, 363-E
Aluminum alloy die castings, 137-E
Aluminum alloy extrusions, 131-M
flaw detection
ultrasonic, 266-S
Aluminum alloy tubing and pipe
bending, 113-G
corrosion
galvanic, 630-R
inhibition, 630-R
Aluminum alloy weldments, 125-K
cracks, 467-K
flaw detection
radiographic, 237-S
tensile properties, 1155-Q
Aluminum alloys, 326-A, 432-A
adhesive joining, 97-K
metal-to-metal, 172-K, 173-K
age hardening, 432-A, 28-N, 482-N, 524-N
anelastic properties
effect of radiation, 82-Q
anodic coating, 182-L, 229-L
coloring, 175-L
sulphuric acid, 169-L
Aluminum alloys, (cont.)
anodized
service testing, 169-L
anodizing, 274-L, 384-L, 783-L
automation, 366-L
equipment, 166-L
standards and specifications, 673-L
applications, 440-A, 544-A, 392-S
arc cutting, 44-G, 418-G
arc welding, 265-K, 327-K, 484-K, 508-K
gas shielded, 291-F, 186-K, 194-K, 213-K, 226-K, 256-K, 284-K, 292-K, 299-K, 329-K, 335-K, 432-K
atomic structure
spatial arrangement, 648-M
bars and rods
bending, 113-G
bend properties
strength and ductility, 1056-Q
bending, 157-G, 332-G
bonding
glass-to-metal, 173-K
brazing, 291-F, 157-K, 219-K, 327-K
torch, 564-K
brittle transition temperature, 1524-Q
casting, 470-E
ceramic coating, 227-L, 234-L
ceramic coating on, 662-L, 719-L, 728-L
chemical conversion coating, 308-L, 365-L
chemical kinetics, 273-P
chemical milling, 161-G
clad, 282-A
cladding, 774-L
cleaning and polishing, 174-L
chemical, 224-L, 365-L
electrolytic, 234-L
cleavage, 52-M
cold treatment, 197-J
composition analysis, 13-S, 170-S
continuous casting, 163-C, 60-F, 203-F
corrosion, 494-A, 1278-Q, 241-R, 263-R, 527-R, 632-R, 176-T
alkaline
inorganic, 332-R
atmospheric, 71-Q, 200-R, 253-R
marine, 549-R
tropical, 230-R
by inorganic acids, 531-R
by waters, 112-R, 158-R, 159-R, 686-R, 697-R, 737-R
fresh, 247-R
pure, 116-R, 117-R, 174-R
sea, 138-R, 200-R
steam, 743-R
chemical
inorganic, 280-R, 281-R

Aluminum alloys, corrosion (cont.)
chemical, (cont.)
organic, 520-R
fatigue, 1138-Q
galvanic, 200-R, 230-R, 644-R
inhibition, 237-R, 113-W
stress, 514-A, 1037-Q, 480-R
corrosion prevention, 607-R
corrosion tests
salt spray, 253-R
cracks, 675-K, 774-L
creep, 40-Q, 121-Q, 485-Q, 953-Q, 1137-Q, 1400-Q, 1405-Q
strength, 161-Q, 686-Q
creep tests
buckling, 148-Q, 686-Q
stress-relaxation, 130-Q, 598-Q, 794-Q
crystal structure, 575-M, 598-M
dislocations, 389-M, 412-M, 415-M
imperfections, 191-M
damping properties
effect of aging, 401-Q
defects, surface, 470-E
die casting, 138-E, 573-E, 460-S
tolerances, 203-E
diffusion, 524-N
diffusion in alloy systems, 279-Q
dispersion hardening, 71-H, 448-N, 1405-Q
drawing
press forming, 335-K
ductility, 514-A, 714-Q, 997-Q, 1346-Q
effect of high temperature, 167-Q
elastic properties
proportional limit, 25-J
electrical conductivity, 566-M, 2-P, 286-P, 306-P
electron beam welding, 255-K
electron diffraction, 575-M
electron microscopy, 575-M
electroplated
adherence tests, 1298-Q
electroplating, 256-L
electroplating on, 350-L
explosive forming, 196-G
extraction and refining
melting and casting, 156-C
extrusion, 63-F, 155-F, 258-F, 774-L
direct, 703-Q
impact and cold, 81-C, 121-F, 140-G, 187-G, 230-G
fatigue, 214-Q, 221-Q, 279-Q, 338-Q, 342-Q, 347-Q, 349-Q, 352-Q, 354-Q, 355-Q, 356-Q, 377-Q, 403-Q, 164-T
thermal, 1282-Q
fatigue life, 217-Q, 346-Q, 353-Q, 415-Q
effect of stress, 496-Q

Aluminum alloys, (cont.)
fatigue properties and tests, 52-M, 28-N, 29-Q, 71-Q, 108-Q, 171-Q, 687-Q, 953-Q, 1295-Q, 1400-Q
fatigue strength, 514-A, 278-Q, 289-Q, 295-Q, 341-Q, 1037-Q, 1137-Q, 1138-Q
effect of peening, 627-Q
effect of size and shape, 497-Q
fatigue tests, 351-Q
rotating beam, 1261-Q
finishing, 313-L, 202-T
flash welding, 652-K
flaw detection, 56-S
forge welding, 327-K
forging practice, 119-F, 914-Q
upsetting, 294-F
forming, 914-Q
distortion, 327-G
finish, 332-G
forming and machining, 160-G
foundry practice, 398-E, 306-P
fractography, 52-M
fracture, 1137-Q, 1538-Q
brittle, 1346-Q, 1524-Q, 527-R
micro-crack formation, 85-Q
friction, 273-P, 290-Q
gas welding, 327-K
oxy-acetylene
defects, surface, 420-K
gases in metals, 1346-Q
grain boundaries, 997-Q
grain growth, 352-N
grain refining agents
sodium, 124-M
grain size, 163-M, 566-M
hardness, 524-N, 527-R
effect of composition, 1-J
effect of heat treatment, 1127-Q
hardness and hardness tests, 160-G, 482-N
heat transfer, 259-J
heat treatment, 555-A, 398-E, 25-J, 30-J, 265-J, 330-J, 714-Q
heating and cooling, 259-J
homogenization, 566-M
impact strength, 1475-Q, 1524-Q
liquid
viscosity, 382-P
machinability, 494-A, 373-G, 421-G
machining, 78-G, 79-G, 143-G
chemical, 133-G, 139-G, 180-G, 257-G
mechanical, 389-G
stress analysis, 385-G
macrostructure, 131-M, 703-Q
magnetic properties, 598-M, 521-P
paramagnetism, 731-P
mechanical properties, 311-A, 432-A,

Aluminum alloys, mechanical properties, (cont.)
440-A, 456-A, 465-A, 513-A, 398-E, 373-G, 71-H, 197-J, 448-N, 286-P, 42-Q, 120-Q, 167-Q, 280-Q, 343-Q, 441-Q, 914-Q, 1278-Q, 737-R, 176-T
effect of grain size, 759-Q
effect of heat treatment, 573-E
effect of high temperature, 174-Q, 175-Q, 547-Q, 798-Q
effect of impurities, 169-E
effect of low temperature, 252-Q, 680-Q, 736-Q
effect of radiation, 530-P
metal spraying on, 651-L
metallography
specimen preparation, 575-M
microradiography, 211-M, 477-M
microstructure, 124-M
primary, 1278-Q
radioactive tracer study, 151-M
notch sensitivity, 377-Q
oxidation
effect of composition, 487-R
painting, 182-L, 224-L, 365-L
pickling, 182-L, 337-L
permanent mold casting, 309-E
physical properties, 311-A, 440-A
effect of radiation, 530-P
plasma arc process, 418-G
plastic deformation, 485-Q, 486-Q, 733-Q, 1538-Q
plastic properties, 25-J
precipitation, 225-N
precipitation hardening, 1-J, 121-J
aging, 513-A, 268-J
quenching, 268-J, 389-M, 1392-Q
radiochemical analysis, 360-S
recrystallization, 63-F, 480-N, 278-Q, 703-Q, 527-R
resistance welding, 291-F, 327-K, 386-K
riveting, 645-K
roll forming, 157-G, 335-K
rolling, 163-C, 59-F, 60-F, 203-F, 774-L, 914-Q
safety, 180-A
sand casting, 309-E, 460-S
seam welding, 330-K
shapes
bending, 113-G
shearing, 332-G
soldering, 157-K, 206-K
solidification, 584-M, 120-N, 139-N
solidification shrinkage, 203-E, 1346-Q
spectrographic analysis, 106-S
spot welding, 196-K, 292-K, 330-K, 333-K, 338-K, 579-K

Aluminum alloys, (cont.)
standards and specifications, 259-A, 56-S, 392-S
stretch forming, 333-K
stress relief heat treatment, 155-G, 197-J
stress rupture properties and tests, 161-Q, 1037-Q
stress-strain laws, 733-Q
stresses, 155-G
residual, 477-Q
transformation, 130-Q
temperature measurement, 265-J
tensile properties, 513-A, 2-P, 155-Q, 703-Q, 714-Q, 924-Q, 975-Q, 1037-Q, 1127-Q, 1392-Q, 1475-Q, 1524-Q
effect of high temperature, 566-Q
tensile properties and tests, 432-K, 122-Q, 1476-Q
thermal diffusivity, 259-J
thermal expansion, 1127-Q
thermal properties, 174-Q, 175-Q
thin films
adherence tests, 1010-Q
transformations, 534-M
tubemaking
rolling, 193-F
ultrasonic welding, 151-K, 245-K, 360-K, 473-K, 665-K
use in aircraft, 282-A
use in airframes, 330-K, 308-T
use in automobiles, 108-T
bodies, 276-G
engines, 134-E, 265-T, 271-T
parts and fittings, 188-T
use in bridges, 171-T
use in buildings, 175-L, 123-T, 126-T, 170-T
use in chemical processing equipment, 282-A, 80-T
use in computers and business machines, 25-X
use in kitchen equipment, 191-R
use in missiles, 61-T
use in nuclear reactors, 259-A, 146-T
use in oil refining equipment, 348-T
use in packaging and wrapping, 81-C, 114-T
use in railroad cars, 124-T, 125-T
use in sandwich structures, 253-A
use in tanks and pressure vessels, 125-K, 87-T
vapor deposition of, 527-N
volume and dimensional changes, 1282-Q
wear, 494-A, 1337-Q
weld tests, 1295-Q
weldability, 181-K, 675-K, 737-R
welding, 157-K

Aluminum alloys, welding, (cont.)
cracks, 467-K
physics, 265-K
x-ray microscopy
effect of deformation, 159-M
yield strength, 155-F
zone melting, 261-C
Aluminum anodes and cathodes, 178-R, 265-R
Aluminum-antimony alloys
electrical and electrochemical properties, 123-P
electrical conductivity, 219-P
electrical properties, 230-P
magnetic properties, 600-P
Aluminum-antimony-gallium system, 103-M
Aluminum bars and rods
mechanical properties, 76-Q
roll forming, 136-G
Aluminum billets
macrostructure, 326-M
Aluminum brass, 384-A
mechanical properties
effect of grain size, 326-M
Aluminum bronze alloys
corrosion tests
stress-corrosion, 301-R
Aluminum-bronze castings
mechanical properties, 467-Q
Aluminum-cadmium alloys
recrystallization, 240-N
Aluminum-calcium alloys
heat of reaction, 551-P
Aluminum castings, 96-E
bend properties and tests, 552-Q
composition analysis
gas, 128-S
corrosion, 1485-Q
cracks, 280-E
degassing, 1-C, 53-E, 190-E, 281-E, 294-E, 310-E
design, 84-E, 95-E
fluidity and castability, 465-A, 204-E, 460-E
fluxing, 501-E
grain size, 6-M, 288-Q
hardness, 1165-Q
heat treatment, 61-J
machining
mechanical, 321-G
mechanical properties, 81-E, 83-E, 61-J, 288-Q, 516-Q
painting, 387-L
porosity, 400-E, 522-E
precipitation hardening, 400-E
properties, 161-E
Aluminum castings, (cont.)
quality control, 58-E, 74-E, 213-E, 975-Q
reclamation, 48-E
solidification phenomena, 216-E, 280-E, 342-E, 574-E, 584-M
standards and specifications, 117-S
stress relief heat treatment, 1110-Q
stresses
residual, 1110-Q
structure control, 32-E, 124-E, 477-E
tensile properties, 1056-Q, 1165-Q
tensile properties and tests, 552-Q, 1485-Q
use in automobiles, 52-T
volume and dimensional changes, 213-E
Aluminum cermets, 1-H, 2-H, 84-H
Aluminum coated steel, 266-R
Aluminum coatings
corrosion, 130-R
sprayed
corrosion tests, 356-R
Aluminum-cobalt alloys, 44-A
Aluminum-copper alloys
age hardening, 248-N, 299-N, 181-Q
effect of composition, 249-N
anodizing, 356-L
atomic structure
effect of deformation, 277-M
corrosion
by inorganic acids, 249-R
intergranular, 249-R
stress, 196-R
creep, 684-Q
rate, 181-Q
crystal structure, 312-M, 406-N
imperfections, 432-M
crystallization, 481-P
diffusion bonding, 216-F
electrical conductivity, 417-N
etching, 160-M
eutectics
formation, 406-N
extrusion, 388-Q
flash welding, 250-K
foundry practice
fluidity and castability, 502-E
fracture, 684-Q
heat treatment
cyclic, 661-P
macrostructure
effect of irradiation, 290-M
melting temperatures, 481-P
microstructure
primary, 481-P
nucleation, 491-N
plastic deformation, 388-Q, 1482-Q

Aluminum-copper alloys, plastic deformation (cont.)
lines and bands, 1491-Q
slip, 1491-Q
precipitation, 417-N, 491-N
precipitation hardening
aging, 165-J
solid solutions
formation, 147-N
superlattice formation, 491-N
surface tension, 660-P
transformations, 312-M
transition structure, 406-N
volume and dimensional changes, 661-P
Aluminum-copper bonded assemblies
tensile properties and tests, 216-F
Aluminum-copper-magnesium alloys
adhesive joining, 412-K
bending, 392-G
drawing, 142-G
machining
mechanical, 376-G
rolling, 108-F, 139-F
Aluminum-copper-silicon alloys
electroplating, 256-L
fatigue properties and tests, 966-Q
fracture, 966-Q
gases in, 439-E
Aluminum-copper-silicon castings
degassing, 439-E
Aluminum-copper-zinc alloys
mechanical properties, 865-Q
physical properties, 865-Q
Aluminum die castings, 164-W
anodizing, 800-L
corrosion
chemical
inorganic, 541-R
organic, 541-R
corrosion tests
immersion
total, 541-R
design, 277-T
electroplating on, 350-L
finishing, 273-L
forging practice, 79-F
machining
mechanical, 78-A
mechanical properties, 368-E, 79-F, 652-Q
physical properties, 652-Q
porosity, 274-E
quality control, 265-E
tumbling, 496-L
Aluminum extrusions, 86-F
age hardening, 757-Q
anodizing, 43-L
Aluminum extrusions, (cont.)
arc welding
gas shielded, 670-K
crystal structure, 178-M, 179-M, 181-M
fatigue strength, 68-Q
mechanical properties, 1154-Q
microstructure, 177-M, 178-M, 179-M
strain aging
tensile properties and tests, 280-N
tensile properties, 68-Q, 1197-Q
tensile properties and tests, 757-Q
work-hardening capacity, 757-Q
Aluminum fiber
rolling, 146-H
Aluminum films
adherence tests, 202-Q
Aluminum foil
anodic coating, 132-T
bonding
metal-to-nonmetal, 486-K
crystal structure, 16-M
electron microscopy, 16-M
etching
electrolytic, 336-L
printing on, 486-K
rolling, 377-W, 379-W
finish, 4-F
ultrasonic welding, 455-K
use in buildings, 123-T
use in cutting tools, 97-G
use in electromagnets, 132-T
use in packaging and wrapping, 29-T
use in radiography, 196-S
use in transformers, 132-T
x-ray diffraction
effect of deformation, 437-M, 438-M
Aluminum forgings
corrosion, 452-R
mechanical properties, 452-R
tolerances, 204-F
Aluminum industry
statistics and economics, 205-A, 219-A, 401-A
Aluminum ingots
continuous casting, 469-C
hardness, 16-Q
homogenization, 317-J
microstructure
primary, 16-Q
Aluminum investment castings
tensile properties and tests, 653-Q
Aluminum-iron alloys
anodizing, 257-F
corrosion by waters
pure, 257-F
extrusion
direct, 257-F

Aluminum-iron alloys, (cont.)
formability, 550-N
magnetic properties, 528-P, 4-S
oxidation, 199-R
solidification, 550-N
transformation
stress induced, 257-F
Aluminum-iron solid solutions
structure, 257-F
Aluminum-iron-silicon alloys
crystal structure, 284-F
rolling
cold, 284-F
Aluminum-lithium alloys
microradiography, 529-M
microstructure
primary, 529-M
recrystallization, 529-M
Aluminum-magnesium alloy weldments
fatigue strength, 972-Q
Aluminum-magnesium alloys, 452-A, 564-A
age hardening, 507-N
annealing, 237-Q
applications, 441-A, 452-A
arc welding
gas shielded, 139-K
creep, 185-Q, 409-Q
strength, 1042-Q
colorimetric analysis, 426-S
composition analysis, 389-S
corrosion, 441-A, 389-S
atmospheric, 554-A
by waters
sea, 554-A
intergranular, 245-R
stress, 75-R, 245-R
crystal structure
dislocations, 370-M, 185-Q
drawing, 142-G
ductility, 507-N
elastic properties, 507-N
electroplating, 256-L
energy of activation, 185-Q
fracture
brittle, 800-Q
grain boundaries, 409-Q
hardness, 507-N, 237-Q
impact strength, 507-N
mechanical properties, 441-A, 124-E, 57-Q
microstructure, 82-J
primary, 627-P
oxidation, 228-R
physical properties, 441-A
plastic deformation, 409-Q
plastic properties, 237-Q, 292-Q
Aluminum-magnesium alloys, (cont.)
polishing
electrolytic, 335-L
precipitation hardening
aging, 82-J, 507-N
recovery, 378-N
recrystallization, 237-Q
rolling, 108-F, 139-F
stress rupture properties and tests, 1095-Q
surface tension, 627-P, 660-P
tensile properties, 507-N
tensile properties and tests, 370-M
viscosity, 552-P
welding, 452-A, 99-K
Aluminum-magnesium-silicon alloys
age hardening, 403-N
friction, 938-Q
rolling, 108-F
Aluminum-magnesium-silicon system, 196-M
Aluminum-magnesium-zinc alloys
properties, 55-J
Aluminum-manganese alloys
annealing, 106-Q
machining
mechanical, 376-G
mechanical properties, 106-Q
recrystallization, 404-N
rolling, 108-F
welding, 99-K
Aluminum-manganese bronze
properties
Aluminum-manganese-iron alloys
corrosion
inhibition, 237-R
Aluminum-manganese-silicon alloys
machining
mechanical, 376-G
Aluminum-nickel alloys
electrolytic polishing, 475-L
formability, 550-N
quenching, 231-J
solidification, 550-N
tempering, 231-J
Aluminum-nickel-cobalt alloys
crystal structure
texture and preferred orientation, 245-M
Aluminum-nickel-iron alloys
corrosion
by waters, 698-R
effect of high temperature, 371-R
microstructure
primary, 698-R
Aluminum ores
concentration, 52-B, 105-B, 109-B

Aluminum ores, (cont.)
crushing
grinding and sizing, 76-B
sintering, 52-B
Aluminum oxide
friction, 873-Q
wear, 873-Q
Aluminum oxide cermets
wear, 702-Q
Aluminum permanent mold castings, 164-W
ceramic coating, 645-L
mechanical properties, 654-Q, 1153-Q
physical properties, 654-Q, 1153-Q
Aluminum plate
bending, 449-G
stress
residual, 449-G
stress analysis, 449-G
Aluminum powder
dispersion hardening, 300-N
emission, 673-P
properties, 448-N
molding
compacting
extrusion, 56-H
Aluminum powder compacts
sintering, 77-H
Aluminum powder metallurgy, 38-H
Aluminum powder parts
corrosion, 452-R
mechanical properties, 452-R
Aluminum riveted joints
mechanical properties, 416-K
Aluminum sand castings, 34-T
flaw detection
ultrasonic, 315-S
mechanical properties, 1153-Q
physical properties, 1153-Q
plastic deformation, 112-Q
Aluminum sandwich structures, 13-T, 330-K, 333-K
bonding
plastic-to-metal, 174-K
use in airframes, 187-T
Aluminum scrap
processing, 115-B
Aluminum sheet
arc welding
gas shielded, 239-K
ceramic coating, 645-L, 679-L
compression properties, 50-G
corrosion prevention
packaging and wrapping, 431-R
removable coatings, 431-R
defects, 60-F
surface, 254-G
Aluminum sheet, (cont.)
drawability, 1248-Q
drawing
deep, 131-G, 786-Q
formability, 786-Q
forming, 381-G
forming and machining, 167-G
grain growth, 233-N
hardness, 16-Q
heat treatment, 381-G
inspection and control, 270-S
joining, 381-G
mechanical properties, 522-Q
microstructure
primary, 16-Q
mill practice, 270-S
roll bonding, 390-L
seam welding, 561-K
stresses, 440-G
stretch forming, 440-G
tensile properties and tests, 700-Q, 1248-Q
ultrasonic welding, 455-K, 561-K
Aluminum-silicon alloys, 222-A, 272-A
anodizing
sulphuric acid, 592-L
die casting, 528-E
electrical conductivity, 316-P
electroplating, 256-L
extraction and refining
degassing, 308-C
fatigue, 481-Q
formability, 550-N
foundry practice, 353-E
melting, 276-E
structure control, 407-E
gases in, 308-C
mechanical properties, 353-E
microstructure
primary, 135-M
permanent mold castings, 288-Q
sand castings, 288-Q
solidification, 550-N
spectrographic analysis, 198-S
viscosity, 552-P
Aluminum-silicon alloy
castings
quality control, 283-E
structure control, 350-E
tensile properties, 276-E
Aluminum-silicon-copper alloys
castings
degassing, 577-E
Aluminum-silicon-iron alloys
liquation, 471-C
x-ray diffraction, 471-C

Aluminum-silicon-magnesium alloys
die casting, 528-E
ductility, 1470-Q
Aluminum-silver alloys
crystal structure
dislocations, 472-M
electrical conductivity, 246-J
precipitation, 664-N
precipitation hardening
aging, 246-J
plastic deformation
slip, 472-M
x-ray microscopy, 664-N
Aluminum strip
arc welding
gas shielded, 239-K, 291-K
continuous casting
equipment, 171-C
painting, 20-L
thermal properties, 376-P
Aluminum-thorium-silicon alloys, 143-C
Aluminum-tin alloys, 272-A
age hardening, 1090-Q
cladding, 247-L
fluidity and castability, 544-E
fracture
brittle, 1090-Q
physical properties
density, 209-P
thermodynamic properties, 200-P
Aluminum-tin systems, 209-P
Aluminum tubing and pipe, 258-F
flaw detection
radiographic, 265-S
mechanical properties, 193-F
Aluminum-uranium alloys
crystal structure
texture and preferred orientation, 152-M
diffusion, 537-N
eutectoid reactions, 449-N
flaw detection
radiographic, 383-S
thermodynamic properties, 295-M
transformations
diffusionless, 449-N
Aluminum weld tests
porosity, 470-K
Aluminum weldments, 88-T, 89-T
defects, 1089-Q
design, 334-T
flaw detection
radiographic, 71-S
impact properties and tests, 1089-Q
impact strength, 1475-Q
inspection and control, 196-K
mechanical properties, 272-K
Aluminum weldments, (cont.)
metallography
etching, 272-M
polishing, 272-M
plastic properties, 284-K
tensile properties, 1-K, 284-K, 1475-Q
tensile properties and tests, 1089-Q, 1107-Q, 1476-Q
tensile strength, 377-K
use in marine equipment, 56-T
Aluminum wire
anodizing, 50-L
bend properties and tests, 343-T
butt welding, 223-K
corrosion
atmospheric, 343-T
crystal structure
texture and preferred orientation, 311-M
ductility, 343-T
electrical conductivity, 343-T
mechanical properties, 1-F
spot welding, 338-K
tensile properties, 343-T
Aluminum-zinc alloys, 272-A
age hardening, 544-N
crystal structure, 573-N
diffusion
self-, 216-N
interfacial, 216-N
electrical conductivity, 544-N
hardness, 573-N
liquation, 471-C
strain aging, 573-N
viscosity, 552-P
x-ray diffraction, 471-C
Aluminum-zinc-magnesium alloys
castings
structure control, 266-E
corrosion
stress, 478-R
fatigue, 454-Q
mechanical properties, 266-E
plastic deformation
slip, 454-Q
Aluminum-zinc-magnesium system
age hardening, 46-N
hardness, 46-N
Aluminum-zinc solid solutions
recovery, 26-N
recrystallization, 26-N
Aluminum-zirconium-cadmium alloys
recrystallization, 240-N
Aluminizing, 180-L, 621-L
Amalgamation, 34-C
Americium
electroplating of, 418-L

Americium, (cont.)
extraction and refining
chemical, 10-C
Ames laboratory, 481-A
Anelastic properties, 228-F, 449-M, 58-Q, 235-Q, 1156-Q, 1497-Q, 1498-Q, 78-X
effect of low temperature, 676-Q
testing equipment, 170-Q
Annealing, 36-J, 48-J, 283-M, 937-Q
bright, 60-J, 138-J
induction, 85-J
vacuum, 235-T
Annealing furnaces
controlled atmosphere, 27-J
Anodized metal
size
thickness and mass measurement, 314-S
Anodizing, 379-E, 173-L, 554-L, 753-L, 129-R
coloring, 175-L, 241-L
equipment, 647-L
patents, 190-L
radioactive tracer study, 257-L
sulphuric acid, 640-L
Antimony, 297-A
applications, 532-A
atomic structure, 454-M
condensation of metals, 450-N
corrosion, by foods, 505-R
crystal structure
imperfections, 495-M
determination, 62-S, 143-S, 371-S
diffusion, 527-N
interfacial, 534-N
diffusion in germanium, 148-N
diffusion in silicon
radioactive tracer study, 683-N
electrical and electrochemical properties, 77-P
electrical properties, 691-P
effect of impurities, 334-P
extraction and refining
chemical, 243-C
distillation, 365-C, 437-C
leaching, 365-C
hardness, 946-Q
magnetic properties, 588-P
microstructure
primary, 558-M
phase diagrams, 471-M
plastic deformation
anisotropic, 946-Q
specific heat
effect of low temperature, 340-P
systems
binary, 18-M, 65-M, 294-M, 452-P
Antimony, systems, (cont.)
complex, 554-M, 569-M
ternary, 257-M, 315-M, 492-M, 559-M, 669-M
thermal expansion, 49-P
thin films
electrical and electrochemical properties, 65-M
Antimony-aluminum-gallium system, 103-M
Antimony-bismuth alloys
physical properties
density, 553-P
Antimony-bismuth-indium system, 74-M
Antimony-cadmium alloys
electrical conductivity, 669-P
superlattice formation, 669-P
viscosity, 669-P
Antimony-lead-oxygen system, 113-C
Antimony sulphide
atomic structure, 140-N
Antimony-tin alloys
electrical conductivity, 669-P
superlattice formation, 669-P
viscosity, 669-P
Antimony-zinc alloys
electrical conductivity, 452-P
Arc cutting, 52-G, 93-G, 116-G, 375-G, 390-G, 441-G, 89-K, 603-K, 49-W
automation, 82-K
Arc welding, 62-E, 3-K, 4-K, 9-K, 17-K, 18-K, 51-K, 57-K, 63-K, 70-K, 127-K, 161-K, 169-K, 188-K, 238-K, 414-K, 502-K, 533-K, 595-K, 603-K, 646-K, 655-K, 660-K, 719-K, 8-W, 38-W, 92-W
atomic hydrogen, 58-K
automation, 5-K, 24-K, 81-K, 82-K
coated electrode, 7-K, 68-K, 76-K, 107-K, 211-K, 235-K, 501-K, 577-K, 185-W, 271-W, 413-W
cracks, 363-K
tests, 153-K
equipment, 24-K, 81-K, 95-K, 273-K, 326-K, 329-K, 336-K, 343-K, 373-K, 570-K, 109-W
fluxes and slags, 69-K, 348-K
gas shielded, 103-A, 167-C, 8-K, 29-K, 30-K, 31-K, 47-K, 48-K, 88-K, 112-K, 148-K, 154-K, 162-K, 164-K, 170-K, 271-K, 289-K, 312-K, 322-K, 340-K, 354-K, 394-K, 409-K, 431-K, 475-K, 497-K, 605-K, 40-W, 233-W
argon, 130-K
equipment, 36-K, 291-K
heat transfer, 346-P
inclusions, 295-K
plasma, 116-G
quality control, 381-K

Arc welding, (cont.)
statistics and economics, 65-K
submerged arc, 46-K, 106-K, 137-K, 171-K, 228-K, 539-K, 556-K, 557-K, 606-K, 709-K, 93-K, 283-L, 317-L
electrodes, 141-L
equipment, 38-K, 195-K
fluxes and slags, 205-K, 462-K, 463-K, 535-K, 677-K
porosity, 400-K
weld tests, 90-K
Argon
specific heat, 12-P
Argonne National Laboratory, 248-T
Armor
arc welding
gas shielded, 330-W
brazing, 126-K
Arsenic
corrosion
by foods, 505-R
determination, 62-S, 97-S, 132-S, 371-S
diffusion in germanium
effect of radiation, 636-N
extraction and refining
chemical, 243-C, 348-C
in steel, 487-Q
microstructure
primary, 558-M
reduction by gases, 188-C
solubility in silver, 299-M
systems
binary, 18-M, 299-M
ternary, 314-M
Atmosphere analyzers, 385-D, 388-D, 56-X
Atmosphere and humidity
instrumentation, 227-W
Atomic energy, 116-W
Atomic structure, 112-M, 133-M, 144-M, 168-M, 306-M, 346-M, 447-M, 448-M, 468-M, 589-M, 335-N, 324-Q, 1134-Q
effect of irradiation, 208-M
interatomic bond, 185-M
spatial arrangement, 20-M, 185-M, 49-Q
Austenite
metallography, 91-M
retained, 43-J, 470-Q, 469-S
effect of heat treatment, 130-J
Austenite formation and decomposition, 36-J, 73-N, 83-N, 118-N, 191-N
formation, 111-N, 362-N, 675-N
Automation, 131-A, 86-W
Automobiles, 13-E, 40-E, 93-E
bodies, 29-K
corrosion, 119-R
corrosion prevention, 415-R
Automobiles, bodies, (cont.)
dip coating, 293-L
drawing
deep, 281-T
materials
aluminum alloys, 276-T
strain aging, 281-T
welding, 392-K
engines, 59-E, 330-J, 24-W, 164-W
aluminum, 127-E
aluminum castings, 134-E
corrosion
by alcohols, 620-R
electroplating on, 478-L
materials
aluminum alloys, 265-T, 271-T
wear, 450-Q, 665-Q
fatigue tests
torsion, 575-Q
materials
powder metals, 315-T
steel, 1146-Q
metal spraying on, 799-L
parts and fittings, 9-L, 109-Q, 411-S
aluminum, 108-T
arc welding
submerged arc, 600-K
case hardening, 285-J
electroplating, 407-L
electroplating on, 543-L
fatigue life, 1483-Q
finishing, 202-T
magnesium, 129-T
materials
aluminum alloys, 188-T
cast iron
nodular, 237-T
painting, 147-L
polishing
electrolytic, 429-L
spot welding, 512-K, 586-K
use of powder metal parts, 195-T
Axles and shafts, 222-E, 336-E, 413-E
castings, 197-E
fatigue properties and tests, 722-Q
fatigue resistance, 561-Q
fatigue strength, 669-Q
forging, 68-F
forging practice, 138-F
forming, 335-G
foundry practice, 371-E, 232-T
hard surfacing on, 801-L
heat treatment, 187-J
induction, 95-J
nitriding, 669-Q
structure control, 412-E

B

Bainite and bainite reaction, 67-N, 119-N, 473-N, 19-X
Barium
  contact potential, 726-P
  thermodynamic properties, 240-P
Barrel plating
  automation, 187-L
Bars and rods
  cleaning and polishing
    mechanical, 119-L
  flaw detection
    ultrasonic, 463-S
  rolling, 241-F
Bearing metals, 622-D, 9-H, 287-J, 289-J, 294-J, 402-M, 676-M, 212-N, 413-N, 476-N, 998-Q, 1188-Q, 1323-Q, 1332-Q, 1436-Q, 1527-Q, 3-T, 285-T, 294-T, 337-T, 340-T, 341-T
  aluminum alloys, 272-A
  cermets, 702-Q
  cladding, 247-L
  composition analysis, 54-S
  compression properties, 1311-Q
  mechanical properties, 441-Q
  physical properties, 441-Q
  properties and tests, 318-T
  volume and dimensional changes, 542-N
Bearings, 18-E, 241-M, 873-Q, 33-R, 3-T, 62-T, 81-T, 322-T, 323-T, 337-T
  anodizing, 294-T
  application, 279-T
  blasting, 342-L
  copper, 186-E
  corrosion, 154-R
  design, 279-T, 341-T
  friction, 1200-Q, 1422-Q
  heat treatment, 35-J, 38-J, 94-J
  inspection and control, 227-S
  lubricants and oils, 264-T
  lubrication, 71-T
  machining, 71-G
  malleable
    wear properties and tests, 1323-Q
  manufacture, 149-T
  materials, 97-T
    bronze, 310-T
    copper-lead alloys, 209-T, 269-T
  mechanical properties, 340-T
  metal spraying on, 483-L
  phosphate coating, 177-L
  pickling, 342-L
  powder metals, 5-H, 47-H
  sulphurizing, 1323-Q
  wear properties and tests, 318-T
Bend properties
  strength and ductility, 1416-Q
Bend properties and tests, 211-Q, 267-Q, 583-Q, 751-Q, 847-Q
Bend tests
  notched
    slow, 310-Q
Bending, 270-G
  equipment, 149-G
Beryllium, 26-A, 38-A, 58-A, 99-A, 165-A, 176-A, 234-A, 241-A, 242-A, 257-A, 285-A, 319-A, 320-A, 332-A, 338-A, 349-A, 362-A, 378-A, 380-A, 382-A, 398-A, 399-A, 490-A, 508-A, 299-T, 317-T
  adhesive joining
    metal-to-metal, 592-K, 594-K
  applications, 48-A, 119-A, 358-A, 506-A, 570-A
  arc welding
    gas shielded, 669-K
  bend properties
    strength and ductility, 1060-Q
  braze welding, 669-K
  composition analysis, 207-S
  corrosion
    by molten metals, 702-R
  creep strength, 231-Q
  crystal structure, 1130-Q
    texture and preferred orientation, 608-M, 609-M, 646-M
  diffusion, 523-N, 268-N
    interfacial, 581-N
    self-,
      radioactive tracer study, 263-N
  ductility, 464-Q, 646-M
    effect of grain size, 336-Q, 425-Q
    effect of orientation, 425-Q
  elastic properties
    Poisson's ratio, 711-Q
  electron emission, 636-P
  extraction and refining, 3-C, 337-C
    distillation, 467-C
    electron beam melting, 267-C
    leaching, 321-C
    melting and casting, 322-C
    separation, 254-C
  extrusion, 188-F, 243-F
  fatigue
    thermal, 179-Q
  forging, 252-F
  forming, 176-A, 400-G
  foundry practice, 378-A
  fracture, 1317-Q
    brittle, 1523-Q
  friction
    effect of pressure, 565-Q

Beryllium, (cont.)
gases in metals, 523-N
grain size, 425-Q
hardness, 1060-Q
health and safety, 152-A, 296-A, 538-A
in magnesium alloys, 228-R
intermetallic compounds
crystal structure, 653-M
joining, 366-K, 653-K
machining, 245-A
machining and forming, 152-G
mechanical properties, 319-A, 378-A, 570-A, 153-H, 608-M, 1130-Q, 1523-Q
mineral resources, 480-A
oxidation, 337-C
physical properties, 570-A
density, 501-P, 1060-Q
polarographic analysis, 93-S
powder metallurgy, 319-A, 378-A, 152-G, 17-H, 27-H, 59-H, 94-H, 106-H
radiochemical analysis, 208-S
radiological safety, 416-A, 455-A
safety, 103-A, 243-A, 244-A, 245-A
single crystals
oxidation
effect of high temperature, 226-R
solid solutions
formation, 513-N
solubility in magnesium, 700-R
systems
binary, 313-M
tensile properties, 336-Q, 1130-Q, 1521-Q
thermal properties, 529-P
transformations
allotropic, 496-N
use in nuclear reactors, 464-Q, 12-T, 111-T, 183-T, 234-T
volume and dimensional changes
effect of radiation, 401-P
weldability, 193-K
welding, 366-K, 643-K
welding and joining, 152-G, 464-Q
zone melting, 265-C
Beryllium alloys
cladding, 729-L
mechanical properties, 42-Q
mosaic structure, 222-M
precipitation, 222-M
tensile properties, 924-Q
ultrasonic welding, 360-K
Beryllium carbide
corrosion
atmospheric, 350-R
Beryllium cermets, 84-H
Beryllium copper alloys
Beryllium copper alloys, (cont.)
adhesive joining
metal-to-metal, 594-K
electroplating on, 460-L
Beryllium extrusions
ductility, 1521-Q
Beryllium ingots
sawing, 208-F
Beryllium-iron alloys
eutectoid reactions, 98-N
Beryllium-nickel alloys
eutectoid reactions, 98-N
Beryllium ores
sources, 12-T
Beryllium oxide, 64-H
crystal structure, 226-R
Beryllium plate, 59-H
Beryllium powder
mill practice
canning and sheathing, 124-H
mixing and blending, 167-H
molding and compacting, 124-H
hot pressing, 175-H
production, 176-A, 54-H, 120-H, 126-H
Beryllium powder compacts
infiltration
vacuum, 107-H
sintering, 64-H, 92-H, 153-H, 167-H
vacuum, 107-H, 126-H
Beryllium powder metal parts
ductility, 1521-Q
Beryllium rod
mechanical properties, 54-H
Beryllium sheet, 59-H
mechanical properties, 92-H
strain aging, 635-N
tensile properties and tests
effect of composition, 144-Q
Bessemer steel
heat treatment
heating and cooling, 182-J
ingot casting
degassing, 174-D
mechanical properties, 244-Q, 978-Q
rolling, 50-F
spectrographic analysis, 41-S, 420-S
testing equipment, 435-S, 436-S
tensile properties, 182-J
Billets
mill practice
grinding, 195-F
scarfing, 195-F
Bismuth
atomic structure, 454-M
colorimetric determination, 130-S
compression properties, 129-Q
condensation of metals, 450-N

Bismuth, (cont.)
corrosion, 212-T
crystal structure
dislocations, 205-M
determination, 30-S, 143-S
diffusion in copper, 308-N
diffusion in silicon, 94-N, 192-P
electrical and electrochemical properties, 77-P
electrical properties, 691-P
effect of impurities, 334-P
hall effect, 38-P
hardness, 946-Q
intermetallic compounds, 168-N
magnetic properties
effect of low temperature, 689-P
microstructure
primary, 558-M
nuclear properties, 276-P
phase diagrams, 189-N
plastic deformation
anisotropic, 946-Q
reaction rates, 710-P
single crystals
electrical and electrochemical properties, 32-P
specific heat, 62-P, 274-P
systems
binary, 568-M, 594-M, 599-M, 9-P, 63-P, 64-P, 274-P
complex, 574-M
ternary, 257-M
thermal analysis, 710-P
viscosity, 663-P
x-ray diffraction, 659-M
Bismuth alloys
composition analysis, 1230-Q
foundry practice
molding, 542-E
hardness and hardness tests, 1230-Q
Bismuth-antimony alloys
electrical conductivity, 655-P, 711-P
hall effect, 655-P
Bismuth-cadmium alloys
eutectics
formation, 599-M
transformations
diffusionless, 599-M
Bismuth-cesium intermetallic compounds
thermodynamic properties, 64-P
Bismuth-indium alloys
thermodynamic properties, 9-P
Bismuth-lead alloys
vapor deposition coating of, 680-L
Bismuth powder metallurgy, 183-P
Bismuth-rubidium intermetallic compounds
thermodynamic properties, 63-P
Bismuth telluride
electrical and electrochemical properties, 20-P
magnetic properties, 20-P
single crystals, electrical and electrochemical properties, 19-P
thermal properties, 20-P
crystal structure
texture and preferred orientation, 1-M
Bismuth-tellurium alloys
electrical conductivity, 232-P, 233-P
electrical properties, 232-P
magnetic properties, 233-P
Bismuth-tellurium intermetallic compounds, 32-P
Bismuth-tellurium-selenium alloys
solidification, 574-M
Bismuth-tin alloys
crystal structures, 714-M
liquid-liquid reactions, 567-M
phase diagrams, 567-M
thermodynamic properties, 87-P
viscosity, 171-P
Bismuth-uranium system, 184-M
Bituminous coating, 96-L, 318-L
Blanking, 70-G
Blast furnace practice, 72-B, 2-D, 4-D, 14-D, 27-D, 35-D, 39-D, 51-D, 64-D, 68-D, 79-D, 114-D, 119-D, 122-D, 149-D, 152-D, 170-D, 202-D, 215-D, 220-D, 222-D, 242-D, 259-D, 273-D, 289-D, 303-D, 330-D, 332-D, 349-D, 350-D, 366-D, 387-D, 398-D, 420-D, 425-D, 469-D, 475-D, 502-D, 544-D, 552-D, 634-D, 662-D, 179-W, 319-W, 331-W, 357-W
automation, 143-D, 331-D, 410-D, 651-D
blast control, 488-D, 597-D
charging, 155-A, 377-A, 60-B, 74-B, 82-B, 112-B, 76-D, 80-D, 154-D, 155-D, 161-D, 164-D, 169-D, 207-D, 212-D, 226-D, 229-D, 243-D, 275-D, 276-D, 290-D, 292-D, 313-D, 337-D, 367-D, 407-D, 411-D, 423-D, 445-D, 460-D, 470-D, 574-D, 576-D, 654-D, 162-W
automation, 266-D, 277-D, 412-D
radioactive tracer study, 583-D
combustion, 274-D
cooling, 223-D
effect of pressure, 154-D, 209-D
enriched blast, 139-D, 159-D, 212-D, 260-D, 272-D, 290-D, 313-D, 374-D
fluxes and slags, 333-D, 381-D, 494-D, 510-D, 537-D, 612-D
history, 300-A, 662-D
instrumentation, 165-D

Blast furnace practice, (cont.)
nonferrous, 287-C
pressure control, 298-D, 597-D, 610-D, 468-S
radioactive tracer study, 408-D, 632-D
research, 395-D
Soviet Union, 127-D
temperature measurement, 487-D
Blast furnaces, 35-D, 544-D, 654-D, 35-W, 61-W, 168-W, 179-W, 319-W, 331-W, 357-W, 96-X
automation, 4-D
carbon linings, 208-W
design, 14-D, 79-D, 260-D, 425-D, 273-W
equipment, 162-W
low shaft, 135-D, 229-D, 293-D, 533-D, 220-D, 279-D, 464-D, 368-W
design, 278-D
refractories, 161-W
refractory linings, 335-W
Blasting, 12-L, 217-L, 284-L, 315-L, 628-L, 300-W
grit, 145-L
Blasting machines, 89-L
Boilers
arc welding, 313-T
cathodic protection, 265-R
condenser tubes, 210-K
corrosion
by sulphur compounds, 731-R
chemical
inorganic, 765-R
materials
alloy steel, 307-T
carbon steel, 307-T
oxidation, 313-T
scaling, 595-R
stress rupture properties and tests, 313-T
welding, 98-K, 210-K
Bolts
creep, 261-T
fatigue strength, 261-T
fracture, 195-Q
heat treatment
induction, 150-W
impact strength, 261-T
Bomb components, 258-E
Bonded assemblies
aluminum, 290-L
brazing, 130-H
tensile properties and tests, 412-K
Bonding
ceramic-to-metal, 40-K, 66-K, 189-K, 441-K
glass-to-metal, 189-K, 220-K, 441-K
Bonding, (cont.)
metal-to-nonmetal, 86-K
plastic-to-metal, 274-K, 559-K, 662-K
effect of high temperature, 174-K
Boride cermets, 49-H
Borides
magnetic properties, 170-P
Boring and broaching, 99-G
Boron
colorimetric determination, 335-S
in steel, 415-S
crystal structure
dislocations
effect of radiation, 360-M
imperfections
effect of radiation, 360-M
determination, 24-S, 176-S
diffusion, 43-N, 72-N
diffusion coating of, 578-L
effect of irradiation, 193-T
extraction and refining
vacuum, 393-C
in stainless steel, 527-K
isotope separation, 37-C
nodulizing agents, 256-E
spectrographic determination, 119-S, 373-S
systems
binary, 393-C, 207-M, 384-M, 423-M, 549-M, 560-M, 667-M
ternary, 113-M, 556-M, 666-M, 677-M
Boron alloys
hardness
hot, 384-M
microstructure
primary, 384-M
volume and dimensional changes
effect of radiation, 402-P
Boron carbides, 64-H
sintering, 45-H
Boron-carbon system, 106-M
Boron compounds
extraction and refining
electron beam melting, 267-C
Boron stainless steel
mechanical properties
effect of radiation, 678-Q
Boron steel, 308-A, 194-T
heat treatment, 308-A
mechanical properties, 308-A, 309-A
effect of radiation, 688-Q
microstructure
primary
effect of radiation, 688-Q
spectrographic analysis, 308-A
transformations, 308-A
tubemaking, 88-F

Boron steel, (cont.)
use in control rods, 309-A
wear resistance, 374-Q
Brass
annealing, 482-M, 1050-Q
atomic structure, 49-M
blanking, 27-G, 269-W
bonding
plastic-to-metal, 163-K
cathodic protection, 423-R
chemical conversion coating, 365-L
cladding, 729-L
cleaning and polishing
chemical, 365-L, 649-L, 224-L
colorimetric analysis, 59-S, 378-S
composition analysis, 59-S, 236-S
condensation of metals, 528-N
continuous casting, 158-C
corrosion, 496-A, 134-R
by inorganic acids, 269-R
by organic acids, 349-R
by waters
sea, 423-R, 704-R
chemical
inorganic, 576-R, 603-R, 704-R
organic, 520-R
concentration cell, 435-R
galvanic, 753-R
inhibition, 432-R, 713-R
inorganic, 217-R
intergranular, 749-R
stress, 496-A, 75-R, 432-R, 639-R, 713-R, 795-R
corrosion prevention, 376-R
crystal structure, 509-M
dislocations, 49-M, 216-M, 341-M, 388-M, 245-N
imperfections, 280-M
damping properties, 1363-Q
dendritic growth, 315-N
determination, 190-S
dezincification, 20-R, 435-R, 794-R
die casting, 179-E, 387-E
diffusion, 68-N, 528-N
drawing
deep, 37-G, 391-G
drilling and reaming, 118-G
ductility, 496-A
elastic properties
effect of aging, 1144-Q
electrical conductivity, 320-P
effect of low temperature, 388-M
electron microscopy, 341-M
electroplating, 222-L
baths, 675-L
electroplating of, 497-L, 764-L, 824-L
control, 534-L

Brass, (cont.)
electroplating on, 649-L, 665-L, 766-L
evaporation of metals, 528-N
explosive forming, 386-G
extrusion
impact and cold, 432-G
fatigue, 342-Q
fatigue strength
effect of peening, 627-Q
fatigue tests
torsion, 765-Q
forging practice, 157-F
forming, 380-G
foundry practice, 168-E, 432-E
degassing, 447-E
fluidity and castability, 502-E
melting, 261-E, 1335-Q
molding, 542-E
rigging, 337-E
solidification phenomena, 120-E
fracture, 447-E, 1335-Q, 749-R
gas welding
oxy-acetylene, 404-K
grain growth, 489-N, 704-R
grain size, 393-M
statistical analysis, 509-M
hardness, 280-M, 1050-Q, 704-R
effect of aging, 1144-Q
micro-, 945-Q
impact properties and tests, 1363-Q
lacquering, 376-R
machinability, 387-G, 421-G
machining, 78-G, 79-G
mechanical, 389-G
stress analysis, 385-G
macrostructure, 1335-Q
mechanical properties, 441-Q, 521-Q
metal spraying of, 507-L, 508-L
metallography
etching, 183-M
polishing, 341-M
specimen preparation, 641-M
microstructure
primary, 482-M, 315-N
milling and hobbing, 222-G
oxidation, 704-R
painting, 224-L, 365-L
piercing, 269-W
plastic deformation, 387-G, 388-M, 640-M, 641-M
lines and bands, 765-Q, 1226-Q
effect of heat treatment, 183-M
slip, 216-M, 940-Q
polishing
mechanical, 530-L
precipitation hardening
aging, 125-J

Brass, (cont.)
presswork, 206-G, 369-G
quenching, 280-M
recrystallization, 489-N
effect of grain size, 482-M
rolling
cold, 482-M
shear strength, 1363-Q
silicon, 320-P
sonic properties, 1504-Q
strain aging, 245-N
stress analysis, 11-G
superlattice formation, 49-M, 239-N
tensile properties, 280-M, 614-M, 1226-Q
tensile properties and tests, 572-Q
thermal conductivity
effect of low temperature, 388-M
tubing and pipe
soldering, 165-K
wear, 1106-Q, 1388-Q
wear properties and tests, 1077-Q
wiredrawing, 278-F
x-ray diffraction, 640-M
yield point mechanism, 933-Q
Brass alloys
x-ray microscopy
effect of deformation, 159-M
Brass bars and rods
annealing, 326-J
Brass castings
quality control, 459-E
solidification phenomena, 342-E
Brass ingots
heat treatment
induction, 316-J
Brass-iron alloys
magnetic properties, 154-J
Brass powder compacts
sintering, 163-M
Brass powder metal parts, 41-H
Brass products and parts
fatigue life, 302-T
Brass scrap
processing, 261-E
Brass stampings
heat treatment
induction, 369-G
Brass strip
thermal properties, 376-P
Brazed joints
electroplating on, 649-L
stress rupture properties and tests, 166-Q
Brazing, 138-J, 64-K, 287-K, 337-K, 448-K, 495-K, 573-K, 589-K, 601-K, 659-K
Brazing, (cont.)
dip, 51-J, 92-K, 693-K
effect of temperature, 78-K
fluxes and slags, 325-K
induction, 615-K, 140-W
induction and resistance heaters, 140-W, 292-W
torch, 136-K
ultrasonic, 421-K
vacuum, 692-K, 235-T
Brazing and soldering materials, 411-K, 504-L, 1348-Q
nickel alloys, 185-K
Brazing and soldering metals, 182-K, 243-K, 249-K, 287-K, 334-K, 359-K, 396-K, 405-K, 407-K, 428-K, 482-K, 495-K, 573-K, 581-K, 613-K, 614-M, 639-Q, 285-T, 174-W, 267-W, 403-W
aluminum, 206-K
Brazing furnaces, 332-K, 684-K, 64-W
design, 226-W, 302-W
Bridges, 89-T
aluminum, 131-T
arc welding, 678-K
cathodic protection, 542-R
corrosion
prevention, 542-R
design, 534-Q
ductility, 1428-Q
gas welding, 514-K
steel
welded, 385-Q
stresses, 534-Q, 1428-Q
stud welding, 158-K
welded
mechanical properties, 385-Q
welding, 131-T
British Steel Castings Research Association, 485-A, 546-A
research, 230-A
Brittle transition temperature, 1017-Q
Bronze, 266-A
age hardening, 653-N
aluminum, 320-P
bright nickel plating on, 216-L
compression properties, 557-A
corrosion, 128-R, 809-R, 810-R
chemical
inorganic, 603-R, 784-R
stress, 534-R
forgings, 557-A
foundry practice
melting, 254-E
degassing, 448-E
rigging, 410-E
gases in, 448-E
hardness, 557-A

Bronze, aluminum, (cont.)
mechanical properties, 312-A
oxidation, 254-E
physical properties, 312-A
transformations, 534-M
use in forming dies, 252-W
beryllium, 400-A
applications, 449-A
grain growth, 365-A
heat treatment, 365-A
mechanical properties, 365-A, 449-A, 521-Q
physical properties, 449-A
casting practice, 245-E
colorimetric analysis, 59-S
composition analysis, 59-S
continuous casting, 158-C
copper
applications, 352-A
mechanical properties, 352-A
physical properties, 352-A
corrosion
by waters
sea, 537-A, 525-R
steam, 219-R
chemical
inorganic, 576-R
organic, 520-R
concentration cell, 435-R
stress, 219-R
crystal structure, 537-A
dezincification, 435-R
elastic properties
effect of low temperature, 1274-Q
electrical conductivity, 320-P
electroplating of, 497-L, 764-L
extraction and refining
melting and casting, 32-C
foundry practice, 87-E, 168-E
chilling, 394-E
molding, 473-E
porosity, 394-E
rigging, 337-E
risering, 394-E, 473-E
hard surfacing of, 657-L
hardness
effect of grain size, 799-Q
machinability, 421-G
machining
mechanical, 236-G
manganese
cathodic protection, 423-R
mechanical properties, 15-P, 441-Q, 310-T
effect of composition, 912-Q
effect of heat treatment, 1527-Q
microstructure
Bronze, microstructure, (cont.)
primary, 374-M
effect of composition, 912-Q
nickel, 266-A, 273-A, 320-P
effect of high temperature, 297-E
grain growth, 241-N
precipitation, 241-N
nickel-aluminum
properties, 245-E
nickel-tin
precipitation hardening
aging, 1457-Q
solution heat treatment, 1457-Q
tensile properties, 1457-Q
physical properties, 15-P
effect of heat treatment, 1527-Q
porosity, 3-E
recrystallization, 364-N, 799-Q
shell mold casting, 38-E
silicon, 320-P
solidification phenomena, 394-E
standards and specifications, 79-S
tensile properties
effect of low temperature, 1274-Q
tin, 320-P
castings
mechanical properties, 467-Q
recrystallization, 229-N
use in bearings, 310-T
use in ships
propulsion equipment, 247-T
wear, 1106-Q
wear properties and tests, 318-T
Bronze alloys
bending, 109-G
colorimetric analysis, 300-S
machining
mechanical, 109-G
Bronze bearings
design, 282-T
lubricants and oils, 282-T
Bronze castings
solidification phenomena, 3-E, 342-E
porosity, 39-E
Bronze centrifugal castings
flaw detection
ultrasonic, 256-S
Bronze powder
properties, 98-H
Bronze powder compacts
molding and compacting, 98-H
sintering, 90-H, 98-H
Bronze sheet
defects
surface, 1071-Q
fracture
crack propagation, 1071-Q

Bronze strip, 9-A
defects
surface, 1071-Q
fracture
crack propagation, 1071-Q
mechanical properties, 961-Q
Brushes and buffs, 20-W
design, 616-L
Brushing, 20-W
Buffing, 616-L, 74-W
automation, 198-L
Buildings
materials, 115-T
ceramic coated steel, 293-T, 298-T
steel sheet, 292-T
nonferrous metal, 136-T
steel
design, 103-T
Bulging, 154-G
Butt welding, 223-K

C

Cable
electrical, 72-T, 79-T, 102-R
aluminum
tensile properties and tests, 112-T
bend properties
strength and ductility, 286-T
bend properties and tests, 343-T
cathodic protection, 105-R, 565-R, 635-R, 674-R
corrosion, 104-R, 105-R, 155-R, 663-R, 664-R
atmospheric, 286-T, 343-T
by soils, 635-R
by waters
brackish, 674-R
ductility, 343-T
electrical conductivity, 343-T
tensile properties, 286-T, 343-T
welding, 333-T
Cadmium, 328-A
amalgamation, 191-C
chromate coating on, 697-L
consumption and production, 28-A
corrosion prevention, 697-L
crystal structure
dislocations, 1540-Q
imperfections, 309-M
texture and preferred orientation, 9-M
determination, 16-S, 30-S, 143-S, 190-S
diffusion
interfacial, 534-N
self-, 167-N
energy of activation, 578-N
Cadmium, (cont.)
drilling and reaming, 118-G
electrical conductivity, 226-P, 437-P
electrochemical properties, 366-P
electroplating, 79-L, 159-L, 222-L, 268-L, 355-L, 344-R, 4-W, 73-W
automation, 237-L
baths, 202-L, 310-L, 713-L
properties and tests, 213-L, 254-L
electroplating of, 2-L, 413-L, 457-L, 458-L, 746-L, 751-L, 797-L, 476-R
control, 534-L
electroplating on, 504-L
electrowinning, 445-C
extraction and refining, 407-C
distillation, 140-B, 444-C
electrolytic, 191-C
leaching, 342-C
precipitation, 91-C, 115-C, 333-C
fatigue life, 43-Q
fatigue strength
effect of low temperature, 854-Q
grain growth
energy of activation, 578-N
metal spraying of, 789-L
passivation, 522-R
physical properties
density, 452-M
plastic deformation, 560-Q
recovery
after deformation, 934-Q
safety, 103-A
shear properties and tests
ultrasonic, 560-Q
single crystals
cleavage, 1520-Q
growth, 18-N
plastic deformation, 1540-Q
specific heat
effect of low temperature, 341-P
systems
binary, 219-M, 269-M, 452-M, 460-M, 599-M, 554-P
ternary, 219-M, 257-M, 319-M
thermodynamic properties, 452-M
vapor-deposition coating of, 481-L
vapor deposition of, 660-L
viscosity, 437-P
volume and dimensional changes, 452-M
Cadmium alloys
composition analysis, 1230-Q
crystal structure
texture and preferred orientation, 528-M
electron diffraction, 528-M
hardness and hardness tests, 1230-Q
magnetic properties

Cadmium alloys, magnetic properties, (cont.)
nuclear magnetic resonance, 428-P
mechanical properties, 441-Q
nuclear properties
resonance, 428-P
oxidation, 528-M
Cadmium-antimony alloys
crystallization, 492-N
microstructure
primary, 492-N
vapor pressure, 492-N
Cadmium-copper alloys
electrical conductivity, 669-P
superlattice formation, 669-P
viscosity, 669-P
Cadmium electroplate
corrosion
atmospheric, 463-R
on alloy steel, 358-Q
stress concentration, 657-Q
Cadmium-indium-silver alloys
volume and dimensional changes
effect of radiation, 402-P
Cadmium industry
statistics and economics, 219-A
Cadmium-molybdenum steel
fatigue properties and tests, 708-Q
Cadmium-sodium alloys
thermodynamic properties, 601-P
Cadmium sulfide
electron emission, 229-P
optical properties, 94-P
absorption and transmission, 220-P
Cadmium-sulphur alloys
single crystals
growth, 100-N
Cadmium-tin alloys
vapor deposition coating of, 680-L
Cadmium-zinc systems, 141-M
Calcium
crystal structure
effect of impurities, 598-N
determination, 98-S, 173-S
extraction and refining
distillation
vacuum, 84-C
in cast iron, 187-E
solubility in titanium, 587-M
spectrographic determination, 70-S, 285-S
thermodynamic properties, 240-P
Calcium-magnesium intermetallic compounds, 29-P
Calorimeters, 89-P
Canadian Department of Mines and Technical Surveys, 299-A
Cans
aluminum, 54-T
corrosion, 802-R
Carbides
atomic structure, 164-M
cemented, 531-A, 340-G, 348-G, 73-H, 296-T
applications, 548-A
bend properties
strength and ductility, 91-Q
compression properties, 91-Q
diffusion bonding, 609-K, 620-K
fracture, 1062-Q
grinding, 95-G
hardness properties and tests, 1194-Q
mechanical properties, 1048-Q
plasma arc process, 421-L
plastic deformation, 77-Q, 1062-Q
sintering, 148-H
slip lines and bands, 1062-Q
wear properties and tests, 5-G, 41-G
composition analysis, 164-M
electroplating, 222-L
in alloy steel, 572-N
in electroplate, 159-L
in stainless steel, 474-N
in steel, 240-M, 329-M, 402-M, 685-M, 141-N, 236-N, 251-N, 255-N, 275-N, 413-N, 477-N, 536-N, 587-N, 621-N, 627-N, 642-N, 669-N, 370-R, 502-R, 605-R
effect of heat treatment, 380-N
in transformer steel, 563-N
magnetic properties, 170-P
powder production, 121-H
wear properties and tests, 1341-Q
Carbo-nitriding, 176-J, 177-J, 193-J, 199-J
Carbon
activity coefficient in iron, 581-P, 617-P
bibliographies, 216-A
corrosion, 201-R
galvanic, 322-R
determination, 32-S, 51-S, 193-S, 206-S, 414-S, 418-S, 443-S, 24-X, 66-X
diffusion, 43-N, 72-N, 79-N, 178-N
diffusion in copper, 325-N
diffusion in ferritic stainless steel, 326-N
diffusion in iron, 250-N, 454-N
diffusion in nickel alloys, 325-N
diffusion in stainless steel, 320-N, 325-N, 432-N, 458-N, 1461-Q
diffusion of, 267-N, 708-P
electron emission, 217-P
solubility, 81-P
solubility in iron, 274-N, 357-P

Carbon, (cont.)
solubility in iron-manganese-silicon alloys, 404-P
spectrographic determination, 349-S
testing equipment, 429-S
systems
binary, 192-M
complex, 628-M
ternary, 194-M, 246-M, 401-M
transfer, 178-N
Carbon electrodes
oxidation, 188-R
Carbon steel, 8-A, 515-A
aluminizing, 631-L
anelastic properties, 1380-Q
effect of heat treatment, 1461-Q
annealing, 68-J, 107-J, 235-J, 299-J, 310-N, 345-N, 1078-Q
applications
chemical processing equipment, 80-T
arc welding, 160-K, 379-K, 399-K, 423-K, 617-K, 632-L
coated electrode, 14-K, 318-K, 391-K, 694-Q, 695-Q
cracks, 498-K
gas shielded, 194-K, 240-K, 511-K, 242-K, 481-K
submerged arc, 712-K
austenite
retained, 345-N
austenite decomposition, 430-N
austenite formation, 589-N
austenite formation and decomposition, 247-N, 434-N
formation, 327-N
austenitizing, 315-K
bainite and bainite reaction, 87-N
bend properties and strength, 786-L
bend properties and tests, 53-Q, 1302-Q
brittle transition temperature, 98-Q, 950-Q
buffing, 700-L
carburizing, 160-J
cast
standards and specifications, 350-S
cathodic protection, 423-R
cementite and cementite reaction, 446-N
centrifugal casting, 511-E
ceramic mold casting, 391-E
chemical conversion coating, 365-L
chromizing, 814-L
induction, 577-L
cladding, 441-L
cladding on, 447-L
cleaning and polishing
chemical, 100-F, 224-L, 365-L
electrochemical, 48-L
Carbon steel, cleaning and polishing, (cont.)
mechanical, 813-L
cold drawing, 166-G
composition analysis
inclusions, 129-S
compression properties, 819-Q
converter processes
fluxes and slags, 399-D
corrosion, 351-L, 432-L, 120-R, 132-R
atmospheric, 54-R, 426-R, 446-R, 488-R
by crude petroleum
effect of temperature, 60-R
by inorganic acids, 113-R, 293-R, 513-R
by sulphur, 366-R
by sulphur compounds, 426-R, 611-R
by waters, 54-R, 488-R
pure, 364-R, 381-R
sea, 423-R, 538-R
steam
effect of high temperature, 369-R
chemical
inorganic, 366-R, 706-R, 716-R, 407-W
organic, 631-L
effect of radiation, 751-R
fatigue, 754-R, 783-R
effect of stress, 373-R
galvanic, 322-R
inhibition, 260-R, 366-R, 567-R, 666-R, 718-R
test methods, 717-R
intergranular, 206-N
stress, 54-R, 488-R, 706-R, 708-R
corrosion tests
effect of high temperature, 364-R
immersion
total, 538-R
creep, 351-E, 40-Q, 225-Q
strength, 999-Q
creep tests
stress-relaxation, 999-Q, 1431-Q
crystal structure, 344-G, 297-R
dislocations, 299-J, 600-M
imperfections, 316-Q
damping properties and tests, 1267-Q
defects
surface, 1480-Q
dendritic growth, 316-N
diffusion
hydrogen, 754-R
diffusion coating
induction, 577-L
diffusion coating on, 578-L
diffusion of chromium, 341-N
dilatometry, 591-N
ductility, 299-J, 625-Q, 273-T

Carbon steel, (cont.)
elastic properties, 1016-Q
Poisson's ratio, 328-Q
shear modulus, 1380-Q
Young's modulus, 273-T
elastic properties and tests, 263-T
electric arc steelmaking
fluxes and slags, 399-D
electron microscopy, 676-M, 1537-Q
electroplating on, 671-L, 786-L
electroslag welding, 244-K
equilibrium constant, 668-P
explosive forming, 196-G, 386-G, 446-G
extrusion
impact and cold, 411-G
fatigue, 218-Q
fatigue life, 217-Q, 1332-Q
fatigue properties and tests, 144-J, 273-T
fatigue strength, 595-Q, 618-Q, 1310-Q
effect of heat treatment, 247-Q
fatigue tests
rotating beam, 188-Q
ferrite and ferrite reaction, 293-N
flakes, 430-N
flame cutting, 265-G, 618-Q
flash welding, 544-K
flaw detection, 411-S
ultrasonic, 716-K
forge welding, 441-L
forgeability, 901-Q
forging practice, 212-F, 411-S, 259-T
formability, 666-Q
forming
cold, 215-G
foundry practice, 341-E, 351-E, 430-E
molding, 391-E
fracture, 236-K, 842-Q, 880-Q, 986-Q, 1070-Q, 1480-Q
brittle, 15-J, 367-K, 12-Q, 379-Q, 434-Q, 594-Q, 993-Q, 1051-Q, 1469-Q, 754-R
effect of heat treatment, 637-Q
effect of stress, 247-N
crack propagation, 858-Q, 886-Q, 1096-Q
effect of composition, 32-Q
effect of radiation, 656-Q
micro-crack formation, 1537-Q
friction, 649-Q
galvanized, 695-Q
graphitization, 616-R
grinding
surface
lubricants and oils, 269-G
hard surfacing, 632-L
hard surfacing of, 381-L

Carbon steel, (cont.)
hardening
testing equipment, 439-G
hardness, 299-J, 1332-Q
micro-, 945-Q
hardness and hardness tests, 1078-Q
hardness tests
spherical indenter, 93-Q
heading
cold, 411-G
heat treatment, 247-F, 96-J, 259-T
heating and cooling, 15-J
induction, 136-J, 204-J, 1309-Q
quenching media, 183-J
high
austenite formation, 591-N
bainite and bainite reaction, 388-N, 389-N, 390-N, 681-N
corrosion
alkaline
inorganic, 601-R
damping properties, 1243-Q
diffusion of hydrogen, 391-N
fractography
effect of heat treatment, 273-M
fracture
brittle, 779-Q
grain boundaries, 442-M
graphitization, 640-N, 641-N, 658-N
magnetic properties, 703-P
hysteresis loop, 605-P
martensite and martensite reaction, 681-N
mechanical properties
effect of deformation, 921-Q
microstructure
primary, 442-M
normalizing, 291-T
pearlite and pearlite reaction, 442-M, 681-N
quenching, 286-J
transformations
isothermal
effect of stress, 246-N
stress induced, 681-N
wiredrawing, 270-F
hydrostatic tests, 1195-Q
impact properties and tests, 34-Q, 98-Q, 819-Q, 839-Q, 842-Q
effect of radiation, 656-Q
impact strength, 993-Q
inclusions, 512-D, 529-D
investment casting, 243-E
lacquering, 759-L
low
age hardening, 318-N
aluminizing, 763-L

Carbon steel, low, (cont.)
annealing, 80-J, 110-J, 115-J, 116-J, 561-N
continuous, 111-J
cost, 112-J
arc welding, 300-K, 302-K
coated electrode, 429-Q
bars and rods
roll forming, 136-G
welding, 356-K
bend properties and tests, 919-Q, 1358-Q
blasting, 638-R
brittle transition temperature
effect of radiation, 802-Q, 1514-Q
carburizing, 94-J, 234-J, 273-J, 246-N
ceramic coating on, 642-L
chromizing, 646-L
corrosion
atmospheric, 466-R
chemical
inorganic, 536-R, 537-R
inhibition, 536-R, 537-R, 733-R
corrosion by waters, 340-R
brines, 537-R
fresh, 733-R
corrosion fatigue, 610-R
corrosion prevention, 638-R
corrosion tests, 536-R
cracks, 1305-Q
creep, 887-Q, 917-Q, 918-Q
effect of temperature, 96-Q
rate, 1193-Q
strength, 1193-Q
crystal structure, 436-W
dislocation
effect of aging, 171-M
effect of impurities, 171-M
texture and preferred orientation, 237-M
drawing, 135-G
electro-slag welding, 468-K
electroplating on, 633-L
electroslag welding, 300-K
fatigue strength, 528-Q, 610-R
fatigue tests
torsional, 610-R
flame cutting, 429-Q
fluidity and castability, 544-E
formability, 242-F
fracture, 1325-Q
brittle, 74-Q, 1252-Q, 1358-Q
crack propagation, 1133-Q
effect of radiation, 802-Q
gases in, 561-N
grain size, 100-F, 115-J
hardness, 273-J, 118-N, 565-N

Carbon steel, low, (cont.)
hardness and hardness tests
effect of stress, 919-Q
hardness tests
spherical indenter, 790-Q, 1530-Q
heat treatment
controlled atmosphere, 116-J
induction, 273-J
impact properties and tests, 1133-Q, 1358-Q
effect of low temperature, 571-Q
impact strength, 1514-Q
impact tests
shock, 805-Q
machining
mechanical, 389-G
stress analysis, 385-G
mechanical properties, 111-J, 763-L, 1305-Q
effect of heat treatment, 875-Q
effect of strain, 1345-Q
magnetic properties
hysteresis loop
effect of composition, 299-P
microstructure, 713-M, 118-N
nitriding, 73-J
oxidation, 297-R
painting, 638-R
plastic deformation
heterogeneous, 1296-Q
plastic properties, 108-J
precipitation hardening
aging, 108-J
radioactivity, 309-P
recrystallization, 110-J, 438-N, 565-N
resistance welding, 362-K
rolling, 2-F, 19-F, 242-F, 118-N, 565-N, 1305-Q
design, 102-F
effect of pressure, 231-F
finish, 100-F, 125-F
sheet
ceramic coating, 368-L
electroplating, 368-L
mechanical properties, 681-Q
stresses, 440-G
stretch forming, 440-G
solidification, 684-D
spot welding, 237-K
strain aging, 108-J, 608-N
stress concentration, 528-Q
stress rupture properties and tests, 927-Q
strip
annealing, 154-F
formability, 154-F
rolling, 154-F

Carbon steel, low, (cont.)
strip (cont.)
size
thickness and mass measurement, 125-F
tensile properties and tests, 154-F
stud welding, 297-K
surface tension, 713-M
tensile properties, 1235-Q
effect of radiation, 1514-Q
tensile properties and tests, 44-Q, 1325-Q
tension impact test, 1375-Q
torsion properties, 1252-Q
transformations
stress induced, 424-Q
tubing and pipe
arc welding, 294-K
twinning
deformation, 424-Q
weldability, 362-K
weldments
fatigue, 237-K
fracture
brittle, 704-Q
hydrostatic tests, 704-Q
mechanical properties, 390-D, 294-K
welds
defects, 860-Q
fatigue tests and properties, 860-Q
wire
dip coating on, 22-L
pickling, 652-L
machinability, 317-A, 308-G, 344-G, 426-G
mechanical, 236-G, 967-Q
magnetic properties, 591-N, 1267-Q
core losses, 583-P
hysteresis loop, 511-P
martensite and martensite reaction, 206-N, 345-N
mechanical properties, 317-A, 675-D, 68-J, 378-K, 1249-Q, 1316-Q
effect of heat treatment, 846-Q
mechanical properties and tests, 880-Q
explosive, 812-Q
medium
arc welding
submerged arc
cracks, 463-K
bainite and bainite reaction, 291-N
ductility, 1366-Q
fatigue, 316-Q
fatigue life, 1143-Q
fatigue strength, 511-Q, 969-Q, 1309-Q
fracture
brittle, 510-Q, 1320-Q

Carbon steel, medium, (cont.)
grain size, 671-M, 1238-Q
impact strength, 1238-Q, 1366-Q
machinability, 387-G
magnetic properties
hysteresis loop, 605-P
martensite and martensite reaction, 603-N
mechanical properties, 301-J, 1398-Q
microstructure, 1398-Q
plastic deformation, 387-G
quenching, 301-J
sonic properties
ultrasonic, 1398-Q
tempering, 301-J
tensile properties, 1238-Q, 1366-Q
transformations
isothermal, 291-N
tubing and pipe
tensile properties, 525-K
weldability, 525-K
weldability, 485-K
weldments
fatigue properties and tests, 708-Q
fracture, 793-Q
brittle, 525-Q
mechanical properties, 485-K
stresses
residual, 525-Q
metal spraying of, 487-L, 511-L
microstructure
primary, 116-Q
nitriding, 136-J, 144-J
normalizing, 68-J, 225-J
notch sensitivity, 625-Q
nuclear properties, 283-A
openhearth practice
fluxes and slags, 399-D
oxidation, 736-R
painting, 224-L, 365-L, 369-R, 538-R
pearlite and pearlite reaction, 213-N, 310-N, 361-N
physical properties, 317-A
density, 583-P
pitting corrosion, 577-R
plastic deformation, 815-Q, 816-Q, 819-Q, 820-Q, 839-Q, 1325-Q, 1431-Q
anisotropic, 1430-Q
bauschinger effect, 1085-Q
lines and bands, 939-Q, 1001-Q, 1051-Q
plastic properties, 901-Q
polishing
electrolytic, 100-A, 584-A, 335-L, 548-L, 585-L
mechanical, 351-L, 700-L
precipitation, 445-N

Carbon steel, precipitation, (cont.)
from liquid, 225-J
projection welding, 546-K
properties, 50-F
quenching, 96-J, 213-J, 214-J, 278-J, 1078-Q
interrupted, 430-N
radioactive tracer methods
metallography, 316-N
recovery
after deformation, 1085-Q
resistance welding, 25-K, 523-K, 708-K
rolling, 50-F, 171-F, 180-F, 247-F, 666-Q, 815-Q, 816-Q
finish, 184-F
surface, 1309-Q
scaling, 523-R
seam welding, 253-K, 545-K, 549-K
equipment, 547-K
segregation, 676-M, 316-N
shell mold casting, 242-E, 503-E
solidification, 151-N
spectrographic determination, 268-S
spot welding, 545-K, 549-K
equipment, 547-K
standards and specifications, 53-Q
strain aging, 600-M, 445-N, 456-N, 1085-Q
stress relief heat treatment, 235-J
stress rupture properties and tests, 1263-Q
stresses
residual, 235-J, 367-K, 595-Q
synthetic resin coating, 369-R
synthetic resin coating on, 577-R
tempering, 26-J, 96-J, 278-J, 1001-Q
tempering reactions, 26-J
tensile properties, 278-J, 299-J, 12-Q, 47-Q, 1195-Q, 1263-Q, 1375-Q, 273-T
effect of composition, 864-Q
tensile properties and tests, 456-N, 53-Q, 625-Q, 1070-Q, 1430-Q
tension relaxation test, 864-Q
torsion properties, 1195-Q
torsion properties and tests, 380-Q, 1430-Q
transformations, 534-M
allotropic, 1263-Q
isothermal, 107-J
tubemaking
welding, 42-F
ultrasonic welding, 360-K
use in boilers, 307-T
use in chemical processing equipment, 53-Q
use in nuclear reactors, 196-T
use in oil refining equipment, 366-R

Carbon steel, (cont.)
wear, 446-N, 649-Q, 967-Q, 321-T
wear resistance, 317-Q
weld tests, 378-K, 438-K, 591-K, 716-K
weldability, 236-K, 367-K, 378-K, 708-K
welding, 572-K
cracks, 434-N
flaw detection
ultrasonic, 549-K
physics, 315-K
welding repair, 608-K
wiredrawing, 133-F, 273-T
x-ray microscopy, 10-M
yield strength, 812-Q
effect of strain, 818-Q

Carbon steel billets
flaw detection, 76-S

Carbon steel castings
applications, 287-A
arc welding, 62-K
gas shielded, 682-K
fracture, 293-N
mechanical properties, 430-E
solidification phenomena, 342-E

Carbon steel foil
rolling, 120-F

Carbon steel forgings
cracks, 265-G
fatigue strength, 109-Q

Carbon steel ingots
defects
surface, 378-D
fatigue properties and tests, 41-Q
mold practice, 378-D
pouring, 414-D
stripping, 813-L

Carbon steel plate
arc welding
gas shielded, 262-K
fracture, 423-A
tests, 1479-Q
heat treatment, 423-A
mechanical properties, 423-A

Carbon steel rope and cable
mechanical properties, 326-T

Carbon steel sand castings
ductility, 6-Q
inclusions, 6-Q

Carbon steel sections
design, 1249-Q

Carbon steel sheet
age hardening, 1053-Q
annealing, 113-J
defects
surface, 378-D
drawing
deep, 316-G

Carbon steel sheet, (cont.)
elastic properties, 183-F, 1053-Q
flame cutting, 279-G
fracture
brittle, 1080-Q
hardness, 183-F
heat treatment
controlled atmosphere, 118-J
rolling, 183-F, 1053-Q
tensile properties and tests, 1080-Q
Carbon steel strip
annealing
cyclic, 232-W
flash welding, 548-K
heat treatment
controlled atmosphere, 14-J
phosphate coating, 367-L
Carbon steel tubing and pipe
cladding, 240-L
corrosion
by inorganic acids, 454-R, 540-R
by water
steam, 616-R
fracture
crack propagation, 1420-Q
seam welding, 551-K
spot welding, 551-K
stress rupture properties and tests, 992-Q
Carbon steel weldments
brittle transition temperature, 695-Q
cracks, 438-K
fatigue strength, 468-K, 608-K
flaw detection, 591-K
fracture
brittle, 624-Q
crack propagation, 977-Q
friction, 889-Q
hardness, 695-Q
impact properties and tests, 977-Q
impact strength, 399-K, 695-Q, 1098-Q
mechanical properties, 538-K, 664-Q, 694-Q
microstructure
primary, 889-Q
plastic deformation, 977-Q
porosity, 664-Q
spectrographic analysis, 523-K
stresses
residual, 624-Q
tensile properties, 318-K, 695-Q
wear, 116-Q
wear properties and tests, 788-Q, 789-Q, 791-Q, 1531-Q, 1532-Q, 1533-Q
Carbon steel wire
arc welding, 381-K
mechanical properties, 326-T
Carbon steel wire, (cont.)
patenting, 277-F
spot welding, 277-F
thermal expansion, 722-P
wiredrawing, 277-F
Carburizing, 28-J, 49-J, 133-J, 177-J, 319-J
equipment, 191-J
Case hardening, 53-J, 64-J, 180-J, 181-J, 189-J
induction, 179-J
Sulfinuz process, 50-J, 92-J
sulphur, 50-J
waste control, 81-A
Cast iron, 45-A
alloy, 133-E
corrosion by inorganic acids, 706-Q
corrosion by organic acids, 706-Q
creep
strength, 28-Q
defects, 351-A
foundry practice, 351-A, 399-E, 706-Q, 232-T
fluidity and castability, 413-E
melting, 373-E, 374-E, 580-E
structure control, 520-E
heat treatment, 384-Q
inclusions, 373-E, 374-E, 580-E
magnetic properties, 238-P
permeability, 343-P
mechanical properties, 351-A, 374-E, 580-E, 343-P, 706-Q
oxidation, 351-A
physical chemistry
desulphurization, 644-D, 645-D
physical properties, 351-A
tensile properties, 520-E
thermal expansion, 343-P
vacuum melting, 644-D, 645-D
wear, 399-E, 384-Q, 665-Q, 1229-Q
wear resistance, 317-Q
analysis
special separation, 27-S, 454-S
applications, 431-E
arc welding, 16-K, 339-K, 644-K
coated electrodes, 229-K, 648-K
austenite formation and decomposition, 385-P, 1336-Q
austenitizing, 207-J
bend properties and tests, 527-Q
blasting, 709-L
brazing, 339-K, 641-K
carbides in, 670-N
carbo-nitriding, 195-J
carburizing
homogeneous, 238-J
case hardening, 23-J

Cast iron, (cont.)
cementite and cementite reaction, 199-N
centrifugal casting, 238-D, 226-E, 339-E, 414-E
ceramic coating, 72-L, 131-L, 199-L, 288-L
defects
surface, 707-L, 708-L
ceramic coating on, 718-L, 794-L
cleaning
electrolytic, 13-L
colorimetric analysis, 112-S, 125-S, 188-S, 304-S
composition analysis, 197-S, 414-S, 431-S, 443-S, 66-X
carbon, 24-X
testing equipment, 362-S
converter processes
bessemer
blowing, 400-D
corrosion, 413-Q, 134-R
by alcohols, 620-R
by crude petroleum, 60-R
by inorganic acids, 365-R, 788-R
by soils, 122-R, 261-R
by sulphur compounds, 465-R
by waters, 739-R
chemical
inorganic, 363-R, 425-R, 739-R
effect of composition, 425-R
inhibition, 612-R
corrosion prevention, 782-R
creep, 610-Q
crystal structure, 487-M, 584-N
imperfections, 207-J
defects
surface, 323-E, 470-E
degassing, 157-E
diffusion
magnesium, 552-N
diffusion bonding, 305-K
diffusion coating on, 232-L
dip coating, 87-L
dip coating on, 428-L, 294-T
ductility, 440-E
effect of composition, 530-Q
effect of impurities, 173-F
effect of high temperature, 413-Q
electrical conductivity, 453-P, 460-P
electrical properties, 369-P
electroplated
adherence tests, 1298-Q
electroplating on, 587-L
enameled, 131-L
eutectics
formation, 114-N, 199-N, 313-N
fatigue, 527-Q

Cast iron, (cont.)
ferrite and ferrite reaction, 262-J
flaw detection
magnetic particle, 164-S
fluidity and castability, 221-E, 584-N
forge welding, 706-K
forging practice
effect of impurities, 173-F
foundry practice, 7-A, 132-E, 144-E, 205-E, 427-E, 431-E, 559-E, 131-L, 294-T
bimetal, 193-E
centrifugal casting, 65-E
crucible
vacuum, 443-E
cupola, 299-E, 316-E, 445-E, 471-E, 271-F
fluxes and slags, 467-E
electric, 424-E, 472-E
electric induction, 419-E
fluidity and castability, 502-E
gating, 135-E, 563-E, 565-E
inserts, 72-E
melting, 86-E, 148-E, 343-E, 476-E, 510-E, 203-W, 348-W, 349-W
use of oxygen, 446-E
molding, 153-E, 164-E
molds and cores, 113-E
porosity, 395-E
pouring, 197-E, 209-E
rigging, 145-E, 198-E
structure control, 436-E, 500-E 510-E
galvanizing, 380-L
gas analysis, 424-S
gas welding, 60-K, 648-K
oxy-acetylene, 339-K
gases in, 586-N, 424-S
graphitization, 97-E, 184-E, 187-E, 14-N, 88-N, 199-N, 266-N, 486-N, 552-N, 568-N, 615-N, 670-N, 453-P
effect of impurities, 412-N
effect of temperature, 165-N
gray, 513-E, 437-Q
anodizing, 294-T
applications, 286-A
arc welding, 217-K
coated electrode, 347-K, 429-K
gas shielded, 616-K
austenite formation and decomposition, 175-N
bend properties and tests, 399-Q
castings
solidification phenomena, 42-E
cavitation corrosion, 227-R
ceramic coating, 360-L
compression properties, 1262-Q

Cast iron, gray, (cont.)
corrosion
by waters
sea, 592-R
crystal structure, 882-Q
crystallization, 911-Q
elastic properties, 1014-Q
electrical conductivity, 603-P
eutectics formation, 175-N
fatigue life, 346-Q
ferrite and ferrite reaction, 971-Q
fluidity and castability, 367-E
foundry practice, 314-E, 336-E, 360-L
cupola, 372-E, 562-E
melting, 313-E
molding, 542-E
pouring, 505-E
structure control, 462-E, 532-N
galvanizing, 265-L, 382-L
graphitization, 971-Q
hardness, 461-P, 1014-Q
heat treatment, 314-E
flame, 252-J
induction, 252-J
industry
statistics and economics, 182-A
machinability, 195-G, 314-G, 882-Q
mechanical properties, 132-E, 882-Q, 971-Q
high temperature, 987-Q
microstructure
primary, 404-M
nucleation, 462-E
permanent mold casting, 277-E, 279-E
pipe formation, 267-E
porosity, 56-E
production and consumption, 164-A
quality control, 132-E
quenching, 973-Q
resistance welding, 429-K
sand casting, 293-E
solidification, 485-N, 532-N, 461-P
solidification phenomena, 145-E, 253-E, 267-E, 292-E, 293-E
solidification shrinkage, 253-E, 292-E, 505-E, 461-P
stresses, residual, 973-Q
structure control, 303-E, 396-E, 474-E, 1014-Q
pipe, 367-E
tensile properties, 1014-Q, 1262-Q
thermal conductivity, 603-P
torsion properties and tests, 1262-Q
use in ingot molds, 36-W
wear, 911-Q, 1229-Q, 227-R
wear resistance, 317-Q
weldability, 217-K

Cast iron, (cont.)
grinding
surface
lubricants and oils, 269-G
hardness, 440-E, 472-E, 93-J, 1063-Q, 1490-Q, 313-W
hardness and hardness tests, 333-E, 844-Q
heat resistant, 133-E, 70-J, 93-J, 227-N
induction, 262-J
high temperature effects, 112-A
inclusions, 262-E, 390-E
investment castings, 377-E
machinability, 204-G, 308-G, 387-G, 457-G, 23-J, 1490-Q
machining, 427-G
mechanical, 3-G
magnetic properties, 291-P, 318-P, 369-P, 385-P
malleabilizing, 260-J
malleable, 41-A, 263-A, 512-E, 437-Q
annealing, 4-J
applications, 515-Q
arc welding, 690-K
austenite
retained, 278-N
austenite formation and decomposition, 180-N
cementite
cementite reaction, 278-N
chromizing, 334-L
design, 579-Q
diffusion
hydrogen, 490-N
foundry practice, 146-E, 371-E
cupola, 344-E
pouring, 197-E
fracture
brittle
effect of composition, 193-Q
effect of temperature, 193-Q
grain size, 28-M
graphitization, 260-J, 266-N, 278-N, 422-N, 535-N, 601-N
heat treatment, 146-E, 152-J, 533-N
fused-bath, 250-J
hydrogen in, 80-N
inclusions, 325-E
magnetic properties, 319-P
mechanical properties, 334-L, 515-Q, 579-Q, 1036-Q
microstructure
primary, 404-M
physical properties, 1036-Q
porosity, 325-E
solidification, 533-N
solidification phenomena, 395-E

Cast iron, malleable, (cont.)
specifications, 312-S
stress rupture properties and tests, 956-Q
structure control, 220-E
sulphurizing, 1323-Q
tensile properties, 250-J
tensile properties and tests, 220-E
transformations
isothermal, 185-N
wear properties and tests, 1323-Q
weld tests, 690-K
malleablizing, 466-E, 250-J, 278-N
martensite and martensite reaction, 1063-Q
mechanical properties, 164-E, 256-E, 339-E, 343-E, 419-E, 431-E, 446-E, 486-E, 369-P
addition agents, 1124-Q
effect of composition, 205-E, 236-Q
effect of high temperature, 236-Q
effect of heat treatment, 413-Q
effect of temperature, 602-Q
statistical analysis, 238-Q
metal spraying on, 587-L
metallography
techniques
magnetic, 626-N
microstructure
primary, 534-D, 247-E, 443-E, 486-E
milling and hobbing, 222-G
nodular, 107-A, 130-A, 191-A, 585-N, 437-Q
addition agents, 334-E
annealing, 135-J, 175-J
applications, 286-A
arc welding
gas shielded, 616-K
castings
solidification phenomena, 42-E
composition analysis, 189-S
corrosion, 1529-Q
galvanic, 753-R
stress, 298-R
creep, 1529-Q
defects
surface, 323-N
degassing, 217-E
electrical conductivity, 283-P, 603-P
eutectics
formation, 305-E
ferrite and ferrite reaction, 585-N
formability, 892-Q
foundry practice, 273-E, 497-E, 572-E
addition agents, 334-E
cupola, 540-E, 541-E
electric, 352-E, 412-E, 539-E

Cast iron, nodular, (cont.)
foundry practice (cont.)
structure control, 444-E, 521-E, 568-E
fracture
brittle, 1002-Q
friction, 126-Q
grain size, 28-M
graphitization, 305-E, 584-N, 1529-Q
hardness, 845-Q
hardness and hardness tests, 517-Q, 870-Q
hardness tests
dynamic, 314-J
heat treatment, 334-E, 187-J, 1529-Q
macrostructure, 334-E
magnetic properties, 318-P
permeability, 283-P
mechanical properties, 219-E, 56-Q, 892-Q, 1529-Q, 237-T
effect of composition, 533-Q
microstructure, 521-E
primary, 254-M, 561-Q, 870-Q
nitriding, 314-J
normalizing, 135-J
oxidation, 1529-Q
plastic deformation, 298-R
porosity, 147-E
quenching, 175-J
rolling, 102-F
hot, 172-F
sand casting, 293-E
scaling, 168-R, 189-R
effect of composition, 295-R
solidification, 51-N, 323-N
solidification phenomena, 225-E, 253-E, 293-E
solidification shrinkage, 253-E, 497-E
spheroidization, 21-N, 439-N
standards and specifications, 339-S
structure control, 185-E, 217-E, 218-E, 219-E, 225-E, 233-E, 270-E, 312-E, 396-E, 412-E, 122-N
tempering, 175-J
tensile properties, 870-Q
tensile properties and tests, 283-P, 517-Q, 845-Q, 339-S
tension test
notched, 46-Q
thermal analysis, 21-N
thermal conductivity, 603-P
transformations
allotropic, 585-N
isothermal, 41-N
use in automobiles
parts and fittings, 237-T
use in ingot molds, 353-W

Cast iron, nodular, (cont.)
use in machine parts, 319-T
use in pipelines, 180-T, 239-T
use in rolling mill rolls, 365-W
wear, 845-Q, 319-T
wear resistance, 387-Q
weldability, 134-K
welding, 707-K
nodular fatigue strength, 561-Q
nucleation, 114-N
oxidation, 204-R, 362-R, 444-R, 799-R
pearlite and pearlite reaction, 333-E
permanent mold casting, 331-E
phase diagrams, 217-M, 458-M
pipe, 445-E
corrosion
blistering and exfoliation, 37-R
plastic deformation, 648-Q
porosity, 72-L, 586-N
porosity and permeability, 257-P
presswork, 401-G
quality control, 152-E, 278-E
quenching, 1063-Q
repair, 16-K
sampling techniques, 81-S
testing equipment, 362-S
sand casting, 50-E, 249-E, 470-E, 476-E
scaling, 495-A, 362-R
shell mold casting, 538-E
solidification, 534-D, 414-E, 450-E, 586-N, 460-P
effect of impurities, 412-N
solidification phenomena, 78-E, 144-E, 164-E, 257-E, 323-E, 339-E, 342-E
solidification shrinkage, 144-E, 221-E, 114-N, 199-N, 460-P
sonic properties, 597-Q
spectrographic analysis, 46-S, 275-S, 349-S
spheroidization, 122-N, 154-N
standards and specifications, 255-S
structural control, 114-E, 184-E, 187-E, 247-E, 249-E, 256-E, 262-E, 284-E, 333-E, 362-E, 385-E, 419-E, 440-E, 450-E, 472-E, 486-E
stud welding, 641-K
sulphurizing, 233-J
tensile properties, 534-D, 249-E, 440-E, 1336-Q, 1490-Q, 107-T
tensile properties and tests, 443-E, 375-Q, 648-Q, 844-Q
effect of composition, 530-Q
thermal analysis, 584-N
thermal expansion, 602-Q
thermal properties, 369-P
thermodynamic properties, 262-J
tin plated, 263-L

Cast iron, (cont.)
transformation, 227-N
tubing and pipe, 238-D, 133-E
gas welding, 28-K
use in automobiles, 107-T
use in chemical processing equipment, 205-T, 222-T
use in oil field equipment, 316-T
wear, 446-E, 195-J, 452-Q, 484-Q, 568-Q, 465-R
wear properties and tests, 314-J
wear resistance, 386-Q, 107-T
weldability, 413-Q
welding, 463-E
quality control, 648-K
welding and joining, 177-K
weldments
brinell hardness, 172-M
macrostructure, 172-M
tensile strength, 172-M
white
austenite formation and decomposition, 626-N
bend properties and tests, 1458-Q
corrosion, 153-A
diffusion, 387-N
dilatometry, 626-N
foundry practice
pouring, 466-E
graphitization, 466-E, 101-N, 420-N
effect of high temperature, 157-N
hardness and hardness tests, 601-Q
impact properties and tests, 1458-Q
inclusions, 420-N
malleabilizing, 242-J
metallography
etching, 522-M
nucleation, 101-N
plastic deformation, 1459-Q
stresses
thermal, 1353-Q
structure control, 355-E
tensile properties and tests, 601-Q
transition structure, 1353-Q
wear, 601-Q, 266-T
wear properties and tests, 153-A
Cast iron castings
reclamation, 463-E
solidification phenomena, 35-E, 14-N
Cast iron pipe
corrosion by soils, 173-R
Cast iron tubing and pipe
passivation, 454-R
Cast steel
foundry practice
molding, 153-E
mechanical properties, 256-E, 490-Q

Cast steel, (cont.)
prices and cost studies, 203-A
structure control, 256-E
Casting machines
continuous, 238-D
Castings
chill, 50-E
cleaning, 8-E, 175-E, 211-E, 384-E, 496-E
degassing, 345-E
vacuum, 215-C
design, 302-A, 92-E, 162-E, 719-Q
effect of composition, 227-E
flaw detection
radiographic, 404-S, 417-S
fluidity and castability, 404-E, 512-E, 583-M
heat treatment, 76-J, 583-M
mechanical properties and tests, 274-Q
quality control, 56-E, 239-E, 366-E, 46-S
radioactive tracer study, 404-S
reclamation, 30-E, 62-E, 102-E
impregnation, 379-E
segregation, 268-E
size
thickness and mass measurement, 195-S
solidification, 583-M, 618-N
solidification phenomena, 61-D, 2-E, 37-E, 63-E, 76-E, 458-E, 556-E, 583-M, 65-N, 313-Q
standards and specifications, 316-S, 397-S
stress concentration, 719-Q
stresses
residual, 213-E
structure control, 268-E, 512-E
effect of composition, 214-D
surface roughness
measurement, 397-S, 462-S
synthetic resin coating, 194-L
tensile properties, 313-Q
tumbling, 599-L
use in missiles, 288-T
volume and dimensional changes, 242-P
Cathodic protection, 563-L, 77-R, 91-R 92-R, 95-R, 99-R, 101-R, 102-R, 121-R, 122-R, 124-R, 236-R, 348-R, 396-R, 420-R, 445-R, 456-R, 550-R, 560-R, 775-R
anodes, 351-R, 352-R
cost, 232-R
switches, 109-R
Cavitation corrosion, 131-R, 184-R, 516-R, 723-R, 774-R
Cementite and cementite reaction, 165-N 202-N, 625-N
Centrifugal casting, 24-E, 65-E, 226-E 402-E, 415-E, 416-E
design, 426-E
Centrifugal castings
defects
surface, 416-E
inclusions, 416-E
structure control, 415-E
Ceramic coated metal, 433-Q
effect of high temperature, 361-L
electrical properties, 410-P
emissivity, 265-P
thermal shock, 445-Q
thermal stresses, 445-Q
Ceramic coating, 15-L, 26-L, 31-L, 71-L, 155-L, 295-L, 296-L, 361-L, 362-L, 411-L, 425-L, 426-L, 451-L, 500-L, 598-L, 770-L, 782-L, 795-L, 226-T, 445-Q
cost, 835-Q
defects, 131-L
effect of high temperature, 215-L
effect of low temperature, 465-L
equipment, 717-L
temperature control, 402-W
Ceramic coatings, 392-L
effect of grain size, 288-L
elastic properties, 529-Q
electrical properties, 770-L
fracture, 529-Q
mechanical properties, 770-L
Ceramic mold casting, 478-E, 494-E, 531-E
Ceramics
bonding, 189-K
use in missiles, 229-T
Cerbium
effect of high temperature, 54-A
Cerium
crystal structure, 457-M
determination, 432-S
extraction and refining
halogenation, 335-C
halide decomposition, 274-C
in carbon steel, 529-D
in cast iron, 184-E
intermetallic compounds
crystal structure, 655-M
systems
binary, 672-M, 336-N
ternary, 384-M, 494-M, 584-M, 672-M
transformations, 82-N
Cerium alloys
atomic structure
spatial arrangement, 655-M
magnetic properties, 18-P

Cerium borides
atomic structure, 136-M
Cerium oxides
atomic structure, 136-M
Cermets, 478-A, 434-G, 77-H, 924-Q, 75-T
bend properties
strength and ductility, 466-Q, 356-S
bend properties and tests, 550-M
corrosion
by inorganic acids, 702-Q, 1104-Q
creep, 1384-Q
creep properties and tests, 1159-Q
crystal structure, 478-M, 550-M
cutting tools and bits, 218-T
damping properties and tests, 582-Q
effect of radiation, 155-T
electrical conductivity, 550-M
fatigue life, 113-Q
flame spraying of, 362-L
flaw detection, 356-S
friction, 702-Q
hardness, 550-M
impact strength, 1058-Q
magnetic properties, 141-P
mechanical properties, 14-H, 129-H, 648-P, 1039-Q, 1131-Q
microstructure
primary, 1131-Q
molding and compacting, 100-H
hot pressing, 1104-Q
oxidation, 550-M, 1039-Q, 1104-Q, 764-R
effect of high temperature, 430-R
physical properties, 648-P, 1131-Q
density, 550-M
properties, 49-H
sintering, 1104-Q
slip casting, 61-H
tensile properties, 1058-Q, 356-S
use in aircraft engines, 356-S
use in missiles, 61-T
volume and dimensional changes
effect of radiation, 402-P
wear, 550-M, 702-Q
Cesium
atomic structure, 346-M
determination, 51-S
electrical properties
effect of low temperature, 426-P, 427-P
radiological safety, 275-A
statistics and economics, 62-A
systems
binary, 64-P
Cesium-gold alloys
crystal structure, 724-P
electrical conductivity, 724-P
Cesium-gold alloys, (cont.)
optical absorption, 724-P
x-ray diffraction, 724-P
Chain, 25-E, 80-S
Chemical conversion coating, 23-L, 554-L, 565-L, 731-L
Chemical equipment
corrosion, 19-T
Chemical extraction and refining equipment
corrosion, 716-R
Chemical laboratory apparatus, 13-X, 66-X
Chemical milling, 161-G
Chemical processing equipment, 116-A, 469-R, 80-T
annealing, 509-K
cathodic protection, 304-R
ceramic coating on, 448-L
corrosion, 164-R, 250-T, 283-T
by inorganic acids, 725-R
chemical
inorganic, 561-R
organic, 333-R
stress, 708-R
design, 334-T, 335-T
forge welding, 441-L
machining
mechanical, 509-K
materials, 381-A, 283-T
cast iron, 205-T, 222-T
lead, 228-T
molybdenum, 220-T
stainless steel, 189-T
tantalum, 539-A
titanium alloys, 189-T
welding, 509-K, 565-K, 711-K, 331-T, 332-T
Chemical reduction coating, 821-L
China
industry and economics, 104-A
Chromate coating, 149-L, 252-L, 546-L, 624-L, 811-L, 129-R
radioactive tracer study, 250-R
Chromium, 258-A, 359-A
adhesive joining
metal-to-metal, 594-K
analysis
special separation, 464-S
applications, 532-A
atomic structure
coordination number, 618-P
bend properties
strength and ductility, 1061-Q
brittle transition temperature, 1061-Q, 1087-Q, 1161-Q, 1519-Q, 1523-Q
coating by, 466-L
colorimetric determination, 58-S

Chromium, (cont.)
composition, 28-S
corrosion, 76-A, 682-L
corrosion tests
salt spray, 722-L
creep, 62-Q, 1084-Q
effect of high temperature, 141-Q
crystal structure, 44-M
imperfections, 1084-Q
texture and preferred orientation, 804-L
determination, 432-S, 443-S
x-ray analysis, 342-S
diffusion, 11-N, 166-N, 177-N
interfacial, 522-N, 525-N
self-, 203-N, 277-N
diffusion coating, 168-L, 231-L, 273-R
diffusion coating of, 594-L
diffusion in carbon steel, 341-N
diffusion in iron-chromium alloys, 277-N
diffusion in titanium alloys, 394-N
dip coating of, 636-L
electric furnace smelting
vacuum, 480-C
electrical conductivity, 618-P
electroforming of, 462-L
electroplate
corrosion, 395-R
corrosion tests, 678-L, 395-R
electroplated
wear, 1005-Q
electroplating, 103-L, 210-L, 266-L, 278-L, 281-L, 289-L, 309-L, 337-L, 357-L, 376-L, 722-L, 614-Q, 344-R
baths, 202-L, 396-L, 567-L
radioactive tracer study, 573-L
on titanium, 218-L
porosity, 566-L
electroplating control, 165-L
electroplating of, 363-L, 394-L, 410-L, 432-L, 462-L, 478-L, 527-L, 543-L, 575-L, 587-L, 590-L, 627-L, 635-L, 665-L, 678-L, 682-L, 739-L, 740-L, 764-L, 786-L, 797-L, 802-L, 803-L, 804-L, 806-L, 807-L, 1004-Q, 1456-Q
baths, 582-L, 583-L, 584-L
control, 534-L, 586-L
radioactive tracer study, 805-L
electrorefining, 86-C
extraction and refining
electrolytic, 263-C
halogenation, 336-C
melting and casting, 1061-Q
forging practice, 263-C
fracture, 1084-Q
brittle, 778-Q, 1087-Q, 1519-Q

Chromium, (cont.)
hardness
micro-, 525-N
hardness and hardness tests, 140-Q
hydrogen adsorption, 143-P
in iron and steelmaking, 111-D, 252-D
intermetallic compounds, 236-C
magnetic properties, 476-P
mechanical properties, 76-A, 778-Q
melting temperatures, 328-M
metallography
replica techniques, 803-L
nuclear properties, 694-P
oxidation, 44-M, 826-R
physical properties
mass and volume, 662-P
plastic properties, 263-C
polishing
electrolytic, 1005-Q
mechanical, 1005-Q
powder production, 69-H
atomization, 57-H
precipitation
from liquid, 636-L
production and consumption, 29-A
radioactive tracer methods
metallography, 522-N
recrystallization, 108-N
reduction by gases, 236-C, 263-C
rolling, 263-C
solid solutions
structure, 1101-Q
specific heat, 379-P
spectrographic determination, 523-K, 239-S, 359-S
surface tension, 662-P
systems
binary, 228-M, 352-M, 521-M, 322-N, 336-N
complex, 628-M
ternary, 236-M, 394-M, 462-M, 515-M, 572-M, 161-N, 295-N
thermal properties, 696-P
thin films
adherence tests, 488-L
optical properties, 21-P
transition structure, 322-N
vapor deposition coating of, 455-L
wear properties and tests, 140-Q
x-ray analysis
composition, 178-S
x-ray determination, 441-S
Chromium alloying agents, 103-C
Chromium alloys
applications, 1025-Q
arc welding
coated electrode, 391-K

Chromium alloys, (cont.)
colorimetric analysis, 231-S
corrosion
atmospheric
industrial, 427-W
electroplating of, 639-L
mechanical properties, 1025-Q
effect of high temperature, 639-Q
oxidation, 572-R
physical properties, 1025-Q
recrystallization
effect of composition, 19-N
soldering
furnace, 642-K
spot welding, 621-K
tensile properties, 924-Q
use in heat treating furnaces, 427-W
use in turbine blades and rotors, 254-A
weldments
tensile properties, 642-K
Chromium-antimony alloys
electrical conductivity, 203-P
Chromium-boron system, 117-M
Chromium carbide, 548-A
Chromium carbide cermets, 271-A
Chromium-cerium alloys
monotectic formation, 336-N
Chromium cermets, 69-H
mechanical properties, 1039-Q
mixing and blending, 128-H
molding and compacting
hot pressing, 128-H
oxidation, 1039-Q
Chromium-cobalt alloys
mechanical properties, 590-N
solution hardening, 590-N
Chromium-cobalt-nickel alloys
elastic properties, 1013-Q
Chromium diffusion coating, 152-L
Chromium electroplate, 197-R
adherence tests, 1298-Q
corrosion, 176-R
atmospheric, 316-R, 530-R
mechanical properties
effect of high temperature, 615-Q
on alloy steel, 358-Q
pitting, 357-L
size
thickness and mass measurement
radiographic, 282-S
use in automobiles, 153-T
Chromium electroplated metal
size thickness and mass measurement, 317-S
Chromium-germanium alloys
electrical properties, 185-P
magnetic properties, 185-P
Chromium-iron alloys
atomic structure, 230-M
Chromium-manganese steel, 206-N, 417-Q
Chromium-molybdenum alloys
creep strength, 883-Q
polishing
electrolytic, 1005-Q
mechanical, 1005-Q
Chromium molybdenum steel, 81-D
creep
rate, 322-M
fatigue properties and tests, 825-Q
notch sensitivity, 825-Q
Chromium-molybdenum steel ingots
ladle casting, 160-D
Chromium-molybdenum vanadium steel, 693-Q, 1-T, 112-W
Chromium-nickel alloys
anelastic properties, 291-Q
specific heat, 255-P
vapor deposition coating, 386-L
Chromium-nickel-molybdenum steel
nitriding, 196-N
Chromium-nickel steel
corrosion
chemical
inorganic, 305-R
diffusion, 79-N
Chromium-nickel-titanium alloys
creep strength, 1315-Q
tensile properties, 1315-Q
Chromium nitride
wear, 701-Q
Chromium ores
roasting, 103-C
Chromium plate, 289-L, 148-T
stresses, 566-L
Chromium plating, 115-L, 108-N
baths, 104-L
Chromium powder
compressibility, 110-H
mixing and blending, 60-H
molding and compacting
cold pressing, 70-H
Chromium powder metallurgy, 29-H
Chromium sand castings
cleavage, 142-Q
crystal structure, 142-Q
Chromium steel, 490-Q
anelastic properties, 488-Q
cleaning, 127-L
corrosion
chemical
inorganic, 305-R
decarburization, 102-J
effect of high temperature, 269-A
grain size, 9-N

Chromium steel, (cont.)
microstructure, 111-N
tempering reactions, 9-N
transformations, 152-N
Chromium-tellurium alloys
heat effect, 719-P
Chromium-tungsten-molybdenum-vanadium steel
weldability, 370-K
Chromizing, 138-J, 445-L, 646-L, 747-L, 814-L
vacuum, 604-L
Clad metal
corrosion tests, 183-S
flaw detection, 183-S
heat treatment, 321-J
size
thickness and mass measurement
radiographic, 372-S
Clad steel
mechanical properties, 609-Q
rolling, 37-F
welding, 198-K, 204-L
Cladding, 183-S
Cleaning, 92-L
alkali, 192-L, 306-L, 547-L, 812-L
electrolytic, 117-L, 547-L
salt bath, 127-L
solvent, 10-L, 757-L
vapor, 757-L
Cleaning and plating equipment, 47-L, 56-L, 196-L, 197-L, 200-L, 201-L, 205-L, 238-L, 312-L, 536-L, 4-W, 5-W, 73-W, 104-W, 130-W, 153-W, 343-W
anodes, 590-L, 148-S, 191-W
automation, 2-L
design, 229-W
materials
zinc, 422-W
Cleaning and polishing, 150-L, 171-L
chemical, 92-G, 3-L, 12-L, 30-L, 34-L, 68-L, 115-L, 144-L, 214-L, 242-L, 244-L, 245-L, 279-L, 340-L, 353-L, 463-L, 464-L, 515-L, 521-L, 531-L, 620-L
automation, 9-L
radioactive tracer study, 474-L
electrochemical, 30-L, 58-L, 68-L, 242-L, 301-L, 463-L, 521-L
automation, 196-L, 197-L, 200-L, 201-L, 205-L
mechanical, 175-E, 16-L, 18-L, 68-L, 203-L, 244-L, 340-L, 515-L, 531-L, 626-L
automation, 9-L
equipment, 406-L
Cleavage, 770-Q
Coating, 555-L, 497-R
nonmetallic, 65-L, 327-L, 471-P, 178-T
corrosion
inhibition, 16-R
varnish, 230-R
nonmetallic materials, 181-L
plasma jet, 181-L
porosity, 95-X
Cobalt, 45-A, 46-A
analysis
special separation, 182-S
anelastic properties, 1539-Q
applications, 179-A, 532-A
atomic structure, 110-M
coordination number, 618-P
colorimetric alloys, 327-S
colorimetric determination, 232-S, 408-S
compression properties, 129-Q
corrosion, 35-R, 326-R
crystal structure, 44-M
dislocations, 202-M, 433-M
determination, 30-S
diffusion
in nickel-molybdenum alloys, 91-N
tungsten carbide, 661-N
dispersion hardening, 447-N
electrical conductivity, 618-P
electrical properties
effect of low temperature, 427-P
electroplating, 100-L, 142-L, 222-L, 344-R
electroplating on, 35-L
extraction and refining, 172-C
chemical, 243-C
degassing
vacuum, 355-C
leaching, 358-C, 425-C
melting
vacuum, 355-C
precipitation, 26-C, 465-C
solvent extraction, 174-C
vacuum melting, 290-C
grain boundaries, 177-H
history, 463-A
in alloy steel, 514-N
in steel, 555-Q
intermetallic compounds
crystal structure, 649-M
liquid
viscosity, 465-P
magnetic properties, 116-P, 476-P
nuclear magnetic resonance, 304-P
paramagnetism
effect of temperature, 73-P
mechanical properties, 355-C, 447-N
metallography
etching, 320-M

Cobalt, (cont.)
metallurgy, 20-A
nuclear properties, 694-P
oxidation, 44-M
phase diagrams, 94-A
photometric determination, 288-S
plastic deformation, 1223-Q
powder production, 119-H
atomization, 57-H
single crystals
x-ray diffraction, 433-M
solubility in sodium, 608-P
spectrographic analysis, 349-S
surface tension, 163-P
systems
binary, 333-M, 384-M, 549-M, 5-P
complex, 628-M
ternary, 372-M, 394-M, 506-M, 556-M, 610-M, 666-M, 677-M
thin films
adherence tests, 488-L
electrical conductivity, 399-P
optical properties, 700-P
transformation
allotropic, 47-N
Cobalt alloy powder
dispersion hardening
oxides, 309-N
Cobalt alloy wire
thermal expansion, 722-P
Cobalt alloys, 264-A, 265-A
age hardening, 303-N, 187-Q
anelastic properties, 187-Q
annealing, 314-N
applications, 463-A
arc welding
design, 1011-Q
bend properties
strength and ductility, 1544-Q
brazing, 328-P, 626-Q
corrosion
chemical
inorganic, 248-R
creep, 121-Q, 187-Q, 1024-Q, 1293-Q, 1384-Q
crystal structure, 372-M
elastic properties and tests, 263-T
electron diffraction, 303-N
electron microscopy, 303-N
extraction and refining
induction melting, 1170-Q
fatigue, 338-Q
fatigue properties and tests, 187-Q
formability, 150-G
forming, 318-A
forming and machining, 150-G
fracture
crack propagation, 1011-Q
Cobalt alloys, (cont.)
hard surfacing, 212-L, 602-L
hardness
hot, 1103-Q
machinability, 184-G
machining
mechanical, 36-G
magnetic properties, 500-P
magnetostriction
magnetic properties, 362-P
mechanical properties, 463-A, 123-J, 1024-Q, 1097-Q
effect of high temperature, 639-Q, 181-T
melting temperatures, 1024-Q
metallography
replica techniques, 691-M
specimen preparation, 303-N
microstructure
primary, 463-A, 1103-Q
oxidation, 187-Q, 430-R
precipitation, 123-J
precipitation hardening, 123-J
properties
effect of high temperature, 287-Q
recrystallization
effect of composition, 19-N
stress rupture properties and tests, 626-Q, 1170-Q
surface tension, 251-P, 328-P
tensile properties, 626-Q, 924-Q, 1293-Q
tensile properties and tests, 122-Q, 1170-Q
transformation
isothermal, 314-N
use in aircraft, 145-T, 181-T
use in missiles, 1097-Q
use in turbine blades and rotors, 254-A
wear, 428-Q, 539-Q
effect of pressure, 538-Q
Cobalt-aluminum alloys
magnetic properties, 1-P
oxidation, 289-R
Cobalt-boron alloys
intermetallic compounds
crystal structure, 549-M
Cobalt-boron solid solutions
structure, 556-M
Cobalt cermets
molding and compacting
hot pressing, 130-H
thermal conductivity, 130-H
Cobalt-chromium alloys
atomic structure, 231-M
hard surfacing of, 784-L
magnetic properties, 231-M
spectrographic analysis, 384-S
Cobalt-chromium-iron alloys, 307-A

Cobalt-chromium-nickel alloys
elastic properties, 1013-Q
Cobalt-chromium-nickel-iron alloys
electrical conductivity, 606-P
thermal expansion, 606-P
transition structure, 606-P
Cobalt-chromium-titanium alloys
melting temperatures, 610-P
solidification, 610-P
temperature measurement, 610-P
Cobalt-chromium-tungsten alloys
corrosion
by inorganic acids, 467-R
Cobalt films
electrical conductivity, 234-P
Cobalt-gadolinium alloys
magnetic properties, 333-P
Cobalt investment castings
tensile properties and tests, 653-Q
Cobalt-iron alloys
ductility, 709-Q
fracture
brittle, 709-Q
gases in, 547-N
magnetic properties, 298-P
thermodynamic properties, 547-N
Cobalt-iron-vanadium alloys
magnetic properties, 248-Q
Cobalt-nickel alloys
damping properties, 826-Q
magnetic properties
Domain theory, 188-P
single crystals
transformation
stress-induced, 1290-Q
transformations
allotropic, 333-N
Cobalt-nickel-chromium alloys
creep, 953-Q
fatigue properties and tests, 953-Q
magnetic properties
diamagnetism, 36-P
paramagnetism, 36-P
Cobalt powder
magnetic properties, 158-P
production
atomization, 116-H
properties, 116-H, 119-H
Cobalt powder compacts
sintering, 177-H
Cobalt powder metal compacts
sintering, 169-P
Cobalt-silicon alloys
magnetic properties, 1-P
Cobalt single crystals
magnetic domains, 37-M
Cobalt-tungsten alloys
analysis
special separation, 179-S
Cobalt-tungsten carbide cermets
mechanical properties, 192-T
Coining, 128-E, 183-E, 86-G, 218-G, 445-G
Coke, 122-A
Coke manufacture, 3-B
Coke ovens, 168-W
Cold treatment, 166-J
Colorimeters, 502-P
Colorimetric analysis, 110-S, 376-S, 466-S, 14-X
Columbium, 26-A, 165-A, 258-A, 284-A, 332-A, 359-A, 362-A, 363-A, 399-A, 404-A
adhesive joining
metal-to-metal, 594-K
applications, 424-A
arc welding
gas shielded, 352-K, 487-K
atomic structure
interatomic bond, 479-M
brittle transition temperature, 1087-Q, 1519-Q, 1523-Q
compression properties, 671-P
corrosion, 76-A
chemical
inorganic, 65-R
organic, 65-R
crystal structure, 619-M
imperfections
effect of radiation, 1067-Q
determination, 25-S
diffusion of, 267-N
ductility, 671-P
electrical properties, 579-P
electroplating of
baths, 584-L
electroplating on, 401-L, 621-R
extraction and refining, 363-A, 24-C, 185-C, 250-C
chemical, 25-C, 379-C, 475-C
halogenation, 39-C, 335-C
ion exchange, 476-C
melting, 72-X
equipment, 339-C
separation, 177-C
vacuum, 300-C
extrusion
impact and cold, 187-G, 1351-Q
forming, 400-G
forming and machining, 181-G
fracture
brittle, 1087-Q, 1519-Q
gases in, 583-N

Columbium, (cont.)
halide decomposition, 258-C, 288-C, 289-C
in stainless steel, 208-R
in steel, 1238-Q
intermetallic compounds
crystal structure, 654-M
machining
mechanical, 258-G
magnetic properties, 579-P
martensitic reactions, 580-M
mechanical properties, 76-A, 464-A, 78-F
effect of high temperature, 564-Q
effect of radiation, 1067-Q
metal spraying on, 621-R
metallography
specimen preparation, 200-M
nuclear properties
cross sections, 671-P
oxidation, 464-A, 140-M, 355-R, 433-R, 621-R
physical properties, 363-A, 464-A
density, 671-P
powder compacts
sintering, 151-H
powder metallurgy, 74-A, 44-H
powder production, 120-H
properties, 37-H
radiochemical determination, 457-S
reduction by metals, 362-C
research, 123-A
sintered parts
bend properties
strength, 151-H
crystal structure, 151-H
electrical conductivity, 151-H
hardness, 151-H
physical properties
density, 151-H
solidification shrinkage, 151-H
tensile properties, 151-H
smelting, 377-C
solubility
hydrogen, 136-P, 736-P
nitrogen, 583-N
specific heat, 671-P
spectrographic determination, 118-S, 461-S
systems
binary, 234-M, 384-M, 395-M, 421-M, 560-M, 580-M, 605-M, 654-M, 673-M
ternary, 494-M, 700-M
tensile properties, 671-P, 979-Q, 1351-Q
tensile properties and tests, 168-Q
Columbium, (cont.)
transformation
isothermal, 355-R
transformations, 395-M
vapor pressure, 177-P
weldability, 193-K
welding, 487-K, 643-K
x-ray microscopy, 355-R
yield strength, 979-Q
zone melting, 264-C
Columbium alloys
mechanical properties, 26-Q, 723-Q, 1279-Q
oxidation
effect of composition, 723-Q
physical properties, 1279-Q
tensile properties, 924-Q
Columbium-beryllium alloys
crystal structure, 428-M
Columbium boride
corrosion, 481-R
Columbium carbides, 170-P
Columbium-chlorine system, 138-M
Columbium extrusions
tensile properties, 1197-Q
Columbium industry
statistics and economics, 205-A
Columbium ores
crushing, and grinding
sizing, 76-B
sources, 80-A, 144-A
Columbium oxygen system, 122-M
Columbium powder metallurgy
sintering, 37-H
Columbium powder metals
molding and compacting, 68-H
Columbium-uranium alloys
oxidation, 139-W
Combustion control, 354-S
Communication equipment, 26-X
Composition analysis, 83-C, 5-S, 49-S, 73-S, 136-S, 218-S, 469-S, 16-X
anodes, 148-S
instruments, 96-S
testing equipment, 615-P
Compression properties and tests, 211-Q
equipment, 1499-Q
Computers, 461-A
Computers and business machines, 167-A, 5-F, 4-X
Consumer goods, 29-G
electroplating, 419-L
materials, 105-T
Containers
shipping and storage
corrosion
blistering and exfoliation, 588-R

Containers, shipping and storage, (cont.)
corrosion, (cont.)
by foods, 588-R
chemical
organic, 449-R
lacquering, 320-L, 759-L
Continuous casting, 403-D, 156-F
aluminum, 41-C, 212-C
equipment, 212-C, 648-D
nonferrous, 33-C, 46-C, 102-C, 158-C
steel, 102-C, 10-D, 69-D, 75-D, 126-D, 133-D, 234-D, 238-D, 239-D, 240-D, 342-D, 427-D, 477-D, 515-D, 534-D, 561-D, 562-D, 676-D, 42-N
process control, 648-D
radioactive tracer study, 356-D
Converter processes, 98-A, 9-D, 19-D, 23-D, 295-D, 348-D, 453-D, 503-D, 616-D, 442-W
alloying agents, 309-D
bessemer, 70-D, 78-D, 112-D, 142-D, 144-D, 196-D, 197-D, 285-D, 354-D
basic, 124-D, 691-D
blowing, 29-D, 30-D, 72-D, 137-D, 178-D, 183-D, 201-D, 218-D, 235-D, 249-D, 253-D, 256-D, 294-D, 353-D, 400-D, 465-D, 547-D, 548-D, 560-D, 623-D, 490-K
charging, 183-D
Olp process, 507-D, 595-D
Perrin process, 20-D, 22-D, 179-D, 208-D, 485-D, 19-E
Phoenix lance process, 15-D, 247-D
T. W. A. process, 458-D
vacuum treatment, 638-D
testing equipment, 434-S
Converters, 285-D, 141-E, 95-W
bessemer, 101-W, 121-W
refractories, 69-B, 133-W, 182-W
Conveyors, 40-L, 146-L, 39-W, 80-W, 86-W, 96-W
automation, 19-W
materials
copper-beryllium alloys, 242-W
Copper, 295-A, 305-A, 327-A
adsorption of sulphur, 504-P
age hardening, 506-R
anelastic properties, 436-Q, 1539-Q
effect of low temperature, 298-Q
effect of radiation, 683-Q
effect of stress, 298-Q
annealing, 261-F, 274-M, 283-M, 286-M, 363-Q, 1433-Q
bright, 761-Q
applications, 5-W
arc cutting, 302-G, 651-K
atomic structure, 707-M
Copper, (cont.)
bend properties and tests, 616-Q
blanking, 27-G
brazed joints
fatigue, 483-Q
tensile properties and tests, 483-Q
brazing, 428-K
vacuum, 472-K
buffing, 700-L
chemical reduction coating, 298-L
cladding, 383-L
cleaning and polishing
electrochemical, 48-L
colorimetric analysis, 58-S, 63-S
colorimetric determination, 121-S
compression properties, 129-Q
compression properties and tests, 31-N
continuous casting, 158-C, 211-C
converter practice, 370-C, 380-C, 381-C, 400-C, 402-C
thermodynamic properties, 173-C
corrosion
alkaline
inorganic, 691-R
atmospheric, 11-Q, 426-R, 712-R
industrial, 529-R
marine, 618-R
by alcohols, 807-R
by inorganic acids, 684-R
by lubricants, 385-R
by nitrogen compounds, 814-R
by sulphur compounds, 426-R, 823-R
by waters, 671-R
sea, 618-R
chemical
inorganic, 528-R, 576-R
organic, 520-R
concentration cell, 177-R, 435-R
effect of irradiation, 153-R
erosion, 642-R, 822-R
galvanic, 4-R, 322-R, 665-R
inhibition, 642-R, 691-R, 807-R
metal transfer, 284-R
corrosion tests, 671-R
creep, 1400-Q
activation energy, 239-P
creep strength, 1225-Q
crystal structure, 172-H, 44-M, 509-M, 581-M, 467-N
dislocations, 59-M, 292-M, 426-M, 430-M, 433-M, 496-M, 501-M, 612-M, 683-Q
effect of orientation, 365-M
imperfections, 135-H, 283-M, 286-M, 309-M, 430-M, 435-M, 436-M, 392-P
effect of radiation, 513-M

Copper, crystal structure, (cont.)
texture and preferred orientation, 445-M, 519-M, 357-N, 1205-Q
damping properties, 774-Q
degreasing, 712-L
determination, 13-S, 30-S, 59-S, 200-S, 371-S, 443-S
dezincification, 435-R
die casting, 518-E, 527-E
diffusion, 286-M, 159-N, 523-N, 527-N, 555-N, 606-N, 607-N, 602-R
graphite, 559-N
interfacial, 525-N
self-, 461-N
silicon, 419-N
titanium, 419-N
zinc, 678-N
diffusion bonding, 301-K, 382-K
diffusion coating on, 21-L
diffusion in iron, 152-H
diffusion of bismuth, 308-N
diffusion of carbon, 325-N
drawing
deep, 391-G
drilling and reaming, 118-G
elastic properties, 330-T
effect of low temperature, 1274-Q
Young's modulus, 774-Q
effect of radiation, 683-Q
electric furnace smelting, 447-C
electrical conductivity, 519-E, 576-E, 705-M, 239-P, 308-P, 492-P, 690-P, 330-T
electrical properties, 77-P, 378-Q
electrical resistivity, 104-P
electrochemical properties, 77-P, 254-P, 378-P, 446-P, 284-R
electrodeposit structures, 738-L
electroforming, 332-L, 703-L, 711-L, 828-L
electron emission, 525-P
electroplated
adherence tests, 712-L
electroplating, 63-L, 74-L, 85-L, 101-L, 105-L, 159-L, 222-L, 266-L, 275-L, 297-L, 300-L, 309-L, 328-L, 329-L, 330-L, 331-L
baths, 84-L, 99-L, 202-L, 238-L, 311-L, 738-L
gravimetric analysis, 756-L
tests, 705-L
volumetric analysis, 756-L
bright, 125-L
control, 239-L
effect of temperature, 235-L
on titanium, 218-L
electroplating of, 282-J, 401-L, 458-L, 497-L, 517-L, 520-L, 527-L, 581-L, 588-L, 608-L, 633-L, 634-L, 674-L, 703-L, 740-L, 797-L, 824-L
baths, 5-L, 656-L
control, 534-L
history, 552-L
electroplating on, 751-L
baths, 46-L
properties and tests, 712-L
electrorefining, 347-C, 354-C, 378-C, 384-C, 401-C, 429-C
energy of activation, 32-N
evaporation of, 501-M
explosive forming, 386-G
extraction and refining, 372-C, 373-C
chemical, 243-C, 396-C
continuous casting, 15-C
distillation, 365-C, 416-C
electric furnace, 240-C
electrolytic, 210-C, 283-C, 296-C
holding and pouring, 199-C
leaching, 202-C, 228-C, 341-C, 365-C
precipitation, 26-C, 202-C, 312-C
separation, 305-C
fatigue life, 43-Q, 361-Q, 439-M, 774-Q
fatigue properties and tests, 11-Q, 655-Q, 742-Q, 1400-Q
fatigue strength, 361-Q
effect of low temperature, 854-Q
fatigue tests
torsion, 765-Q
flame cutting, 302-G
flash welding, 469-K
forge welding
die, 375-K, 377-K
roll, 376-K
forging practice
drop, 817-Q
foundry practice
gating, 250-E
history, 188-A
melting, 302-E, 13-W, 169-W
quality control, 488-E
structure control, 519-E
fracture, 1317-Q
brittle, 616-Q, 761-Q
friction, 363-Q, 1425-Q
gas welding
oxy-acetylene, 541-K
gases in, 523-N, 555-N
grain boundaries, 274-M, 612-M, 705-M
grain growth, 621-M, 12-N, 32-N, 59-N
grain size, 393-M
statistical analysis, 509-M
hard surfacing, 21-L
hardness, 1478-Q

Copper, hardness, (cont.)
hot, 85-L
micro-, 496-M, 525-N
hardness tests
spherical indenter, 117-Q, 890-Q
history, 356-A
in cast iron, 882-Q
intermetallic compounds
crystal structure, 649-M
liquid
physical properties
density, 467-P
thermal expansion, 467-P
viscosity, 465-P
machinability, 387-G, 421-G
machining
mechanical, 236-G
magnetic properties, 112-P
mechanical properties, 15-P
effect of radiation, 1510-Q
melting
fuel fired, 369-C
metal spraying, 21-L, 276-L
metal spraying of, 392-L, 507-L, 508-L, 587-L, 1522-Q
metallography
replica techniques, 340-M
metallurgy, 18-A
history, 525-A
microscopy, 621-M
microstructure, 1478-Q
primary, 85-L, 621-M
neutron diffraction
effect of deformation, 434-M
nuclear properties
radioactive decay, 695-P
nucleation, 12-N
ore preparation, 127-B
oxidation, 44-M, 95-Q, 233-R, 506-R, 602-R, 710-R, 769-R
permanent mold casting, 356-E
physical properties, 15-P
pickling, 473-L
pitting corrosion, 671-R
plastic deformation, 387-G, 210-P, 486-Q, 816-Q, 817-Q, 848-Q
effect of grain size, 553-Q
lines and bands, 655-Q, 765-Q
slip, 95-Q
strain concentration, 1432-Q
polishing
chemical, 473-L
electrolytic, 139-L, 529-L, 541-L, 615-L, 745-L
mechanical, 700-L
porosity, 527-E
porosity and permeability, 135-H

Copper, (cont.)
powder metal parts
hardness and hardness tests, 651-Q
physical properties
density, 651-Q
tensile properties and tests, 651-Q
powder production, 91-H, 118-H, 119-H
atomization, 4-H
precipitation, 12-N
process control, 402-C
reclamation, 182-C
recovery, 606-N, 607-N
effect of radiation, 685-N
recrystallization, 286-M, 292-M, 32-N, 78-N, 125-N
effect of deformation, 31-N
reduction by gases, 2-C, 54-C
reduction by metals and gases, 98-C
roll bonding, 376-K
rolling, 73-F, 216-F, 816-Q, 1433-Q
cold, 263-F, 445-M
hot, 263-F, 1432-Q, 1478-Q
safe handling, 227-A
seam welding, 253-K
single crystals
compression properties and tests, 732-Q
dislocations, 336-M
electron diffraction, 768-R
fatigue, 1094-Q
fracture
crack propagation, 1094-Q
growth, 357-N, 465-N
metallography
etching, 292-M
oxidation, 581-M, 767-R, 768-R
plastic deformation, 856-Q
slip, 732-Q
strain aging, 856-Q, 1094-Q
tensile properties, 856-Q
x-ray diffraction, 433-M, 767-R
effect of deformation, 438-M
smelting, 125-A, 75-C, 227-C, 255-C, 438-C
by-products, 109-C
solid solutions
plastic deformation, 408-Q
stresses, 408-Q
thermodynamic properties, 411-P
specific heat, 502-P
effect of deformation, 210-P
spectrographic determination, 239-S, 240-S
standards and specifications, 60-S, 243-S
statistics and economics, 61-A
strain aging, 214-N, 516-N, 848-Q

Copper, (cont.)
stress-rupture properties and tests, 1225-Q
stresses
residual, 1433-Q
submerged arc welding, 227-K
surface roughness
measurement, 267-S
swaging, 189-F
systems
binary, 7-M, 78-M, 269-M, 283-N, 313-M, 345-M, 351-M, 366-M, 410-M, 557-M, 584-M, 585-M, 681-M
ternary, 53-M, 371-M, 540-M, 559-M, 610-M
tensile properties, 519-E, 47-Q, 1439-Q
effect of low temperature, 1274-Q
tensile properties and tests, 572-Q
texture, 78-N
thermal conductivity, 690-P, 330-T
thermal properties, 696-P
thermodynamic properties, 255-C, 392-P
thin films
density, 674-P
ultrasonic welding, 6-K, 360-K
use in buildings, 49-T, 50-T
use in springs, 330-T
vapor deposition on, 532-M, 467-N
vapor pressure
radioactive tracer study, 442-P
wear, 378-Q, 1337-Q, 1425-Q
wear properties and tests, 95-Q, 1205-Q
welding, 42-K, 77-K, 212-K, 590-K
weldments
corrosion
stress, 18-R
fatigue, 483-Q
tensile properties and tests, 483-Q
wire
clad
electrical conductivity, 571-P
physical properties
density, 571-P
tensile properties, 571-P
wiredrawing, 261-F, 278-F
x-ray diffraction, 707-M
effect of deformation, 300-M, 434-M
effect of irradiation, 430-M, 435-M
effect of stress, 436-M, 439-M
zone melting, 135-C, 264-C
Copper alloy extrusions
mechanical properties, 493-Q
Copper alloys, 327-A
annealing, 351-M
bright, 106-J, 318-J
applications, 541-A
chemical processing equipment, 80-T
Copper alloys, (cont.)
atomic structure, 10-N, 311-N
co-ordination number, 616-M
cavitation corrosion, 184-R
centrifugal casting, 186-E, 511-E
colorimetric analysis, 356-E, 300-S
corrosion, 1181-Q, 368-R, 809-R
atmospheric
tropical, 568-R
by fuels, 539-R
by inorganic acids, 303-R
by soils, 122-R, 261-R
by waters
fresh, 549-R
chemical
inorganic, 603-R
erosion, 642-R
fatigue, 1138-Q
galvanic, 230-R, 753-R
inhibition, 539-R
stress, 133-R, 639-R, 759-R
tropical atmosphere, 230-R
corrosion prevention, 642-R
corrosion tests, 539-R
stress-corrosion, 301-R
creep, 39-Q, 485-Q, 957-Q
crystal structure, 616-M, 107-Q
defects
surface, 297-E
dezincification, 254-R
diffusion, 10-N
dispersion hardening, 448-N
elastic properties, 330-T
Young's modulus, 311-N
elastic properties and tests, 263-T
electrical conductivity, 129-E, 322-J, 292-P, 308-P, 624-P, 1240-Q, 330-T
electrical properties, 311-N, 547-P
electroplating on
standards and specifications, 210-S
extraction and refining
induction melting, 142-C
fatigue
thermal, 1282-Q
fatigue strength, 1138-Q
fatigue tests
torsion, 765-Q
forming, 380-G
foundry practice, 432-E
melting, 129-E, 269-E
fracture
brittle, 1284-Q
tests, 319-Q
grain growth, 292-P
hardness and hardness tests, 1440-Q
heat transfer, 259-J

Copper alloys, (cont.)
heat treatment, 585-M
heating and cooling, 259-J
investment casting, 243-E
liquid
viscosity, 382-P
machinability, 1181-Q
machining, mechanical, 109-G
magnetic properties, 51-P
martensitic reactions, 441-N
mechanical properties, 466-A, 127-J, 448-N, 107-Q, 280-Q, 441-Q, 521-Q, 1181-Q, 1240-Q, 1284-Q, 200-T
effect of high temperature, 639-Q
microradiography, 211-M
oxidation, 773-Q, 233-R
effect of high temperature, 470-R
peritectoid reactions, 305-N
pickling, 790-L
plastic deformation, 485-Q
lines and bands, 765-Q
polishing
electrolytic, 710-L
powder metallurgy, 47-H
powders
sintering
effect of temperature, 48-H
precipitation, 127-J, 225-N
precipitation hardening, 127-J
aging, 322-J
presswork, 206-G
quenching, 351-M
recovery, 10-N
resistance welding, 25-K, 303-W
sand casting, 250-E
sand castings
electrical conductivity, 320-P
shell mold casting, 248-E
solid solutions
plastic deformation, 366-Q
solidification, 585-M
spectrographic analysis, 368-R
spot welding, 579-K
standards and specifications, 60-S, 297-S, 344-S
strain aging, 624-P
stress rupture properties and tests, 957-Q
superlattice formation, 311-N
surface tension, 251-P
tensile properties, 322-J, 773-Q
thermal conductivity, 230-T, 1240-Q
thermal diffusivity, 259-J
tubemaking
bending, 109-G
welding, 209-F
use in bearings, 186-E
Copper alloys, (cont.)
use in food processing equipment, 303-R
use in oil field equipment, 316-T
volume and dimensional changes, 1282-Q
wear, 1106-Q
wire
corrosion
abrasion, 740-R
by inorganic acids, 740-R
by waters, 740-R
corrosion prevention, 740-R
x-ray microscopy
effect of deformation, 159-M
Copper-aluminum alloys
colorimetric analysis, 394-S
effect of irradiation, 154-P
electrical resistivity, 154-P
fretting, 1312-Q
gas analysis, 379-S
hardness, 1312-Q
martensitic reactions, 426-N
microstructure
primary, 426-N
order-disorder
effect of radiation, 631-N
transformations
isothermal, 345-M
x-ray diffraction, 699-M
Copper-aluminum-titanium system, 196-M
Copper-aluminum-zinc alloy
crystal structure, 284-F
rolling
cold, 284-F
Copper-antimony system, 77-M
Copper-arsenic alloys
electrical conductivity
effect of deformation, 637-P
plastic deformation
slip
effect of composition, 667-Q
shear properties and tests, 667-Q
thermal conductivity
effect of deformation, 637-P
Copper bars and rods
standards and specifications, 263-S
Copper-beryllium alloys, 383-A
age hardening, 575-N, 641-Q
atomic structure
interatomic bond, 641-Q
crystal structure
texture and preferred orientation, 731-Q
ductility, 1481-Q
elastic properties, 641-Q
electrical conductivity, 434-A, 679-P, 1481-Q
electroplating on, 289-T

Copper-beryllium alloys, (cont.)
forming, 413-G
foundry practice, 413-G
hardness, 280-J, 641-Q, 1481-Q
history, 150-A
joining, 413-G
machining, 413-G
mechanical properties, 434-A
microstructure
primary, 280-J
mill practice, 413-G
mosaic structure, 222-M
phase diagrams, 575-N
precipitation, 222-M
precipitation hardening, 242-W
aging, 280-J, 575-N
tensile properties, 731-Q, 1481-Q
thermal conductivity, 1481-Q
torsion properties, 731-Q
transformations, 534-M
isothermal, 313-M, 452-N
use in conveyors, 242-W
use in die casting dies, 251-W
wear, 242-W
Copper-beryllium bearings, 289-T
Copper-bismuth alloys
electrodeposit structures, 334-N
Copper-boron alloys
powders
molding and compacting
rolling, 154-H
tubemaking
drawing, 154-H
Copper cable
electrical
ceramic coating on, 226-T
Copper-cadmium alloys
mechanical properties, 521-A
physical properties, 521-A
Copper castings
alloying
nickel, 122-E
degassing, 269-E, 294-E
electrical conductivity, 302-E, 704-P
mechanical properties, 122-E, 516-Q
mechanical properties and tests, 189-Q
microstructure, 189-Q
primary, 200-E
porosity, 269-E
solidification phenomena, 585-M
standards and specifications, 271-S, 308-S
structure control, 200-E, 553-E
Copper-chromium alloys
age hardening, 392-N, 31-Q
electrical conductivity, 31-Q
friction, 938-Q
Copper-chromium alloys, (cont.)
hardness and hardness tests, 31-Q
precipitation, 392-N
Copper-chromium-zirconium system, 196-M
Copper-cobalt alloys
electrical properties, 315-P
magnetic properties, 315-P, 714-P
precipitation hardening, 247-J
Copper converter practice, 69-B, 69-C
Copper die castings
machining
mechanical, 78-A
Copper electrodes
mechanical properties, 156-T
Copper electroplate
corrosion
atmospheric, 316-R
electron microscopy, 268-M
grain growth, 116-N
Copper foil
x-ray diffraction
effect of deformation, 437-M, 438-M
Copper-gallium alloys
superlattice formation, 283-N
Copper-gold alloys
anelastic properties, 436-Q
crystal structure, 90-M, 429-M
diffusion
sulphur, 155-N
elastic properties and tests
effect of radiation, 582-N
electrical conductivity
effect of radiation, 582-N
electrical properties, 493-N
grain boundaries, 235-M
intermetallic compounds
crystal structure, 235-M
order-disorder, 634-N
effect of radiation, 582-N
superlattice formation, 493-N
Copper-indium alloys
diffusion, 235-N
precipitation, 235-N
Copper industry
statistics and economics, 219-A
waste control, 341-C, 402-C
Copper ingots
standards and specifications, 271-S
Copper investment castings
tensile properties and tests, 653-Q
Copper-iron alloys
diffusion, 234-N
elastic properties and tests
effect of radiation, 582-N
electrical conductivity
effect of radiation, 582-N

Copper-iron alloys, (cont.)
order-disorder
effect of radiation, 582-N
precipitation, 234-N, 624-N
Copper-lead alloys
macrostructure, 628-P
surface tension, 628-P
use in bearings, 209-T, 269-T
Copper-manganese alloys
electrical properties, 315-P
magnetic properties, 315-P, 685-P
nuclear properties
resonance, 34-P
Copper-nickel alloys, 433-A
applications, 442-A
converter practice, 380-C
corrosion, 433-A, 442-A, 497-A, 347-N
corrosion by waters
sea, 497-A
diffusion, 229-M
electrical properties, 493-N
fretting, 1312-Q
hardness, 1312-Q
heat of reaction, 582-P
mechanical properties, 442-A, 347-N
microstructure
primary, 229-M
nuclear properties
resonance, 34-P
precipitation hardening
aging, 347-N
recrystallization, 347-N
specific heat
effect of low temperature, 314-P
superlattice formation, 493-N
x-ray diffraction, 662-M
Copper-nickel-iron alloys
intermetallic compounds
crystal structure, 308-M
magnetic properties, 470-P
coersive force, 308-M
Copper-nickel-manganese alloys
die casting, 253-T
Copper-nickel-silicon alloys
corrosion, 347-N
chemical
inorganic, 1268-Q
die casting, 253-T
ductility, 1268-Q
elastic properties, 1268-Q
electrical conductivity, 1268-Q
hardness, 1268-Q
mechanical properties, 347-N
precipitation hardening
aging, 347-N, 1268-Q
recrystallization, 347-N
tensile properties, 1268-Q
Copper ores
flotation, 9-B, 27-B, 29-B, 202-C, 228-C
fluid bed process, 98-B, 99-B
roasting, 32-B
sources, 33-A
Copper-palladium alloys
electrical conductivity, 678-P
superlattice formation, 368-N
thermodynamic properties, 405-P
Copper pipe
corrosion by soils, 173-R
Copper plate
hardness, 275-L
Copper powder, 69-W
compressibility, 70-H, 110-H
fatigue strength, 1542-Q
mixing and blending, 60-H
molding and compacting, 4-H
rolling, 85-H, 132-H, 133-H, 147-H
cold, 123-H
particle shape and size, 132-H, 133-H
properties, 119-H, 133-H, 448-N
sintering, 25-H, 97-T
tensile properties, 1542-Q
Copper powder compacts
diffusion, 140-H
infiltration
vacuum, 107-H
sintering, 4-H, 111-H, 123-H, 132-H, 135-H, 140-H, 152-H, 172-H
atmospheres, 88-H
vacuum, 107-H
volume and dimensional changes, 152-H
Copper powder metal
use in automobiles, 154-T
Copper powder metal parts
tensile properties, 451-Q
Copper scrap
processing, 115-B
Copper sheet
arc welding
gas shielded, 35-K, 397-K
compression properties, 50-G
gas welding, 35-K
roll bonding, 390-L
Copper-silicon alloys
fretting, 1312-Q
hardness, 1312-Q
oxidation, 769-R
internal, 55-R
Copper-silicon-zinc alloys
corrosion
stress, 1442-Q
dezincification, 1442-Q
tensile properties, 1442-Q

Copper-silver alloys
corrosion, 51-R
order-disorder, 217-N
single crystals, 217-N
solid solutions, 272-P
Copper strip
electrical conductivity, 132-H
tensile properties, 85-H, 132-H, 147-H
thermal properties, 376-P
Copper-tin alloys
cathodic protection, 423-R
corrosion, 809-R
by waters
sea, 423-R
fretting, 1312-Q
hardness, 1312-Q
macrostructure, 628-P
surface tension, 628-P
vapor deposition coating of, 680-L
Copper-tin compacts
growth during sintering, 53-H
Copper-tin system, 168-E
Copper-titanium alloys
age hardening, 359-N, 377-N
compression properties, 1383-Q
ductility, 1383-Q
electrical conductivity, 1383-Q
electrical properties, 377-N
hardness, 1383-Q
solidification shrinkage, 1383-Q
tensile properties, 1118-Q, 1383-Q
Copper tubing and pipe
arc welding, 224-K
corrosion
stress, 639-R
Copper weldments
tensile strength, 377-K
Copper wire
butt welding, 223-K
corrosion, 878-Q
corrosion prevention, 755-R
corrosion tests
immersion
total, 755-R
crystal structure
dislocations, 289-M
texture and preferred orientation, 311-M
dip coating, 193-L
electrical conductivity, 322-J, 596-Q
fracture, 878-Q
lubricants and oils, 755-R
mechanical properties, 596-Q
precipitation hardening
aging, 322-J, 289-M
quenching, 289-M
soldering, 193-L
Copper wire, (cont.)
tensile properties, 322-J
Copper-zinc alloys
corrosion, 809-R
diffusion, 229-M
diffusion of zinc, 298-N
electrical conductivity
effect of deformation, 637-P
electrical properties, 493-N
fretting, 1312-Q
hardness, 1312-Q
macrostructure, 628-P
microstructure
primary, 229-M
superlattice formation, 493-N
surface tension, 628-P
thermal conductivity
effect of deformation, 637-P
Copper-zinc-nickel alloys
specific heat
effect of low temperature, 371-P
superlattice formation, 239-N
Copper-zinc system, 254-R
Corrosion, 451-A, 710-K, 36-L, 503-L, 597-L, 3-R, 26-R, 89-R, 91-R, 142-R 587-R, 467-S
atmospheric, 61-R, 90-R, 401-R, 715-R
effect of radiation, 429-R
marine, 52-L, 135-L
test methods, 714-R
tropical, 533-R
biological, 221-R
blistering and exfoliation, 251-R, 328-R
by alcohols, 120-R
by chemicals
inorganic, 128-R, 163-R
by fuels, 27-R, 47-R, 360-R
by halogen compounds, 290-R
by inorganic acids, 274-D, 70-R, 165-R
effect of high temperature, 293-R
effect of pressure, 191-R
effect of radiation, 294-R
effect of temperature, 191-R
by lubricants, 22-R
by molten metals, 139-R, 732-R, 9-T
by soils, 91-R, 94-R, 99-R, 102-R, 103-R, 104-R, 105-R, 106-R, 122-R, 143-R, 173-R, 203-R, 259-R, 261-R, 780-R
by sulphur compounds, 27-R
by waters, 36-R, 107-R, 109-R, 404-R, 533-R
boiler, 48-R, 141-R, 282-R, 595-R
inhibition, 325-R
fresh, 47-T
sea, 135-L, 847-Q, 184-R, 329-R, 524-R, 776-R

Corrosion, (cont.)
chemical, 51-R
inorganic, 77-R, 497-R, 514-R
effect of high temperature, 806-R
effect of irradiation, 264-R
effect of radiation, 575-R
effect of temperature, 21-R
organic, 164-R, 267-R, 398-R, 497-R, 547-R
concentration cell, 721-R
design, 235-R, 652-R
effect of high temperature, 255-R, 388-R, 627-R
effect of radiation, 78-R, 206-R
erosion, 516-R
galvanic, 144-L, 50-R, 124-R, 134-R, 231-R, 322-R, 693-R, 720-R, 776-R
inhibition, 254-P, 15-R, 29-R, 30-R, 43-R, 44-R, 45-R, 48-R, 50-R, 63-R, 113-R, 135-R, 282-R, 353-R, 359-R, 436-R, 512-R, 711-R, 777-R
intergranular, 732-R
effect of heat treatment, 288-R
tests, 375-R
metal transfer, 3-Q, 114-R, 284-R
research, 47-A, 205-R, 387-R, 439-R, 629-R, 636-R, 690-R
scaling, 15-R
stray current, 9-R, 93-R, 98-R, 155-R
stress, 2-R, 13-R, 40-R, 133-R, 327-R, 336-R, 374-R, 412-R, 475-R, 659-R
tarnishing, 447-R
Corrosion fatigue, 847-Q, 484-R
Corrosion prevention, 151-L, 522-L, 15-R, 28-R, 31-R, 33-R, 34-R, 50-R, 118-R, 123-R, 142-R, 153-R, 775-R
automobiles
bodies, 415-R
biological, 221-R
packaging and wrapping, 45-R, 72-R, 125-R, 126-R
removable coatings, 260-L
Corrosion resisting materials, 116-A, 381-A, 442-A, 446-A, 470-A, 496-A, 497-A, 499-A, 516-A, 518-A, 519-A, 447-G, 253-J, 659-K, 594-L, 881-Q, 1182-Q, 1455-Q, 448-R, 469-R, 525-R, 545-R, 568-R, 737-R, 792-R, 809-R
aluminum, 245-R
machining, 431-G
magnesium 245-R
mechanical properties, 497-R
Corrosion testing equipment, 337-R, 381-R, 671-R, 69-X
autoclaves, 64-R, 38-X, 42-X
corrosion
stress, 460-R
Corrosion tests, 185-L, 10-R, 222-R, 270-R, 306-R, 337-R, 403-R, 514-R, 685-R, 183-S
artificial weathering, 56-R, 286-R
electrical, 152-R
electrochemical, 14-R, 36-R, 43-R, 94-R, 104-R, 132-R
equipment, 382-R, 552-R
high humidity and condensation, 82-R, 90-R, 154-R
immersion
alternate, 248-R
salt spray, 56-R, 286-R
standards and specifications, 780-Q, 140-R
Cowpers, 213-W, 308-W
Cranes, 62-W
arc welding
repair, 537-K
lubrication, 54-F
welding, 114-K
Cranes and elevators
materials, 216-W
Crankcases
aluminum, 101-E
Crankshafts
cast iron
nodular, 329-Q
Creep, 54-N, 491-P, 60-Q, 75-Q, 158-Q, 200-Q, 241-Q, 265-Q, 330-Q, 331-Q, 449-Q, 485-Q, 499-Q, 502-Q, 503-Q, 507-Q, 508-Q, 524-Q, 628-Q, 891-Q, 1006-Q, 1030-Q, 1266-Q, 1354-Q
effect of deformation, 685-Q
effect of heat treatment, 463-Q
effect of high temperature, 149-Q
effect of radiation, 1272-Q
effect of stress, 287-M, 149-Q, 230-Q
grain boundaries, 448-Q
rate
effect of high temperature, 147-Q
testing equipment, 822-Q
Creep buckling test, 158-Q, 686-Q
Creep properties and tests, 1159-Q
effect of temperature, 1362-Q
Creep strength, 35-Q, 1496-Q
effect of grain size, 231-Q
effect of high temperature, 186-M, 147-Q, 349-Q
effect of temperature, 231-Q
theory, 636-Q
Creep tests
stress relaxation, 598-Q, 794-Q, 876-Q
Crucible furnaces, 147-W
Crucibles and pots, 317-C, 320-C, 644-D, 299-E, 1049-Q, 332-W
columbium, 139-W

Crucibles and pots, (cont.)
crystal structure, 436-W
metal spraying, 427-L
uranium, 139-W
Cryostats, 1476-Q
Crystal structure, 31-M, 61-M, 168-M, 468-M, 469-M, 486-M, 514-M, 637-M, 63-N, 142-P, 589-P, 1134-Q, 12-X, 87-X
dislocations, 36-M, 39-M, 233-M, 285-M, 287-M, 321-M, 353-M, 381-M, 385-M, 386-M, 443-M, 449-M, 450-M, 500-M, 518-M, 626-M, 629-M, 200-Q, 476-Q, 499-Q, 705-Q, 712-Q, 769-Q, 770-Q, 811-Q, 903-Q, 1156-Q, 1409-Q, 374-R
effect of deformation, 347-M
effect of stress, 632-M
single crystals, 4-M, 5-M
effect of heat treatment, 490-M
effect of impurities, 215-M
effect of low temperature, 405-Q
effect of radiation, 638-M
imperfections, 24-M, 48-M, 283-M, 284-M, 285-M, 287-M, 301-M, 350-M, 407-M, 443-M, 455-M, 464-M, 500-M, 650-M, 628-Q
effect of heat treatment, 191-M
effect of low temperature, 282-M
effect of temperature, 21-M
texture and preferred orientation, 170-M, 201-M, 245-M, 474-M, 573-M, 360-N, 1208-Q, 89-X
tests, 318-M
Crystallization, 228-N, 679-N
Cupolas, 102-A, 79-E, 321-E, 383-E, 390-E, 534-E, 10-W, 81-W, 134-W, 213-W, 270-W, 280-W, 301-W, 346-W, 349-W, 367-W, 386-W, 417-W, 434-W
cooling equipment, 145-W
design, 102-W
plant layout, 128-W
refractory linings, 28-W
basic, 210-W
Cutlery
presswork, 206-G
Cutting, 138-G

D

Dairy equipment
materials
aluminum alloys, 335-K
stainless steel, 210-T
Damping properties, 273-Q, 1156-Q, 78-X
effect of temperature, 253-Q
Damping properties and tests, 33-Q, 1007-Q
Decarburization, 53-J, 86-J, 87-J, 98-J, 245-J
Defects
surface, 253-S
flaw detection
ultrasonic, 272-S
Degreasing, 433-L, 446-L, 750-L
equipment, 768-L
vapor, 388-L
Dendritic growth, 188-N
Deoxidizers, 132-D, 461-E
Diamonds, 65-G
Die casting, 27-E, 28-E, 29-E, 61-E, 89-E, 108-E, 130-E, 140-E, 177-E, 235-E, 402-E, 2-W
design, 326-E
equipment, 137-E, 199-E, 291-E, 409-E
lubricants and oils, 357-E, 507-E
tolerances, 93-E
vacuum, 195-E, 315-E
equipment, 158-E
Die casting dies, 130-E, 312-G, 32-W, 251-W, 393-W
design, 184-W, 209-W
materials
molybdenum, 336-W
molybdenum alloys, 327-W
Die casting practice, 298-E
Die castings
cleaning, 491-E
design, 125-E, 160-E
porosity, 274-E
standards and specifications, 264-S
use in missiles, 92-T
Die sinking
automation, 100-G
Dies
forging, 108-W
arc welding
repair, 537-K
chromium plated, 33-W
design, 145-F
materials
nickel alloys, 424-W
forming, 439-A, 21-F, 41-F, 54-G, 125-G, 297-G, 324-G, 401-G, 311-J, 59-L, 965-Q, 239-T, 46-W, 48-W, 50-W, 51-W, 170-W, 187-W, 230-W, 252-W, 269-W
aluminum bronze, 166-W
cemented carbide, 70-W
copper alloys, 166-W
design, 84-W
hardness, 394-W
heat treatment, 45-J, 394-W, 398-W

Dies, forming, (cont.)
machining
spark, 126-G
materials
alloy steel, 423-W
toolsteel, 279-W
plastic, 115-G, 31-W
steel, 178-W
Diffusion, 615-K, 284-M, 160-N, 184-N, 267-N, 276-N, 455-N, 554-N, 557-N, 596-N, 671-N, 728-P, 628-Q, 74-R
effect of deformation, 49-N, 260-N, 381-N
effect of irradiation, 260-N
in alloy systems, 132-N, 158-N
interfacial, 136-H, 285-N, 652-N
measurement, 11-B, 145-B, 370-N
use of tracers, 142-N
radioactive tracer study, 6-N, 84-N, 166-N, 176-N, 177-N, 179-N, 394-N, 599-N
self, 136-H, 50-N, 158-N, 174-N, 373-N, 382-N
effect of vacancies, 86-N
radioactive tracer study, 167-N, 203-N, 526-N, 600-N
testing equipment, 398-N, 556-N
Diffusion bonding, 193-K
Diffusion coated metal
oxidation
effect of high temperature, 273-R
Diffusion coating, 10-H
Dilatometry, 95-M, 309-M, 87-N, 47-X
Dip coated parts
painting, 27-L
structure, 165-M
Dip coating, 106-L, 118-L, 293-L, 498-L, 536-L
Dispersion hardening, 72-H, 84-H
Distortion
effect of heat treatment, 236-P
weldments, 580-K
Drawing, 161-F, 142-G
cold, 251-F
deep, 57-G, 146-G, 232-G, 334-G, 364-G, 402-G
lubricants and oils, 37-G
press forming, 334-G
rods and shapes, 126-F
Drilling and reaming, 55-G, 74-G, 88-G, 322-G, 122-T, 254-T
lubricants, 118-G
ultrasonic, 421-K
Drills, 74-G, 322-G
percussion and rock, 253-T
Ductility, 215-F, 267-F, 54-N, 770-Q, 1257-Q, 1423-Q
Ductility, (cont.)
size and shape effects, 896-Q
test specimens, 896-Q
tests, 1008-Q
Dysrosium, 243-P
powder metallurgy, 105-H

E

Earth-moving equipment
arc welding
submerged arc, 458-K
heat treatment
flame, 131-J
Elastic and anelastic properties
instrumentation, 753-Q
Elastic properties, 62-Q, 807-Q, 1136-Q
Poisson's ratio, 711-Q, 747-Q, 748-Q
effect of stress, 328-Q
shear modulus, 212-Q, 326-Q
Young's modulus, 215-F, 212-Q, 235-Q, 259-Q, 273-Q, 753-Q, 872-Q, 78-X
testing equipment, 170-Q
Elastic properties and tests, 1007-Q, 1370-Q
Electric arc furnaces, 136-B, 38-C, 124-C, 271-C, 282-C, 6-D, 38-D, 180-D, 190-D, 261-D, 347-D, 545-D, 14-W, 66-W, 83-W, 188-W, 241-W, 260-W, 309-W, 320-W
automation, 432-W
crucibles, 193-W
refractory linings, 206-W, 371-W
vacuum, 229-C, 304-W, 324-W, 325-W, 396-W
Electric arc steelmaking, 580-A, 2-D, 3-D, 6-D, 24-D, 34-D, 38-D, 57-D, 71-D, 150-D, 180-D, 190-D, 268-D, 329-D, 373-D, 374-D, 401-D, 453-D, 459-D, 482-D, 518-D, 545-D, 619-D, 646-D, 428-E
alloying, 640-D
charging and melting, 21-D, 54-D, 347-D, 386-D, 452-D, 66-W
vacuum, 261-D, 615-D
cost, 241-W
deoxidation, 284-D, 577-D
prices and cost studies, 598-D
refining and finishing, 437-D, 523-D
stirring, 655-D, 692-D
vacuum, 258-D
Electric furnace smelting
nonferrous, 619-D
Electric induction furnaces, 261-D, 556-D, 260-E, 421-E, 424-E, 10-J, 26-W, 56-W, 83-W, 143-W, 218-W, 318-W, 332-W

Electric induction furnaces, (cont.)
refractory linings, 160-W
vacuum, 141-C, 142-C, 268-W, 396-W
Electric induction steelmaking, 21-D, 200-D, 225-D, 265-D, 316-D, 386-D, 503-D, 529-D, 646-D, 421-E
deoxidizers, 446-D
prices and cost studies, 598-D
refractories
basic, 480-D
vacuum, 261-D, 446-D, 622-D, 668-D, 669-D
Electric motors, 378-E, 273-K
repair, 83-K
Electric steel, 401-D, 430-P
fatigue, 270-T
machining
mechanical, 452-G
magnetic properties, 415-P, 416-P
spectrographic analysis
testing equipment, 435-S, 436-S
tensile properties, 270-T
torsion properties, 270-T
Electrical and electrochemical properties, 105-L, 58-P, 149-P, 282-P
Electrical and electronic equipment, 160-A, 580-A, 61-E, 179-E, 499-E, 535-E, 6-G, 24-H, 8-K, 235-P, 722-P, 235-T
electroforming, 596-L
electroplating on, 434-L, 460-L
heat transfer, 230-T
magnesium, 159-T
materials, 93-T, 95-T, 102-T
molybdenum, 174-G, 216-T
titanium, 275-T
metal spraying on, 434-L
standards and specifications, 311-S
steels for, 96-T
ultrasonic cleaning, 469-L
Electrical conductivity, 223-P, 498-P, 602-P, 644-P, 647-P
effect of low temperature, 323-P, 609-P
effect of magnetic field, 202-P
effect of stress, 269-P
effect of structure, 293-P
tests, 351-P, 1259-Q
Electrical contact metals, 67-H
Electrical instruments, 53-X
Electrical properties, 448-M, 483-P
contact potentials, 450-P
Electrical resistance metals, 442-A, 297-T
Electricity, 167-D
Electrochemical properties, 337-P, 709-R, 711-R
books, 217-A
Electrochemistry
ionization potential, 251-L, 212-P, 475-P
radioactive tracer study, 172-P
Electrodeposit structures, 499-L
Electrodes, 116-S, 90-T
welding
coated, 209-K
Electroforming, 332-L, 734-L
Electrolytes
reclamation, 100-A, 584-A
Electromagnets, 186-T
Electron beam melting
equipment, 271-C, 440-C
vacuum, 441-C
Electron beam welding, 304-C, 234-K, 372-K, 554-K, 598-K, 599-K, 686-K
equipment, 530-K, 531-K
vacuum, 398-K
Electron diffraction, 44-M, 83-M, 271-M, 392-M, 537-Q, 12-X
Electron emission, 124-P, 149-P, 150-P, 513-P, 645-P
effect of magnetic field, 288-P
Electron microscopy, 13-M, 17-M, 44-M, 242-M, 267-M, 322-M, 349-M, 392-M, 397-M, 409-M, 446-M, 505-M, 523-M, 531-M, 656-M, 701-M, 320-Q, 712-Q, 174-R
bibliographies, 470-M
equipment, 565-M, 79-X
specimen preparation, 130-M
Electronic equipment
chemical reduction coating, 298-L
electroplating, 282-L
materials, 98-T
Electrophoretic plating, 153-L, 554-L, 758-L
Electroplate
atomic structure, 613-Q
corrosion
atmospheric, 176-R
crystal structure, 613-Q
microstructure
primary, 170-N
stresses, 613-Q
surface roughness
measurement, 17-X
Electroplated metal
corrosion
atmospheric, 538-L, 530-R
crystal structure, 244-N
ductility, 595-L
finishing, 538-L
hardness, 595-L
size, thickness and mass measurement, 538-L
soldering, 459-L

Electroplated metal, (cont.)
stresses, 595-L
use in missiles, 46-L
Electroplating, 141-A, 24-L, 49-L, 56-L, 58-L, 67-L, 83-L, 105-L, 171-L, 222-L, 435-L, 499-L, 513-L, 554-L, 568-L, 655-L, 658-L, 244-N, 337-P, 79-T, 13-X
automation, 5-F, 196-L, 197-L, 200-L, 201-L, 205-L
baths, 32-L, 60-L, 66-L, 219-L, 251-L, 277-L, 405-L, 534-L, 576-L, 147-S
composition analysis, 192-L
effect of impurities, 57-L, 404-L
control, 120-L, 532-L, 533-L, 576-L, 701-L, 817-L
design, 819-L
equipment, 409-L
instrumentation, 46-X
plant layout, 47-L, 370-L
porosity, 580-L
properties and tests, 63-L, 114-L, 246-L, 533-L, 595-L, 818-L
quality control, 108-L
Russia, 557-L
safety, 370-L
tests, 397-L
waste control, 50-A, 73-A, 81-A, 225-A, 226-A, 246-A, 343-A, 344-A, 403-L
Electroslag welding, 45-K, 54-K, 192-K, 269-K, 709-K, 720-K, 363-W
equipment, 44-K, 268-K, 390-K
design, 519-K
Electrowinning equipment
corrosion
chemical
inorganic, 407-W
Embossing, 54-G
Endurance testing, 377-Q
Energy of activation, 455-N, 162-P, 443-P
Engineering
mechanical
glossary, 215-A
handbook, 215-A
Erbium
heat of reaction, 494-P
Etching
cathodic, 94-M
waste control, 132-A
Eutectics
formation, 135-M, 64-N, 188-N
Evaporation
of metals, 460-N, 654-N
Explosive cutting, 278-G
Explosive forming, 153-G, 177-G, 224-G, 225-G, 226-G, 227-G, 238-G, 239-G, 243-G, 267-G, 284-G, 347-G, 363-G, 364-G, 372-G, 384-G, 393-G, 435-G
equipment, 362-G
Explosive hardening, 202-G
Explosives, 238-G
Extraction and refining, 143-B, 43-C
arc melting
ultrasonic, 323-C
vacuum, 217-C, 224-C, 229-C
decomposition, 68-B
degassing
vacuum, 215-C
distillation, 169-C
vacuum, 225-C
electrolytic, 120-C, 472-C, 105-L, 337-P
electron beam melting, 223-C
electron-bombardment melting, 134-C
electrolytic, 472-C
high purity, 83-C
induction melting
vacuum, 216-C, 224-C
ion exchange, 137-C, 154-C
leaching, 118-C
melting
vacuum, 215-C, 235-T
precipitation
equipment, 357-C
skull melting
vacuum, 220-C
solvent extraction, 58-C
thermodynamic properties, 235-C
zone melting
equipment, 162-C
Extrusion, 21-F, 246-F, 254-F, 295-F, 445-G, 119-K
direct, 124-F
effect of pressure, 814-Q
equipment, 136-F, 194-F
hot, 255-F
impact and cold, 161-F, 76-G, 105-G, 194-G, 220-G, 232-G, 282-G, 412-G, 432-G, 445-G
equipment, 121-F
lubricants and oils, 191-F
inverted, 11-F
lubricants and oils, 82-F, 191-F
Extrusions
defects, 124-F
use in aircraft engines, 63-T

F

Fans and blowers, 10-W
Fasteners, 41-H

Fasteners, (cont.)
chromium electroplating on, 210-L
materials, 182-T
titanium, 324-T
stainless steel, 166-T
steel, 168-L
tumbling, 316-L
Fatigue, 159-G, 340-Q, 359-Q, 403-Q, 419-Q, 446-Q, 476-Q, 785-Q, 824-Q, 1508-Q, 164-T
cracks, 339-Q
effect of deformation or strain, 348-Q
effect of history, 348-Q
effect of stress, 218-Q, 253-Q, 348-Q, 498-Q, 531-Q
research, 1306-Q
size and shape effects, 352-Q
test specimens, 214-Q
testing
high temperature, 215-Q
testing equipment, 213-Q
thermal, 504-Q, 506-Q, 1117-Q, 1371-Q
testing equipment, 585-Q
tests, 910-Q
Fatigue life, 172-Q, 341-Q, 351-Q, 353-Q, 954-Q
effect of aging, 415-Q
effect of pressure, 217-Q
effect of residual stress, 347-Q
effect of stress, 496-Q, 520-Q
statistical analysis, 342-Q, 345-Q
Fatigue properties and tests, 353-M, 49-Q 50-Q, 51-Q, 58-Q, 60-Q, 721-Q, 739-Q, 742-Q, 782-Q, 903-Q, 968-Q, 1057-Q, 1403-Q
statistical analysis, 1139-Q, 1467-Q
testing equipment, 869-Q, 1140-Q
ultrasonic, 888-Q, 932-Q
Fatigue strength, 91-G, 236-L, 491-P, 341-Q, 343-Q, 519-Q, 524-Q, 1326-Q, 1456-Q
effect of grain size, 1299-Q
effect of high temperature, 349-Q
effect of peening, 627-Q
effect of size and shape, 497-Q
effect of stress, 254-Q
notch sensitivity, 352-Q
statistical analysis, 342-Q
Fatigue testing equipment, 462-Q
Fatigue tests, 346-Q, 351-Q
rotating beam, 344-Q, 823-Q
equipment, 514-Q
torsion, 344-Q
variable stress, 1-Q, 344-Q, 505-Q, 1083-Q
Ferrites
magnetic properties, 437-P
Ferrites, (cont.)
sintering, 79-H
Ferroalloys, 227-E
extraction and refining, 352-C
melting
electric arc furnaces, 352-C
Ferrochromium, 204-D
carbon-free, 103-C
decarburization, 254-J
extraction and refining, 244-C
nitriding, 328-J
Ferrocolumbium
spectrographic analysis, 239-S
Ferromagnetic alloys
heat treatment, 194-J
Ferromanganese, 131-C, 170-D, 215-W
extraction and refining, 244-C
nitriding, 328-J
Ferrosilicon
analysis, 160-S
extraction and refining, 244-C
melting
blast furnace practice, 352-D
blast furnace smelting, 122-D, 123-D
electric furnace smelting, 123-D
Ferrotitanium
production, 214-C
Ferrous metals
research, 341-A
Fiber metallurgy, 87-H, 143-H, 51-W
Finishing, 135-L, 195-L, 452-L, 479-L, 491-L, 555-L
glossaries, 208-L, 349-L
handbooks, 207-L, 208-L
patents, 641-L
review, 162-L
waste control, 232-A
Finishing equipment, 72-W
design, 189-L
mechanical, 198-G
ultrasonic, 25-W
equipment
shot, chip and balls, 284-L, 709-L, 15-W, 69-W, 300-W
Finishing industry
waste control, 354-A
Flame and arc cutting, 19-G
fluxes and slags, 237-G
Flame cleaning, 8-E, 809-L
Flame cutting, 175-E, 39-G, 93-G, 102-G, 170-G, 210-G, 290-G, 405-G, 199-M, 387-W
equipment, 211-E, 103-G, 303-G
surface defects, 355-G
Flash welding, 67-K
design, 310-K
equipment, 116-K

Flaw detection, 356-Q, 85-S, 225-S, 472-S
magnetic flux, 271-P
magnetic induction, 2-S, 3-S, 169-S, 186-S, 351-S
testing equipment, 428-S
magnetic particle, 42-S, 164-S, 215-S, 280-S
optical, 149-S, 201-S, 252-S, 253-S, 281-S
testing equipment, 365-S
penetrant, 444-S
radioactive tracer study, 381-S
radiographic, 39-S, 40-S, 127-S, 145-S, 222-S, 237-S, 242-S, 293-S, 439-S, 474-S
testing equipment, 359-W
ultrasonic, 427-A, 159-S, 223-S, 228-S, 229-S, 247-S, 305-S, 315-S, 407-S, 437-S, 465-S
equipment, 266-S
testing equipment, 386-S
Flaw detection equipment, 229-S, 37-X
Magnaflux, 294-S
x-ray, 265-S, 40-X, 44-X
Fluorine
determination, 199-S
Fluxes and slags, 87-D, 388-E, 18-J, 299-K
activity coefficient, 536-D, 54-P, 464-P
analysis, 220-S
books, 217-A
composition analysis, 98-S
density, 214-P
diffusion
measurement, 45-D
electric furnace smelting, 447-C
electrical and electrochemical properties, 54-P
electrical conductivity, 45-D, 213-P
electrochemical properties, 161-P
radioactivity, 309-P
reclamation, 181-A, 325-A, 90-L
solubility, 45-D
spectrographic analysis
testing equipment, 274-S
steelmaking, 463-D
surface tension, 505-P
Foil
metallography
specimen preparation, 535-M
spot welding, 687-K
Food processing equipment, 5-R, 25-R
corrosion, 121-R, 442-R
corrosion prevention, 438-R
materials
copper alloys, 303-R
stainless steel, 303-R
Forge welding, 109-K, 374-K
roll, 202-F, 51-K
Forgeability, 293-F
tests, 111-F
Forges
press, 176-F, 119-K, 198-W
Forging, 67-F, 198-F
automation, 68-F
history, 136-A
hot, 48-F
lubricants and oils, 143-F
Forging equipment, 368-A, 469-Q, 201-W, 259-W, 260-W
automation, 198-W
handling accessories, 99-W
Forging practice, 17-F, 18-F, 74-F, 84-F, 128-F, 161-F, 175-F, 176-F, 215-F, 224-F, 254-F, 267-F, 39-G, 154-G, 119-K
automation, 30-F, 75-F, 177-F
drop, 145-F, 125-G
hollow, 38-F
plant layout, 30-F
stress analysis, 167-F, 237-F
upsetting, 32-F, 228-F
lubricants and oils, 191-F
Forgings
flakes, 430-N
flaw detection
radiographic, 184-S
ultrasonic, 184-S
fracture, 191-Q
heat treatment, 58-J
induction, 10-J
mechanical properties, 191-Q
microstructure
primary, 58-J
turning, 97-G
Formability, 224-G
Forming, 15-F, 221-G, 170-W
cold, 215-G
lubricants and oils, 190-F
Forming and machining, 277-A
effect of temperature, 141-G
explosive forming, 110-G
Russia, 191-G
Forming equipment, 334-A, 221-G
automation, 53-W
mandrels and punches, 112-W, 187-W, 347-W, 965-Q
Foundries, 103-W
cooling equipment, 344-W
cost studies, 106-A
plant management, 425-A
safety, 236-E
waste control, 105-A
Foundry equipment, 118-E, 264-E, 422-E,

Foundry equipment, (cont.)
2-W, 55-W, 145-W, 149-W, 183-W, 298-W, 316-W, 351-W
automation, 181-E
layout, 285-E
mixers and ladles, 2-B, 291-E, 311-E
refractory linings, 281-W
plant layout, 391-W
vacuum, 315-E
Foundry furnaces, 164-W
vacuum, 268-W
Foundry industry
professional activities, 198-A
statistics and economics, 198-A
Foundry molds and cores, 304-E, 389-E, 146-W. 205-W, 212-W, 329-W, 333-W
porosity and permeability, 104-E
Foundry ovens, 37-W
Foundry pattern making, 17-E, 170-E, 223-E, 237-E, 238-E, 282-E, 286-E, 370-E, 389-E
design, 425-E
history, 94-E
mercury, 46-E
plastics, 523-E
Foundry patterns, 350-W, 364-W
Foundry practice, 4-A, 12-A, 15-A, 199-A, 18-E, 40-E, 69-E, 188-E, 215-E, 241-E, 264-E, 289-E, 322-E, 330-E, 435-E, 455-E, 575-E, 279-F, 100-S, 351-W
air furnace, 55-E, 85-E
automation, 288-E, 422-E, 456-E
binding, 126-E
centrifugal casting, 178-W
chilling, 119-E
coremaking, 9-E, 17-E, 57-E, 172-E, 194-E, 479-E
baking, 172-E
cupola, 13-A, 14-A, 3-B, 349-D, 433-D, 4-E, 16-E, 19-E, 47-E, 79-E, 110-E, 116-E, 133-E, 156-E, 210-E, 273-E, 295-E, 296-E, 308-E, 319-E, 321-E, 338-E, 348-E, 380-E, 381-E, 382-E, 383-E, 390-E, 438-E, 442-E, 454-E, 513-E, 534-E, 551-E, 558-E, 561-E, 564-E, 567-E, 578-E, 28-W, 137-W, 301-W, 386-W
automation, 533-E
desulphurizers, 489-E
fluxes and slags, 471-E
pressure control, 405-E
refractories, 406-E
use of coal, 316-E
defects, 403-E
design, 404-E, 437-E, 549-E
dictionary, 98-E
Foundry practice, (cont.)
electric, 619-D, 19-E
electric induction, 421-E
gating, 495-E
radioactive tracer study, 354-E
Germany, 106-A
handbooks, 99-E
heading, 143-E
history, 427-E
industrial relations
job training, 154-A
materials handling, 306-A
melting, 214-D, 111-E, 196-E, 263-E, 301-E, 411-E, 457-E, 517-E, 581-E, 300-J
electric, 260-E
vacuum, 474-A, 252-C, 358-E, 360-E
molding, 26-E, 104-E, 105-E, 149-E, 154-E, 237-E, 249-E, 367-E, 422-E, 498-E, 517-E, 340-W
automation, 60-E, 234-E
dry sand method, 126-E, 171-E, 174-E
equipment, 480-E
green sand, 506-E
green sand method, 64-E, 96-E, 118-E, 171-E
equipment, 173-E
shell, 5-E, 41-E, 159-E, 174-E, 248-E, 318-E, 516-E
automation, 285-E
molds, 178-W
pilot plants, 481-E
plant layout, 150-E, 65-W
plant management, 361-E
pouring, 209-E, 231-E, 244-E, 291-E, 304-E, 311-E, 366-E, 537-E
professional activities, 197-A
quality control, 530-E
radioactive tracer study, 387-A
research, 101-A, 299-A, 546-A, 490-E
rigging, 54-E, 120-E, 223-E, 403-E
risering, 2-E, 49-E, 163-E, 224-E, 231-E
shell mold casting, 142-E
statistical analysis, 91-E, 202-S
statistical control, 192-S
statistics and economics, 182-A
temperature measurement, 93-X
testing equipment, 481-E, 365-S
ventilation equipment, 328-W, 352-W
waste control, 330-A, 367-A
Foundry sand
handling equipment, 37-W
automation, 78-W
properties and tests, 103-E
Foundry sand technology, 23-E, 180-E, 325-E, 542-E

Foundry sand technology, (cont.)
binding, 26-E, 115-E, 149-E, 176-E, 178-E, 475-E
properties and tests, 1-E, 6-E, 7-E, 11-E, 12-E, 20-E, 73-E, 109-E, 176-E, 290-E
Fractography, 264-M, 252-Q
Fracture, 264-M, 409-M, 62-Q, 152-Q, 195-Q, 330-Q, 343-Q, 476-Q, 532-Q, 562-Q, 824-Q, 902-Q, 1017-Q, 1141-Q, 1208-Q, 1301-Q
brittle, 141-N, 199-Q, 322-Q, 662-Q, 751-Q, 813-Q, 1017-Q, 1180-Q, 1409-Q, 1418-Q, 1468-Q, 1541-Q, 374-R
effect of temperature, 153-Q
hydrogen, 165-Q
test methods, 1324-Q
tests, 1018-Q
crack propagation, 196-Q, 356-Q, 558-Q, 643-Q, 771-Q, 1019-Q, 1180-Q
effect of deformation, 685-Q
effect of stress, 1506-Q
microcrack formation, 356-Q, 785-Q, 828-Q, 903-Q
testing equipment, 588-Q, 837-Q
tests, 558-Q
Free energy, 1291-Q
Free machining metals, 515-A, 314-G
foundry practice, 341-E
Free machining steel
machinability, 204-G
Fretting, 79-Q, 519-Q, 1201-Q, 1508-Q
Friction, 80-G, 249-Q, 283-Q, 320-Q, 452-Q, 1202-Q, 1203-Q, 1204-Q, 1217-Q, 1228-Q, 1421-Q, 1509-Q
testing equipment, 397-Q, 897-Q
Friction welding, 553-K, 700-K, 702-K
repair, 703-K
Fuels
liquid, 167-D, 299-D
processing
gaseous, 70-B
solid, 167-D
powder metals, 38-H, 91-T
Furnaces
melting, 205-C, 449-D, 263-E, 169-W, 348-W
batch, 443-W
costs, 13-W
crucible, 373-W
design, 442-W
equipment, 137-W
graphite bar, 203-W
lubricants and oils, 31-D
refractories, 278-W
nonmetallurgical, 70-R, 135-W
Furnaces, (cont.)
preheating, 89-W, 177-W, 224-W, 262-W, 289-W, 369-W, 395-W, 441-W
combustion control, 355-S
design, 419-W
induction, 383-W
smelting
refractories, 278-W
Furniture, 793-L
aluminum, 53-T

G

Gadolinium
heat of reaction, 494-P
powder metallurgy, 105-H
spectrographic analysis, 29-S
thin films
optical properties, 700-P
Gages
magnesium, 119-W
roughness, 316-S, 17-X
thickness
ultrasonic, 238-S
Gallium
determination, 141-S
diffusion in aluminum, 471-N
dilatometry, 489-M
electrical conductivity, 134-P, 244-P
extraction and refining
electrolytic, 299-C
microstructure
primary, 558-M
phase diagrams, 489-M
single crystals
electrical conductivity, 263-P
thermodynamic properties, 263-P
solid solutions
hardness tests
diamond pyramid, 143-Q
spectrographic analysis, 104-S
statistics and economics, 62-A
systems
binary, 18-M, 384-M, 283-N
complex, 570-M
ternary, 314-M, 315-M
Gallium alloys
composition analysis, 62-S
Gallium-aluminum-antimony system, 103-M
Gallium-antimony alloys
magnetic properties, 600-P
Gallium-arsenic alloys
electrical conductivity, 280-P
etching, 96-M
hall effect, 280-P
semiconductors, 140-P

Gallium arsenide
vapor pressure, 153-P
Gallium-indium
electrical conductivity, 244-P
Gallium phosphide
vapor pressure, 153-P
Gallium-tin alloys
electrical conductivity, 244-P
Galvanizing, 534-A, 87-L, 90-L, 364-L
cold, 630-L
fluxes and slags, 696-L
history, 553-L
Gas
blast furnace, 172-A, 634-D
Gas analysis, 296-S, 363-S
testing equipment, 433-S
Gas regulators and mixers, 96-X
Gas turbines
blades
cast, 110-T
Gas welding, 27-K
defects, 355-K, 500-K
equipment, 115-K
oxy-acetylene, 749-L
pressure, 222-K
waste control, 68-A
Gases
diffusion in uranium, 629-P
production, 14-J, 57-J
Gases in cast iron, 586-N
Gases in metals, 662-N
effect of pressure, 5-X
effect of temperature, 5-X
radioactive tracer study, 655-N
Gases in nickel, 337-N, 338-N
Gases in stainless steel, 45-N
Gases in steel, 337-N, 338-N, 283-S, 422-S
Gases in titanium, 313-J
Gasoline and diesel engines, 430-W
Gear cutting and screw cutting, 16-G
Gears, 160-Q, 247-Q
carburizing, 236-J
case hardening, 150-J, 248-J
cast iron, 120-T
nodular, 120-T
fatigue, 150-J
fatigue strength, 199-G, 1150-Q, 344-T
hardenability, 248-J
hardness, 248-J
hardness tests
dynamic, 314-J
heat treatment, 121-T
flame, 296-J
induction, 77-J, 344-T
mechanical properties
effect of high temperature, 727-Q
Gears, (cont.)
nitriding, 314-J
porosity, 256-S
quenching, 143-J
rolling
surface, 199-G
steel, 120-T, 121-T
steel castings, 120-T
stresses, 150-J, 670-Q
residual, 1198-Q
wear
effect of lubrication, 634-Q
radioactive tracer study, 458-Q
wear properties and tests, 314-J, 133-Q
Germanium, 145-A, 376-A
addition agents
aluminum, 148-P
bibliographies, 216-A
books, 158-A
cleaning and polishing
chemical, 471-L
colorimetric analysis, 64-S
colorimetric determination, 157-S
corrosion, 182-R
atmospheric, 545-P
tarnishing, 541-P
crystal structure, 457-M, 533-M
dislocations, 15-M, 29-M, 88-M, 216-M, 418-M, 419-M, 572-P
imperfections, 207-N
texture and preferred orientation, 302-M, 752-R
damping properties, 774-Q
diffusion, 149-N, 159-N
arsenic, 636-N
elastic properties, 1486-Q
Young's modulus, 774-Q
elastic properties and tests, 1109-Q
electrical and electrochemical properties, 59-P
electrical conductivity, 208-M, 269-P, 533-P, 534-P, 535-P, 536-P, 537-P, 538-P, 539-P, 540-P, 541-P, 542-P, 543-P, 544-P, 545-P, 556-P, 561-P, 567-P, 568-P, 572-P, 573-P, 576-P, 577-P, 725-P
effect of impurities, 723-P
electrical properties, 419-M, 93-P, 118-P
dielectric, 573-P, 574-P, 664-P
electrochemical properties
ionization potential, 279-P
electron emission, 560-P, 575-P
etching
electrolytic, 179-L
eutectics
formation, 405-N

Germanium, (cont.)
extraction and refining
halogenation, 128-C
precipitation, 386-C
fatigue life, 774-Q
gas analysis, 168-S
grain boundaries, 572-P
hall effect, 559-P
magnetic properties, 558-P, 588-P
metallography
etching, 29-M
effect of orientation, 382-M
microstructure
primary, 558-M
nuclear properties
cross-section, 535-P, 539-P
radioactive decay, 536-P
optical properties, 541-P
absorption and transmission, 557-P
reflection, 367-P, 512-P
refraction, 574-P
oxidation, 542-P, 623-R
photoconductivity, 95-P, 106-P
pickling, 471-L
plastic deformation
slip, 216-M
polishing
mechanical, 471-L
semiconductors, 148-P
single crystals
atomic structure, 208-M
cleavage, 1520-Q
corrosion, 752-R
creep, 72-Q
dislocations, 101-M
electrical conductivity, 692-P
growth, 207-N, 366-N, 405-N, 546-N
microstructure
primary, 483-R
oxidation, 483-R, 752-R
solubility of carbon, 592-P
sonic transmission, 1486-Q
specific heat, 425-P
statistics and economics, 62-A
systems
binary, 592-P
ternary, 150-M, 371-M
thermal conductivity, 561-P, 725-P
thermal expansion, 49-P
thermodynamic properties, 107-P
thin films
electrical conductivity, 665-P
vapor-deposition coating of, 665-P
vapor deposition of, 533-M
zone melting, 128-C, 135-C
Germanium alloys
crystallization, 29-N
Germanium alloys, (cont.)
diffusion
by antimony, 148-N
Germanium-aluminum alloys
electrical conductivity, 397-P
Germanium-chromium alloys
electrical properties, 185-P
magnetic properties, 185-P
Germanium-silicon alloys, 123-N
electrical conductivity, 28-P
thermal conductivity, 28-P
Germanium-vanadium alloys
microstructure, 180-M
Glass, 144-G
bonding, 189-K
Gold
adhesive joining
metal-to-metal, 594-K
amalgamation, 126-C
austenitic
crystal structure
dislocations, 564-M
boiling temperatures, 360-P
bonding
glass-to-metal, 220-K
chemical reduction coating, 133-L
cladding of, 629-L
compression properties, 129-Q
corrosion
atmospheric, 11-Q
chemical
inorganic, 576-R
crystal structure, 312-N, 467-N, 532-M
dislocations, 59-M, 288-M, 378-M, 387-M
imperfections, 378-M, 495-M, 392-P
texture and preferred orientation, 253-M
diffusion, 527-N
diffusion in silicon, 191-P
electric furnace smelting, 447-C
electrical conductivity, 147-P
electrical properties, 691-P
contact potential, 727-P
electron microscopy, 378-M
electroplated
porosity and permeability, 623-P
electroplating, 159-L, 222-L, 297-L
electroplating of, 18-L, 460-L, 472-L, 497-L, 551-L, 740-L, 815-L
extraction and refining
chemical, 348-C
cyanidation, 126-C, 351-C
precipitation, 333-C
fatigue life, 43-Q
fatigue properties and tests, 11-Q

Gold, (cont.)
Hall effect
effect of temperature, 65-P
nuclear properties
radioactive decay, 695-P
optical properties, 30-P
absorption and transmission, 730-P
phase diagrams, 471-M
polishing
electrolytic, 615-L
quenching, 288-M, 378-M, 672-Q
smelting, 125-A
solid solutions
thermodynamic properties, 411-P
solidification, 349-P
specific heat, 30-P
effect of low temperature, 340-P
stresses
thermal, 672-Q
superlattice formation, 312-N
systems
binary, 269-M, 324-M, 366-M, 349-P
ternary, 319-M
thermodynamic properties, 349-P, 392-P
thin films
electron diffraction, 253-M
vapor deposition, 386-L
vapor deposition of, 387-M, 532-M, 467-N
vapor pressure
radioactive tracer study, 442-P
yield strength, 672-Q
zone melting, 132-C
Gold alloys
crystal structure, 616-M
thermal conductivity, 604-P
vapor deposition of, 527-N
Gold-cadmium alloys
transformations
diffusionless, 173-N, 646-N
twinning
deformation, 1093-Q
Gold-copper alloys
electrical conductivity, 261-N, 292-N
electroplating
properties and tests, 830-L
magnetic properties, 497-P
superlattice formation, 261-N, 292-N
Gold foil
atomic structure, 379-M
Gold-indium alloys
magnetic properties, 688-P
Gold-lead alloys
vapor deposition coating of, 680-L
Gold-manganese alloys
magnetic properties, 715-P
neutron diffraction, 22-M
Gold-nickel alloys
age hardening, 349-N
annealing, 349-N
crystal structure
imperfections, 349-N
Gold ores
mining, 34-A
sources, 34-A
Gold-platinum system, 98-P
Gold-silver alloys
strain aging, 307-N
thermodynamic properties, 307-N
Gold-silver-copper systems, 118-M
Gold-tin alloys
atomic structure, 555-M
order-disorder, 555-M
thermodynamic properties, 471-M
Gold wire
precipitation hardening
aging, 289-M
quenching, 289-M
Grain boundaries, 505-N, 1468-Q
effect of orientation, 188-M
Grain growth, 61-M, 65-N, 137-N, 204-N, 372-N, 373-N
effect of impurities, 287-N
effect of stress, 116-N
Grain refining agents, 202-E, 228-N, 437-N, 441-P
Grain size, 148-M, 199-M, 588-M, 684-M, 228-N, 437-N
testing equipment, 511-M, 618-M
Graphite, 1202-Q
applications, 520-A
brazing, 611-K
corrosion
by molten metals, 498-N
galvanic, 322-R
diffusion
molten metals, 559-N
electrical conductivity, 433-P
in cast iron, 404-M
mechanical properties, 81-Q
microstructure
primary, 232-M
oxidation
effect of radiation, 12-R
tensile properties, 433-P
thermal properties, 433-P, 81-Q
Graphite crucibles and pots, 171-W
Graphite electrodes
mechanical properties, 156-T
Graphitization
effect of deformation, 88-N
Graphitizing agents
copper, 971-Q
nickel, 971-Q
Grinders, 21-G, 107-G, 252-G, 118-W

Grinding, 100-E, 26-G, 47-G, 83-G, 198-G, 295-G, 366-G, 16-L, 229-Q
automation, 25-L
centerless, 298-G
diamonds, 48-G
effect of pressure, 107-G
form, 112-G, 122-G
stresses
residual, 1273-Q
surface, 112-G, 122-G, 147-G, 306-G
Grinding belts and wheels, 83-G, 182-G, 295-G, 313-G, 25-L, 12-W, 18-W, 142-W, 406-W
abrasives, 366-G
diamond, 95-G
wear, 915-Q
Guns, 525-A, 537-A

H

Hafnium, 26-A, 235-A, 359-A, 382-A, 414-A
amalgamation, 22-C
atomic structure
interatomic bond, 479-M
corrosion, chemical
inorganic, 1264-Q
crystal structure
texture and preferred orientation, 461-M
determination, 205-S
electrical conductivity, 1264-Q
electrochemical properties, 415-L
electroplating of, baths, 584-L
extraction and refining, 259-C
arc melting, vacuum, 218-C
chemical, 23-C
halogenation, 92-C
mechanical properties, 1264-Q
oxidation, 11-R, 167-R
production and consumption, 32-A
recrystallization, 461-M
roll bonding, 344-L
systems
binary, 307-M, 595-M
transformations
diffusionless, 638-N
use in nuclear reactors, 234-T, 295-T
weldability, 193-K
Hafnium powder production, 7-H
Hafnium-selenium alloys
thermodynamic properties, 131-P
Hafnium-selenium system, 100-M
Hafnium sulphides, 100-M
electrical properties, 132-P
thermodynamic properties, 131-P
Hafnium-tellurium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Hafnium-tellurium system, 100-M
Halide decomposition, 234-C
Hall effect, 112-P, 718-P
Harbor facilities
arc welding, 516-K
Hard alloys, 784-L, 1544-Q
machining
ultrasonic, 68-G
metallography
polishing, 54-M
wear, 345-T
Hard surfaced metal, 178-L
Hard surfacing, 45-L, 59-L, 73-L, 109-L, 141-L, 143-L, 178-L, 283-L, 317-L, 326-L, 525-L, 749-L, 785-L, 297-W
equipment, 115-K
Hardness, 91-G, 302-Q
conversions, 396-Q
hot
testing equipment, 822-Q
micro, 107-M, 14-Q, 392-Q, 1177-Q
testing equipment, 478-Q, 1115-Q
tests, 302-Q
Hardness and hardness tests, 114-Q, 475-Q, 707-Q, 740-Q, 1135-Q
effect of high temperature, 119-Q
instrumentation, 47-X
test specimen, 1234-Q
testing equipment, 1289-Q
Hardness tests
diamond pyramid, 1349-Q
spherical indenter, 13-Q, 206-Q, 1015-Q
Headers, 195-W
Heading
cold, 121-G
Health, 51-A, 133-A
Heat exchangers, 328-K, 324-P, 673-R, 21-W
arc welding
gas shielded, 344-K
brazing, 136-K
corrosion, 173-W
Heat resisting materials, 77-A, 112-A, 114-A, 174-A, 175-A, 381-A, 437-A, 446-A, 447-A, 462-A, 463-A, 464-A, 470-A, 477-A, 478-A, 488-A, 495-A, 498-A, 519-A, 532-A, 251-C, 480-D, 340-E, 418-E, 174-F, 186-F, 243-F, 287-F, 114-H, 142-H, 229-J, 253-J, 370-K, 419-K, 659-K, 642-L, 303-N, 635-P, 643-P, 648-P, 592-Q, 626-Q, 639-Q, 685-Q, 701-Q, 797-Q, 840-Q, 864-Q, 943-Q, 1011-Q, 1013-Q, 1021-Q, 1022-Q, 1023-Q, 1024-Q,

Heat resisting materials, (cont.)
1025-Q, 1026-Q, 1027-Q, 1028-Q, 1029-Q, 1030-Q, 1031-Q, 1032-Q, 1033-Q, 1039-Q, 1047-Q, 1048-Q, 1049-Q, 1097-Q, 1102-Q, 1120-Q, 1162-Q, 1164-Q, 1182-Q, 1251-Q, 1315-Q, 1355-Q, 1368-Q, 1369-Q, 1391-Q, 1399-Q, 1449-Q, 572-R, 573-R, 581-R, 591-R, 646-R, 157-T, 197-T, 251-T, 341-T
age hardening, 1381-Q
applications, 3-A, 124-A
heat treating furnaces, 427-W
arc welding
coated electrode, 10-K, 320-K
gas shielded, 320-K
austenite, 191-N
austenite formation and decomposition, 636-K
brazing
furnace, 13-K
by inorganic acids, 792-R
by organic acids, 792-R
corrosion
by nitrogen compounds, 296-R
chemical
inorganic, 806-R
creep, 121-Q, 433-Q, 507-Q
creep strength, 636-K, 893-Q, 1381-Q
creep tests
stress-relaxation, 691-Q
crystallization, 1381-Q
data books, 223-A
ductility, 636-K, 1356-Q
elastic properties, 431-Q
explosive forming, 177-G
fatigue strength, 691-Q
flaw detection
ultrasonic, 228-S
forging, 173-G
forging practice, 17-F
forming, 318-A, 400-G
forming and machining, 150-G, 172-G, 173-G, 181-G
foundry practice
melting, 893-Q
fracture, 431-Q
grinding, 443-G
hardness, 636-K, 1393-Q
heat treatment, 173-G
industry
statistics and economics, 205-A
investment casting, 259-E
machinability, 398-G
machining, 188-G
electrochemical, 433-G
mechanical, 396-G, 397-G
Heat resisting materials, (cont.)
mechanical properties, 11-H, 26-Q, 42-Q, 120-Q, 577-Q, 603-Q, 675-Q
microscopy, 375-R
microstructure
primary, 229-M
mill practice
scarfing, 117-E
milling and hobbing, 185-G
nickel alloys, 172-W
oxidation, 338-R, 375-R
physical properties, 422-Q, 675-Q
properties, 287-Q
resinous coatings, 129-L
rubber pad forming, 178-G
spinning, 178-G
stainless steel, 269-A
standards and specifications, 32-W
stress rupture properties, 636-K
stress rupture properties and tests, 438-Q, 1397-Q
tensile properties, 636-K, 393-Q, 422-Q, 431-Q, 924-Q, 1356-Q
tests, 272-Q
use in aircraft, 2-T
use in aircraft engines, 11-H
use in missiles, 594-P, 100-T
wear, 701-Q
weldability, 10-K
welding, 172-G, 173-G
joining and assembling, 636-K
Heat transfer, 619-D, 56-F, 475-N, 591-P
Heat treating equipment, 264-W, 380-W, 392-W
atmosphere generators, 88-H, 219-W, 227-W, 282-W, 389-W
materials
nickel alloys, 172-W
Heat treating furnace parts
ceramic coating, 698-L
Heat treating furnaces, 15-A, 6-J, 152-J, 287-J, 785-R, 127-W, 143-W, 192-W, 234-W, 264-W, 355-W, 429-W, 433-W
continuous, 416-W
controlled atmosphere, 97-J, 167-J, 11-W, 27-W, 165-W, 380-W, 415-W
design, 210-J
electric, 212-J, 236-J, 317-J, 1-W, 64-W, 326-W, 374-W, 415-W, 438-W
gas, 35-J, 98-J, 220-J, 16-W, 27-W, 148-W, 199-W, 334-W
continuous, 163-J
vacuum, 385-W
induction, 64-W, 150-W, 202-W, 247-W, 265-W
materials
nickel alloys, 172-W

Heat treating furnaces, (cont.)
oil, 98-J, 232-W
refractories, 278-W
refractory linings, 206-W
salt bath, 22-J
temperature measurement, 400-W
vacuum, 200-W, 354-W, 384-W
controlled atmosphere, 392-W
Heat treatment, 9-F, 15-F, 154-G, 38-J, 45-J, 332-J, 596-N
controlled atmosphere, 57-J, 98-J, 117-J, 119-J, 167-J, 228-J, 241-J, 245-J, 307-J, 309-J, 282-W
equipment, 308-J
distortion, 188-J
equipment, 224-J
flame, 384-G, 131-J, 178-J, 189-J, 255-J, 296-J
fused-bath, 22-J, 64-J
heating and cooling, 9-J, 157-J, 249-J, 300-J
induction, 42-J, 90-J, 95-J, 271-J, 150-W
Heating and cooling
induction, 84-J
Heating elements, 785-R
Heating for working, 62-F
induction, 84-F
High strength materials, 440-A, 445-A, 447-A, 471-A, 559-A, 290-F, 342-G, 348-G, 359-G, 218-J, 526-K, 503-M, 296-N, 359-N, 488-N, 562-N, 593-Q, 647-Q, 658-Q, 730-Q, 952-Q, 1044-Q, 1048-Q, 1247-Q, 1249-Q, 1303-Q, 1350-Q, 1528-Q, 631-R, 254-T, 288-T
explosive forming, 33-G
fatigue tests
rotating beam, 188-Q
forming, 318-A, 400-G
heat treatment, 399-G
industry
statistics and economics, 205-A
machining
mechanical, 223-G, 396-G, 397-G, 399-G
mechanical properties, 63-Q
milling and hobbing, 185-G
quenching, 21-A
rubber pad forming, 178-G
spinning, 178-G
welding, 643-K
Homogenization, 279-J
Honing, 7-G, 274-G, 336-G
Household appliances
corrosion
chemical
organic, 682-R
Household appliances, (cont.)
resistance welding, 128-K, 252-K
Hydroforming, 317-G
Hydrogen
absorption by iron, 302-P
adsorption, 143-P, 179-P
determination, 74-E, 131-K, 9-S, 126-S, 168-S, 206-S, 209-S
diffusion, 90-N
in carbon steel, 754-R
in cast iron, 490-N
in iron, 539-N, 1173-Q, 754-R
in nickel, 754-R
in steel, 284-J, 93-N, 290-N
dilatometry, 32-M
in aluminum-magnesium alloys, 800-Q
in cast iron, 157-E, 80-N
in ceramic coating on steel, 706-L
in copper, 761-Q
in electric steel, 300-D
in iron, 264-N, 418-N, 540-N
in iron-cobalt alloys, 709-Q
in nickel, 338-N
in steel, 334-D, 361-D, 303-K, 400-K, 457-L, 220-N, 264-N, 338-N, 391-N, 409-N, 418-N, 540-N, 197-Q, 244-Q, 617-Q, 806-Q, 861-Q, 974-Q, 986-Q, 1043-Q, 1517-Q, 1518-Q, 588-R, 292-S, 329-S
in tantalum, 117-N
in titanium, 3-P, 260-Q, 304-Q, 907-Q, 1043-Q
in weldments, 123-K, 153-K, 208-K, 109-K
solubility in columbium, 736-P
solubility in magnesium, 146-P
solubility in metals, 136-P
solubility in tantalum, 736-P
solubility in uranium, 611-P
solubility in zirconium, 368-P
systems, binary, 368-P
Hydrogen sulphide, 383-Q
Hydropress forming, 346-G

I

Impact properties and tests, 739-Q, 884-Q, 944-Q, 1301-Q
size and shape effects, 871-Q
Impact tests
explosive, 1141-Q
equipment, 718-Q
Inclusions
in steel, 161-S
Indium
applications, 448-A

Indium, (cont.)
atomic structure, 454-M
colorimetric determination, 64-S
composition analysis, 235-S
crystal structure, 520-M
determination, 30-S, 62-S
diffusion, 527-N
self-, 400-N
electrical conductivity, 45-P, 570-P
electroplating of, 355-L, 551-L, 740-L, 823-L
extraction and refining
electrolytic, 237-C
leaching, 237-C, 424-C
friction, 224-Q
magnetic properties, 588-P
mechanical properties, 448-A
physical properties, 448-A
density, 452-M
polarographic determination, 12-S
spectrographic analysis, 104-S
statistics and economics, 62-A
systems
binary, 18-M, 65-M, 219-M, 316-M, 452-M, 460-M, 283-N, 9-P, 554-P
complex, 569-M, 570-M
ternary, 219-M, 257-M, 315-M, 319-M
thermal expansion, 49-P
thermodynamic properties, 452-M
thin films
electrical and electrochemical properties, 65-M
volume and dimensional changes, 452-M
Indium alloys
crystallization, 29-N
vapor deposition of, 527-N
Indium-antimony alloys
electrical conductivity, 219-P
effect of low temperature, 246-P
Hall effect
effect of low temperature, 246-P
intermetallic compounds
plastic deformation, 100-Q
nuclear properties
resonance, 693-P
Indium-arsenic-selenium alloys, 111-M
Indium arsenide
Hall effect, 44-P
vapor pressure, 153-P
Indium-cadmium alloys
thermodynamic properties, 554-P
Indium phosphide
vapor pressure, 153-P
Indium-phosphorus alloys
electrical properties, 176-P
single crystals
growth, 95-N
Indium rod
magnetic properties, 262-P
Indium-tellurium alloys
electrical properties, 206-P
Ingot molds, 32-C, 46-D, 369-D, 378-D, 383-D, 414-D, 418-D, 244-E, 331-E, 436-E, 412-N, 459-N, 36-W, 59-W, 111-W, 299-W, 313-W, 317-W, 340-W, 428-W
cast iron
annealing, 81-J
nodular, 222-W
materials
cast iron
nodular, 353-W
wear, 604-Q
Ingots
crystal structure
texture and preferred orientation, 463-N
dendritic growth, 222-N
die casting, 524-E
flaw detection
radiographic, 299-S
grain size, 481-N, 487-N
recrystallization, 481-N
rolling, 481-N
solidification, 65-N, 459-N, 487-N, 618-N
dendritic growth, 463-N
size
thickness and mass measurement, 649-D
stripping, 54-F, 249-F
Induction furnaces, 373-W
Induction heaters, 117-W
Induction heating, 13-P
Industrial relations, 201-A
Inorganic compounds
electrical properties, 194-P
magnetic properties
domain theory, 194-P
hysteresis loop, 194-P
Inspection and control, 24-A, 1-S
equipment, 227-S
standards and specifications, 345-S
Institute of metals
history, 184-A
Intermetallic compounds, 79-M, 269-M
bibliographies, 216-A
chemical kinetics, 455-M
corrosion, 477-A
crystal structure, 38-M, 47-M, 71-M, 87-M, 90-M, 185-M, 453-M, 455-M, 457-M, 478-M, 486-M, 492-M, 508-M, 526-M, 590-M, 643-M, 474-N, 49-P, 249-Q, 991-Q

Intermetallic compounds, (cont.)
electrical properties, 130-P, 132-P
grain growth, 168-N
hardness
micro-, 1047-Q
hardness tests
diamond pyramid, 1047-Q
mechanical properties, 477-A
physical properties, 428-N
single crystals
electrical conductivity, 175-P
growth, 96-N
thermodynamic properties, 455-M, 131-P
Investment casting, 261-A, 10-E, 14-E, 31-E, 45-E, 46-E, 67-E, 106-E, 121-E, 128-E, 167-E, 183-E, 229-E, 243-E, 246-E, 252-E, 259-E, 346-E, 452-E, 482-E, 504-E, 515-E, 535-E
applications, 88-E, 365-E
automation, 77-E
design, 328-E
equipment, 21-E, 272-E
molding, 131-E
standards and specifications, 306-E
surface defects, 529-E
vacuum, 496-E
Investment castings, 424-W
design, 301-A, 653-Q
flaw detection
magnetic particle, 368-S
penetrant, 368-S
mechanical properties, 252-E
standards and specifications, 368-S, 391-S
Iridium
corrosion, 503-P, 87-R
electrochemical properties, 503-P
extraction and refining
precipitation, 333-C
isotopes, 127-S
melting temperatures, 328-M
spectrographic analysis, 278-S
thermal properties, 529-P
zone melting, 264-C
Iron, 119-C
absorption
hydrogen, 302-P, 311-P
activity coefficient, 581-P, 683-P, 699-P
carbon, 617-P
age hardening, 153-N, 226-N, 1214-Q
amalgamation, 184-C, 191-C
analysis, 89-S
special separation, 182-S, 212-S
anelastic properties, 259-Q, 885-Q, 1214-Q
annealing, 104-J, 82-M

Iron, (cont.)
atomic structure, 110-M, 707-M, 345-P
austenite formation and decomposition, 621-M
cathodic protection, 681-R, 816-R
cavitation corrosion, 394-R
ceramic coated, 529-Q
chromizing on, 747-L
clad
tensile properties, 166-H
volume and dimensional changes
effect of radiation, 166-H
cladding on, 166-H
cleaning
alkali, 306-L
electrolytic, 505-L
colorimetric analysis, 63-S, 425-S
composition analysis, 48-S, 50-S, 200-S, 286-S, 432-S
carbon, 193-S
manganese, 146-S
vacuum, 388-S
converter processes
bessemer
blowing, 468-D
corrosion, 556-L, 256-R, 734-R
alkaline
inorganic, 594-R
atmospheric, 719-R
industrial, 529-R
marine, 618-R
by alcohols, 807-R
by halogen compounds, 290-R
by inorganic acids, 113-R, 379-R, 409-R
by lubricants, 385-R
by molten metals, 680-R
by organic acids, 291-R, 477-R
by soils, 24-R, 79-R
by sulphur compounds, 66-R, 74-R, 453-R, 473-R
chemical
inorganic, 213-R, 214-R, 455-R, 528-R, 576-R
erosion, 642-R
fatigue, 754-R
galvanic, 539-N, 4-R, 443-R
inhibition, 150-R, 166-R, 212-R, 443-R, 455-R, 521-R, 594-R, 642-R, 668-R, 718-R, 779-R, 807-R, 816-R
corrosion by waters, 17-R, 192-R, 347-R
sea, 618-R
steam, 761-R
creep
strength, 999-Q
creep tests
stress-relaxation, 999-Q

Iron, (cont.)
crystal structure, 44-M, 45-M, 187-M, 372-M, 526-M, 194-N, 579-N, 275-P, 1196-Q, 297-R
dislocations, 30-M, 50-M, 341-M, 416-M, 612-M, 482-Q, 1505-Q
texture and preferred orientation, 281-M, 376-M, 519-M, 576-M, 223-N
determination, 187-M, 7-S, 13-S, 59-S, 154-S, 206-S
special separation, 179-S
x-ray analysis, 342-S
diffusion, 11-N, 166-N, 177-N, 274-N, 538-N, 708-P, 655-R
aluminum, 429-N
carbon, 250-N, 454-N
copper, 152-H
hydrogen, 539-N, 1173-Q, 754-R
interfacial, 195-N
measurement, 443-N
self-, 563-D, 138-N
radioactive tracer study, 376-N, 526-N
silicon, 419-N
sulphur, 539-N
titanium, 419-N, 502-N
diffusion bonding, 22-K, 382-K
dispersion hardening, 644-N
ductility, 539-N
elastic properties, 259-Q
Poisson's ratio, 711-Q
electrical and electrochemical properties, 55-P
electrical properties
effect of low temperature, 427-P
electrical resistivity, 153-N
electrochemical properties, 254-P, 302-P, 719-R
ionization potential, 668-R
electron diffraction, 45-M
electron microscopy, 341-M
electroplating of, 211-L, 824-L, 825-L, 826-L, 520-L, 740-L
baths, 396-L
eutectoid reactions, 205-N
evaporation of, 509-D
extraction and refining
chemical, 201-C, 243-C
decomposition, 68-B
distillation, 140-C, 334-C
electrolytic, 191-C
leaching, 97-B
fatigue, 48-Q
fatigue life, 361-Q, 775-Q
fatigue properties and tests
effect of, 698-Q
fatigue strength, 361-Q, 411-Q
effect of peening, 627-Q

Iron, (cont.)
forming
cold, 829-Q
foundry practice
cupola, 307-E
history, 545-A
fracture, 9-Q, 546-Q, 1506-Q, 1538-Q
brittle, 434-Q, 1253-Q, 754-R
microcrack formation, 775-Q
free energy, 699-P
friction, 938-Q
galvanized
corrosion, 610-L
galvanizing, 610-L
gases in, 538-N, 540-N
grain boundaries, 82-M, 612-M, 195-N, 539-N
grain growth, 197-N
effect of deformation, 257-N
effect of heat treatment, 221-N
graphitization, 164-N
hardness
effect of temperature, 27-N
history, 193-A, 331-A, 553-A, 252-T
hydrogen adsorption, 143-P
hydrogen in, 418-N
impact, 546-Q
intermetallic compounds
crystal structure, 383-M
investment casting
vacuum, 222-C
liquid
activity coefficient, 670-P
chemical kinetics, 684-P
physical properties
density, 467-P
surface tension, 90-P
temperature measurement, 279-S, 82-X
thermal expansion, 467-P
viscosity, 465-P
machinability, 417-G
magnetic domains, 376-M, 413-M, 441-M
magnetic properties, 4-P, 11-P, 56-P, 357-P, 476-P
effect of heat treatment, 104-J
core losses, 625-P
diamagnetism, 129-P
domain theory, 71-P, 289-P
hysteresis loop, 1253-Q
magnetostriction, 411-Q
permeability, 708-P
martensite and martensite reaction, 579-N
mechanical properties, 355-C, 281-M, 299-Q, 1196-Q
effect of radiation, 862-Q, 1126-Q
melting temperatures, 687-P

Iron, (cont.)
metal transfer, 114-R
metallography
etching, 50-M
polishing, 341-M
specimen preparation, 562-M
microscopy, 621-M
microstructure, 621-M, 554-Q, 948-Q, 17-R
nitriding, 205-N
nitrogen in, 418-N
nuclear properties, 345-P, 694-P
optical properties
absorption and transmission, 413-P
oxidation, 44-M, 149-R, 171-R, 297-R, 655-R, 728-R, 769-R
effect of pressure, 287-R
painting, 556-L, 691-L
porosity, 593-L
passivation, 58-R, 148-R, 175-R, 190-R 291-R, 496-R
radioactive tracer study, 250-R
phase diagrams, 471-M
phosphate coating, 593-L, 831-L, 455-R
photometric analysis, 288-S
pitting corrosion, 815-R
effect of orientation, 688-R
plastic deformation, 210-P, 885-Q, 1357-Q, 1538-Q
anisotropic, 383-M
lines and bands, 775-Q, 1502-Q
slip, 48-Q, 554-Q, 829-Q
polarographic analysis, 440-S
polarographic determination, 124-S
polishing
electrolytic, 615-L
powder compacts
sintering, 334-C, 88-H, 109-H, 123-H, 140-H, 152-H, 155-H, 157-H, 166-H, 97-T
powder metallurgy
handbook, 65-H
powder metal parts
carburizing, 137-J, 139-J
chromizing on, 618-L
cyaniding, 139-J
electrical and electrochemical properties, 157-H
hardness and hardness tests, 139-J
physical properties
density, 157-H
specifications, 312-S
tensile properties, 157-H, 451-Q
use in automobiles, 154-T
powder production, 46-H, 109-H, 117-H, 180-H
powders
amalgamation, 94-C

Iron, powders, (cont.)
fatigue strength, 1542-Q
precipitation, 454-N, 649-N
production and consumption, 30-A
pure, 163-D
damping capacity, 567-Q
electric induction melting vacuum, 257-D
radioactive tracer study, 43-S
reaction rates, 734-P
reclamation, 23-A
recovery, 470-N
recrystallization, 223-N, 470-N, 630-N
effect of deformation, 257-N
texture, 223-N
reduction by metals, 214-C
reduction by metals and gases, 130-C
rubber coating, 556-L
scaling, 17-R, 747-R
shell mold casting, 335-E
single crystals
crystal structure
dislocations, 709-M
growth, 416-M, 470-N, 616-N
magnetic properties, 56-P, 355-P, 616-P
Domain theory, 53-P, 68-P
metallography
etching, 709-M
oxidation, 786-R
plastic deformation, 271-N
recrystallization, 470-N
strain aging, 271-N
tensile properties, 482-Q, 1121-Q
thermal properties, 616-P
size, thickness and mass measurement, 43-S
solid solutions
formation, 98-N, 513-N
solidification, 197-N
solubility
carbon, 274-N, 357-P
oxygen, 389-P
titanium, 502-N
solubility in acid, 113-P
solubility in lead, 469-P
solubility in tin, 138-P
specific heat, 86-P, 468-P
effect of deformation, 210-P
spectrographic analysis, 4-S, 17-S, 277-S, 373-S
spectrographic determination, 118-S, 285-S
sponge, 452-D
HYL process
strain aging, 27-N, 201-N, 226-N
surface tension, 160-P, 163-P, 469-P

Iron, (cont.)
systems
binary, 324-M, 333-M, 352-M, 355-M, 551-M, 552-M, 5-P
complex, 383-M, 628-M
ternary, 53-M, 236-M, 246-M, 297-M, 372-M, 394-M, 401-M, 462-M, 484-M, 506-M, 517-M, 541-M, 542-M, 572-M, 596-M, 666-M, 677-M, 295-N, 466-P
temperature measurement, 403-S
tensile properties, 775-Q, 948-Q, 1375-Q, 1439-Q, 1502-Q
tension impact test, 1375-Q
thermal properties, 529-P
thermodynamic properties, 221-D, 264-P, 359-P, 466-P
thin films
crystal structure, 331-M
physical properties
density, 331-M
tin coating, 138-L
transformations
allotropic, 25-N, 38-N, 369-N, 468-P
isothermal, 194-N
twinning
thermal, 577-M
use in bearings, 5-H
volume and dimensional changes, 687-P
wear, 65-Q
wear resistance, 211-L
welding and joining, 184-K
x-ray analysis
composition, 178-S
x-ray determination, 441-S
x-ray diffraction, 576-M, 707-M
zone melting, 135-C, 698-Q, 477-R

Iron alloy sheet
galvanizing
hot, 408-M

Iron alloy wire
thermal expansion, 722-P

Iron alloys
activation energy, 371-N
austenite formation and decomposition, 515-N
brazing, 626-Q
cavitation corrosion, 227-R
ceramic coating
glass, 644-L
chemical kinetics, 442-N, 275-P
corrosion
atmospheric
industrial, 427-W
chemical
inorganic, 399-R
galvanic, 183-R

Iron alloys, (cont.)
creep, 121-Q, 399-R
damping properties and tests, 124-Q, 1339-Q, 1505-Q
dendritic growth, 222-N
diffusion
self, 371-N
electrical conductivity, 133-N
electrical properties, 547-P
equilibrium constant, 668-P
fatigue
thermal, 1282-Q
ferromagnetism, 400-P
fracture
brittle, 594-Q, 1173-Q
free energy, 621-P
graphitization, 348-N, 440-N
hardness
effect of impurities, 325-Q
micro-, 89-Q
heat treatment, 133-N
quenching media, 183-J
magnetic properties, 442-N, 1339-Q
effect of temperature, 354-P, 361-P
magnetostriction, 362-P, 448-P
martensite and martensite reaction, 442-N, 621-P
mechanical properties, 351-N, 1023-Q, 1097-Q, 1316-Q
effect of high temperature, 639-Q
metallography
radioactive tracer methods, 222-N
nucleation, 442-N
order-disorder, 448-P
oxidation, 338-R, 581-R, 656-R
effect of orientation, 242-R
precipitation, 225-N, 440-N
precipitation hardening, 1023-Q
scaling, 581-R
structure
effect of impurities, 325-Q
stress rupture properties and tests, 626-Q, 1023-Q, 1167-Q
surface tension, 251-P
tensile properties and tests, 122-Q, 626-Q, 1023-Q, 1167-Q, 399-R
thermal expansion, 222-P
thermal properties, 435-P
transformations, 133-N
allotropic, 351-N
use in heat treating furnaces, 427-W
use in missiles, 1097-Q
use in turbine blades and rotors, 254-A
volume and dimensional changes, 1282-Q
wear properties and tests, 227-R, 1342-Q
weldments
effect of low temperature, 594-Q

Iron-aluminum alloys
applications, 489-P
atomic structure, 145-M
electrical conductivity, 420-P
electron diffraction, 596-R
hardness, 995-Q
impact strength, 995-Q
induction melting, 244-D
ingot casting, 244-D
magnetic domains, 420-P
magnetic properties, 1-P, 489-P, 650-P, 651-P, 4-S
mechanical properties, 489-P, 742-R
order-disorder, 503-N, 521-N
oxidation, 405-R, 554-R, 596-R, 742-R
rolling, 244-D
scaling, 554-R
superlattice formation, 75-N, 521-N
tensile properties, 995-Q
tempering, 420-P
texture and preferred orientation, 335-M
Iron-aluminum cermets, 297-M
Iron-aluminum-carbon alloys
magnetic properties, 447-P
metallography
specimen preparation, 586-M
microstructure, 586-M
Iron-aluminum-manganese alloys, 283-A
transformations
isothermal, 189-M
Iron-aluminum-nickel-copper alloys, 256-P
Iron-aluminum powder
diffusion coating of, 621-L
Iron and steel industry
Germany, 396-A
Great Britain, 396-A
history, 159-A, 240-W
research, 237-A
production and consumption, 278-A, 279-A
waste control, 342-A, 353-A, 355-A
Iron and steelmaking, 49-A, 70-A, 166-A 169-A, 473-A, 16-D, 31-D, 52-D, 214-D, 224-D, 227-D, 449-D, 472-D, 473-D, 498-D, 512-D, 539-D, 564-D, 600-D, 658-D, 664-D, 534-K
automation, 53-B, 230-D, 461-D, 656-D
bibliographies, 43-A
byproducts, 248-A
computers, 599-D, 656-D
degassing, 353-C
dephosphorization, 99-D
desulphurization, 96-D, 99-D, 433-D, 458-D, 411-E
direct reduction, 128-B, 147-B, 5-D, 47-D, 48-D, 49-D, 53-D, 200-D, 217-D,
Iron and steelmaking, direct reduction, (cont.)
268-D, 302-D, 339-D, 344-D, 429-D, 467-D, 495-D, 513-D, 582-D, 591-D, 604-D, 643-D, 680-D
electric, 316-D
H-iron process, 131-D, 263-D, 516-D
Hoganas process, 42-D
HYL process, 264-D, 452-D
Madrigal process, 317-D, 450-D, 594-D
strategic-Udy process, 108-D, 262-D, 451-D
duplexing, 348-D, 360-D
electric resistance, 319-D
electric smelting, 151-D
Europe, 167-D
flame-slag reaction, 318-D
France, 365-D
fuels, 474-D
Germany, 168-D
Great Britain, 267-D
heat economy, 308-D
history, 171-A, 304-A, 348-A, 382-D, 493-D, 663-D
hot metal processes, 60-B, 135-D, 153-D, 202-D, 220-D, 291-D, 328-D, 341-D, 350-D, 364-D, 436-D, 451-D, 459-D, 641-D
inclusions, 443-D, 504-D
India, 402-A, 538-D, 657-D
instrumentation, 36-X, 296-D
kaldo process, 173-D, 307-D, 335-D, 438-D, 611-D
I-D process, 185-D, 186-D, 269-D, 271-D, 294-D, 315-D, 390-D, 435-D, 508-D, 549-D, 607-D, 631-D, 64-F
low shaft furnace practice, 19-D, 28-D, 270-D, 330-D, 679-D
oxidation and deoxidation equilibria, 97-D
oxygen furnace processes, 1-D, 8-D, 19-D, 50-D, 153-D, 291-D, 295-D, 301-D, 350-D, 370-D, 371-D, 387-D, 434-D, 456-D, 457-D, 525-D, 550-D, 556-D, 595-D, 189-W
oxygen processes, 184-D, 211-D
physical chemistry, 11-B, 145-B, 235-C, 45-D, 51-D, 70-D, 94-D, 101-D, 112-D, 140-D, 202-D, 242-D, 252-D, 297-D, 313-D, 370-D, 463-D, 499-D, 529-D, 557-D, 560-D, 585-D, 678-D, 292-S
dephosphorization, 100-D, 166-D
desulphurization, 98-D, 147-D, 158-D, 213-D, 225-D, 314-D, 375-D, 433-D, 441-D, 620-D, 621-D, 633-D

Iron and steelmaking, physical chemistry, (cont.)
flame-metal reactions, 7-D, 26-D, 27-D, 43-D, 44-D, 87-D, 54-P, 214-S
gas-metal reactions, 7-D, 40-D, 47-D, 63-D, 64-D, 85-D, 109-D, 110-D, 142-D, 419-D, 509-D, 571-D, 617-D, 91-P
gas-solid reactions, 129-D, 210-D, 582-D, 586-D
oxidation and deoxidation equipment, 11-D, 36-D, 39-D, 44-D, 53-D, 63-D, 67-D, 83-D, 86-D, 132-D, 145-D, 149-D, 205-D, 325-D, 344-D, 355-D, 413-D, 420-D, 466-D, 479-D, 535-D, 661-D, 54-P
radioactive tracer study, 221-D
slag-metal reactions, 78-D, 86-D, 88-D, 89-D, 90-D, 91-D, 92-D, 93-D, 96-D, 98-D, 99-D, 102-D, 107-D, 111-D, 114-D, 115-D, 158-D, 166-D, 232-D, 318-D, 354-D, 363-D, 371-D, 393-D, 424-D, 428-D, 433-D, 434-D, 444-D, 466-D, 520-D, 536-D, 537-D, 558-D, 563-D, 572-D, 601-D, 602-D, 642-D, 653-D, 148-E, 160-P, 464-P
power plants, 186-W, 204-W
price and cost studies, 563-A, 461-A, 486-D
process control, 296-D, 569-D
radioactive tracer study, 69-A, 566-D, 606-D
recarburization, 233-D
refractories, 262-A, 41-B, 338-D, 605-D 626-D
research, 108-A, 485-A, 551-A, 403-D, 521-D, 522-D
reverberatory processes, 155-W
review, 663-D
Russia, 406-D, 415-D, 462-D, 505-D, 527-D
special processes, 1-D, 231-D, 349-D, 374-D, 503-D, 517-D, 580-D, 662-D
statistical analysis, 412-S
statistics and economics, 308-D, 405-D
use of oxygen, 110-B, 301-D, 439-D, 455-D, 522-D, 593-D, 630-D
use of television equipment, 68-X
use of tracers, 148-E
vacuum, 474-A, 650-D
vacuum melting, 580-A, 110-C, 221-C, 353-C, 355-C, 44-D, 59-D, 60-D, 130-D, 148-D, 156-D, 163-D, 198-D, 241-D, 312-D, 321-D, 343-D, 362-D, 402-D, 440-D, 448-D, 540-D, 573-D, 665-D, 667-D, 670-D, 677-D, 683-D, 433-S, 56-W
Iron and steelmaking, vacuum melting, (cont.
equipment, 268-W
tests, 351-D
waste control, 79-A, 221-A, 375-A, 510-A, 216-D, 388-W
Iron-arsenic alloys
dendritic growth, 265-N
Iron carbides
crystal structure, 261-M
particle size, 156-N
Iron-carbon alloys
austenite formation and decomposition, 626-N
bainite and bainite reaction, 389-N
cementite and cementite reaction, 195-M
crystal structure, 487-M
diffusion of zinc, 424-L
dilatometry, 626-N
electron diffraction, 195-M
galvanized, 424-L
metallography
techniques
magnetic, 626-N
phase diagrams, 487-M
precipitation hardening
aging, 192-M
Iron-carbon-aluminum system
magnetic properties
ferromagnetism, 88-P
microstructure, 88-P
Iron-carbon-arsenic alloys
dendritic growth, 265-N
Iron-carbon-silicon alloys
carbides in, 379-N
graphitization, 386-N
Iron-carbon system, 156-N
Iron castings
arc cutting, 192-G
ceramic coating on, 827-L
defects
flaw detection
magnetic particle, 294-S
surface, 827-L
repair, 192-G
solidification phenomena, 533-N
structure control, 552-N
Iron cermets, 1-H
mechanical properties, 129-H
Iron-chromium alloys
atomic structure, 231-M
austenite formation, 622-N
corrosion
by sulphur compounds, 470-A
crystal structure
dislocations, 444-M
diffusion of chromium, 277-N
electron emission, 23-P, 396-P

Iron-chromium alloys, (cont.)
extraction and refining
degassing, 479-C
vacuum, 482-C
gases in, 547-N
grain boundaries, 444-M
hardness, 611-N
magnetic properties, 231-M, 128-P
hysteresis loop, 42-P
metallography
etching, 427-M, 444-M
microstructure, 266-J
oxidation, 470-A, 426-Q
quenching, 266-J
recrystallization, 611-N
spectrographic analysis, 241-S
thermodynamic properties, 547-N
transformation
allotropic, 369-N
transformations, 427-M
creep strength, 426-Q
Iron-chromium-aluminum alloys, 61-X, 332-Q
oxidation, 236-M, 400-R, 622-R
Iron-chromium-cobalt alloys
mechanical properties, 590-N
Iron-chromium-manganese system, 155-M
Iron-chromium-nickel alloys
solution hardening, 590-N
transformations, 110-N
Iron-chromium-nickel-molybdenum alloys
creep, 953-Q
fatigue properties and tests, 953-Q
Iron-chromium-nickel-vanadium system, 85-M
Iron-cobalt alloys
ductility, 709-Q
elastic properties, 1016-Q
fracture
brittle, 709-Q
hardness, 611-N
magnetic properties, 556-A, 178-P, 298-P
recrystallization, 611-N
Iron-cobalt-chromium alloys
transformations, 394-M
Iron-cobalt-molybdenum alloys
magnetic properties, 622-P
Iron-cobalt-nickel alloys
magnetic properties, 166-P
Iron-cobalt-nickel-aluminum alloys
age hardening, 660-N
Iron-cobalt-palladium system, 175-M
Iron-cobalt-tungsten alloys
magnetic properties, 622-P
Iron-cobalt-vanadium alloys
crystal structure
texture and preferred orientation, 67-M
Iron-copper alloys
atomic structure
interatomic bond, 451-Q
crystal structure, 129-M
oxidation, 451-Q
precipitation hardening
aging, 129-M
thermal shock tests, 451-Q
Iron-copper compacts
growth during sintering, 53-H
Iron-copper powder metal parts
carburizing, 137-J
Iron-copper system, 166-M
Iron films
crystal structure, 473-M
electrical conductivity, 234-P
physical properties
density, 473-M
Iron-gadolinium alloys
magnetic properties, 333-P
Iron ingots
flaw detection
ultrasonic, 406-S
Iron-manganese alloys
hardness, 611-N
recrystallization, 611-N
twinning
thermal, 577-M
Iron-manganese system, 105-M
Iron-manganese-silicon alloys
solubility of carbon, 404-P
Iron-molybdenum alloys
age hardening, 576-N
electrical conductivity, 576-N
hardness, 576-N
magnetic properties
hysteresis loop, 576-N, 329-P
oxidation, 555-R
transformation
allotropic, 369-N
Iron-molybdenum-cobalt alloys
magnetic properties
hysteresis loop, 329-P
Iron-molybdenum-tungsten system, 83-M
Iron-nickel alloys
crystal structure, 187-M, 602-M
crystal structure and preferred orientation, 276-M
damping properties and tests, 1267-Q
diffusion
carbon, 99-N
dilatometry, 38-M
electrical conductivity, 70-P, 669-P
electrical properties
effect of low temperature, 208-P
elastic properties
shear modulus, 729-Q
Young's modulus, 484-P

Iron-nickel alloys, (cont.)
evaporation, 127-N
hardness, 602-M, 611-N
heat treatment
induction, 602-M
magnetic domains, 441-M
magnetic properties, 38-M, 70-P, 128-P, 484-P, 490-P, 717-P, 1267-Q
effect of heat treatment, 186-T
effect of low temperature, 208-P
hysteresis loop, 83-P
magnetostriction, 157-P
martensite and martensite reaction, 56-N, 103-N, 633-N
effect of radiation, 684-N
optical properties
absorption and transmission, 413-P
mechanical properties
effect of low temperature, 405-Q
oxidation
effect of orientation, 242-R
physical properties
density, 484-P
precipitation
from liquid, 329-N
quenching, 266-J
recrystallization, 276-M, 611-N
rolling, 383-P
single crystals
texture and preferred orientation, 362-N
spectrographic analysis, 384-S
superlattice formation, 669-P
tensile properties, 484-P
thermal expansion
effect of deformation, 383-P
thermodynamic properties, 358-P
transformations, 270-N
allotropic, 3-N
viscosity, 669-P
Iron-nickel-aluminum-cobalt powder metal, 52-H
Iron-nickel-chromium alloys
anelastic properties, 710-Q
creep strength, 426-Q
elastic properties
Young's modulus, 710-Q
magnetic properties
magnetostriction, 710-Q
oxidation, 426-Q
thermal conductivity, 672-P
thermal expansion, 672-P
thermodynamic properties, 672-P
Iron-nickel-cobalt alloys
brazing, 611-K
magnetic properties
magnetostriction, 381-P
thermal expansion, 467-A, 527-P
Iron-nickel-molybdenum alloys
electrical conductivity, 374-P
magnetic properties, 144-P, 717-P
Iron-nickel-titanium alloys
age hardening, 135-N
Iron-nitrogen alloys
crystal structure
texture and preferred orientation, 393-N
martensitic reactions, 393-N
Iron ores, 126-A, 583-A, 226-D
briquetting, 60-B, 122-B
composition analysis, 371-S
concentration, 54-B
electrostatic, 19-B
magnetic, 24-B, 50-B, 51-B
crushing
grinding and sizing, 33-B, 57-B
electrowinning, 30-C
fluid bed process, 73-B, 99-B, 101-B, 128-B, 136-B, 147-B, 495-D
magnetic properties, 123-B
microradiography, 477-M
pelletizing, 11-B, 121-B, 145-B
preparation, 200-A, 43-B, 44-B, 45-B, 46-B, 47-B, 48-B, 49-B, 50-B, 51-B, 61-B, 81-B, 97-B
reclamation, 155-A, 377-A
roasting, 11-B, 14-B, 40-B, 100-B, 111-B, 119-B, 125-B, 126-B
sintering, 15-B, 18-B, 30-B, 31-B, 42-B, 58-B, 72-B, 74-B, 75-B, 78-B, 79-B, 80-B, 82-B, 83-B, 84-B, 85-B, 86-B, 87-B, 88-B, 89-B, 90-B, 91-B, 93-B, 95-B, 102-B, 106-B, 107-B, 116-B, 120-B, 123-B, 124-B, 125-B, 141-B, 144-B, 146-B, 155-D, 276-D, 290-D, 292-D
sources, 27-A, 137-A, 323-A
statistics and economics, 200-A
Iron oxides, 91-D, 190-N
grain growth, 126-N, 204-R
magnetic properties, 155-P, 158-P, 165-P, 167-P
mechanical properties, 270-Q
solubility, 306-L
Iron-oxygen carbon system, 85-D
Iron-palladium alloys
eutectics
formation, 355-M
magnetic properties
magnetostriction, 421-P
Iron-platinum alloys
dilatometry, 38-M
magnetic properties, 38-M
magnetostriction, 421-P

Iron powder
compressibility, 70-H, 110-H
mechanical properties, 140-H, 155-H, 180-H, 451-Q, 1542-Q
molding and compacting
rolling, 123-H, 129-H
extrusion, 129-H
cold pressing, 166-H
sintering, 334-C, 24-H, 109-H, 123-H, 140-H, 152-H, 166-H
atmospheres, 25-H, 26-H, 88-H
Iron powder metallurgy
handbook, 65-H
Iron sheet
corrosion
atmospheric, 825-R
crystal structure, 408-M
dip coating, 165-M
standards and specifications, 473-S
Iron-silicon alloys
corrosion
chemical
inorganic, 545-R
organic, 545-R
crystal structure, 213-M
dislocations, 275-M
texture and preferred orientation, 169-M, 305-M, 376-M, 417-M, 356-P
grain boundaries
effect of orientation, 188-M
hardness, 611-N
magnetic domains, 376-M
magnetic properties, 1-P, 207-P, 356-P, 495-P, 642-P
effect of heat treatment, 370-P
effect of stress, 164-P
magnetostriction, 522-P
permeability, 127-P, 472-P
metallography
etching, 376-M
microstructure, 213-M
oxidation, 769-R, 773-R
recrystallization, 169-M, 611-N
scaling, 498-R, 600-R
single crystals
magnetic properties, 616-P
recrystallization, 306-N
thermal properties, 616-P
thermodynamic properties, 471-M
Iron-silicon-carbon-oxygen system, 91-P
Iron-silver-copper system, 84-D
Iron-silver-manganese system, 84-D
Iron-silver-sulphur system, 84-D
Iron-silver system, 84-D
Iron sponge, 101-B
Iron statuary, 252-T
Iron strip
standards and specifications, 473-S
thermal properties, 376-P
Iron sulphide, 190-N
electrical properties, 152-P
magnetic properties, 152-P
Iron systems
binary, 192-M, 384-M, 526-M
ternary, 189-M, 526-M
Iron-tungsten alloys
age hardening, 576-N
diffusion, 549-N
electrical conductivity, 576-N
electrical properties, 549-N
hardness, 576-N
magnetic properties, 576-N
Iron-vanadium alloys
anelastic properties, 612-N, 1379-Q
crystal structure, 1378-Q
elastic properties, 612-N, 1378-Q
electrical conductivity, 613-N
hardness, 612-N, 613-N
magnetic properties
saturation induction, 613-N
recrystallization, 612-N
strain aging, 612-N
superlattice formation, 613-N
transformations
allotropic, 209-N
Iron-vanadium-aluminum alloys
electrical conductivity, 613-N
formation, 613-N
hardness, 613-N
Iron-vanadium-molybdenum alloys
electrical conductivity, 613-N
formation, 613-N
hardness, 613-N
magnetic properties
saturation induction, 613-N
Iron wire
crystal structure
texture and preferred orientation, 311-M
Iron-zinc alloys
magnetic properties, 4-S
Irradiated metals
extraction and refining
chemical, 21-C
Isotope separation, 82-C

J

Jewelry
materials, 113-T

K

Kitchen equipment
brazing, 314-K
corrosion by inorganic acids, 191-R
materials
aluminum, 314-K
Krupp-Renn process, 117-D
Krypton
solubility in liquid lead, 709-P
solubility in liquid silver, 709-P
solubility in liquid tin, 709-P

L

Laboratory furnaces, 1-N, 1178-Q, 2-X, 5-X, 45-X, 53-X, 75-X, 76-X, 80-X, 83-X
vacuum, 268-C, 72-X
Laminates, 1-A
Lanthanon, 322-A
Lanthanum
systems
binary, 293-M, 584-M
ternary, 494-M
Lathes, 19-W, 87-W
testing, 71-W
wear, 568-Q
Laws and legal actions, 168-A
Lead
anelastic properties, 1179-Q, 1539-Q
applications, 118-A
blast furnace practice, 175-C, 340-C, 387-C, 414-C, 419-C, 421-C
cathodic protection, 46-R, 565-R, 635-R
cleaning and polishing
chemical, 520-L
colorimetric analysis, 356-E
colorimetric determination, 86-S
condensation of metals, 450-N
converter practice, 382-C, 400-C
corrosion, 663-R, 664-R, 19-T, 228-T
by foods, 505-R
by inorganic acids, 195-R
by lubricants, 385-R
by soils, 261-R, 635-R
by waters, brackish, 674-R
chemical
inorganic, 576-R
galvanic, 322-R, 722-R
inhibition, 441-R
creep, 289-N, 1250-Q
creep strength
effect of deformation, 402-Q
crystal structure
dislocations, 679-M
Lead, crystal structure, (cont.)
imperfections, 309-M, 495-M
texture and preferred orientation, 357-N
damping properties, 774-Q
determination, 54-S, 59-S, 143-S, 236-S
die casting, 518-E
diffusion
self-, 520-N
energy of activation, 578-N
diffusion of antimony, 370-N
diffusion of arsenic, 370-N
diffusion of cadmium, 370-N
diffusion of lithium, 370-N
diffusion of sodium, 370-N
diffusion of tin, 370-N
diffusion of zinc, 370-N
distillation
vacuum, 410-C
elastic properties
Young's modulus, 774-Q
electric furnace smelting, 397-C, 399-C, 417-C, 446-C, 447-C
electrical and electrochemical properties, 77-P
electron emission, 525-P
electroplating, 355-L, 344-R
electroplating of, 740-L
electroplating on, 504-L, 520-L
electrorefining, 111-C, 129-C, 414-C
electrowinning, 463-C
equilibrium constant, 523-P
extraction and refining, 83-C, 408-C
distillation, 140-B, 122-C, 416-C, 444-C
electric furnace, 240-C
leaching
equipment, 341-C
oxidation, 113-C
separation, 129-B, 333-C, 418-C
extrusion, 40-F
effect of pressure, 814-Q
fatigue, 203-Q
fatigue life, 402-Q, 774-Q
fatigue tests
variable stress, 1250-Q
forge welding
roll, 376-K
forging practice, 53-F
drop, 817-Q
upsetting, 1297-Q
formability, 1297-Q
grain boundaries, 193-M
grain growth, 288-N, 289-N
energy of activation, 578-N
hydrostatic tests, 1250-Q
inorganic compounds
thermal properties, 196-P

Lead, (cont.)
liquid
sonic properties, 543-Q
machining, 156-G
melting
fuel fired, 369-C
metal spraying of, 507-L, 789-L
nuclear properties, 276-P
ores
sources, 204-A
oxidation, 81-R, 722-R
passivation, 522-R
permanent mold casting, 356-E
plastic deformation, 362-Q, 817-Q
lines and bands, 814-Q
slip, 203-Q
powder metallurgy, 168-H
recrystallization, 289-N
reduction by gases, 2-C, 363-C
reverberatory smelting
nonferrous, 182-C
roll bonding, 376-K
single crystals
anelastic properties, 105-Q
growth, 357-N
magnetic properties
diamagnetism, 50-P
smelting, 57-C, 309-C, 388-C, 443-C
solubility
krypton, 709-P
solubility of iron, 469-P
specific heat, 274-P
stress analysis, 11-G
surface tension, 469-P
systems
binary, 316-M, 274-P, 432-P, 590-P
thermal properties, 696-P
thermodynamic properties, 590-P
thin films
annealing, 353-P
conductivity, 353-P
use in cathodic protection, 352-R
use in chemical processing equipment, 19-T, 228-T
welding, 590-K
yield point mechanism, 933-Q
zone melting, 383-C
Lead alloys
age hardening, 92-N
applications
chemical processing equipment, 80-T
bend properties and tests, 692-Q
composition analysis, 1230-Q
corrosion
by soils, 122-R
chemical
inorganic, 406-R
Lead alloys, (cont.)
creep
rate
effect of pressure, 692-Q
crystal structure
texture and preferred orientation, 527-M
electron diffraction, 527-M
hardness and hardness tests, 1230-Q
liquid
viscosity, 382-P
machining
mechanical, 45-G
mechanical properties, 441-Q
oxidation, 527-M
specific heat, 432-P
stress analysis, 45-G
Lead-antimony alloys
corrosion
by inorganic acids, 195-R
Lead-antimony-oxygen system, 113-C
Lead bars and rods
extrusion
direct, 236-F
Lead-bismuth alloys
solidification, 43-P
solidification shrinkage, 326-P
thermodynamic properties, 43-P
Lead bronze
use in bearings, 47-H
Lead-cadmium alloys
thermodynamic properties, 284-P
Lead-calcium alloys
extraction and refining, 408-C, 470-C
reduction by metals, 439-C
Lead castings
solidification phenomena, 342-E
volume and dimensional changes, 242-P
Lead-copper alloys
creep, 859-Q
mechanical properties, 859-Q
Lead electroplate
corrosion
atmospheric, 530-R
Lead industry
statistics and economics, 219-A
Lead-lithium alloys
creep, 859-Q
mechanical properties, 859-Q
Lead isotopes
physical properties
mass and volume, 218-P
Lead ores
concentration, 22-B, 37-B
roasting, 138-B
sintering, 138-B
spectrographic analysis, 109-S

Lead pipe
corrosion by soils, 173-R
Lead plating
baths, 116-L
Lead powder
compressibility, 70-H, 110-H
Lead scrap
processing, 115-B, 129-B
Lead selenium alloys
diffusion
in alloy systems, 150-N
self, 150-N
magnetic properties, 96-P
Lead sulfide
electron emission, 228-P
single crystals
corrosion
atmospheric, 215-R
Lead tellurium alloys
diffusion
self, 150-N
diffusion in alloy systems, 150-N
magnetic properties, 96-P, 509-P
Lead-tin alloys
grain boundaries, 193-M
metallography, 89-M
thermodynamic properties, 519-P
Lead-tin-barium alloys
corrosion
stress, 553-R
Lead tubing and pipe
corrosion
by inorganic acids, 454-R
extrusion, 264-F
passivation, 454-R
Leaded brass
bright nickel plating on, 216-L
Leaded bronze
bright nickel plating on, 216-L
Levitation melting
equipment, 206-C
vacuum, 224-C
Light metals, 134-A
adhesive joining, 640-K
metal-to-metal, 604-K
arc welding
gas shielded, 657-K
assemblies, 640-K
castings
hardness, 1165-Q
tensile properties, 1165-Q
creep strength, 604-K
degreasing, 388-L
electroplating on, 394-L
extraction and refining
holding and pouring, 199-C
extrusion, 174-F
Light metals, (cont.)
fatigue strength, 604-K
flaw detection
ultrasonic, 377-S
forging practice, 212-F
foundry practice, 111-G
heat treatment, 232-J
impact strength, 604-K
machinability, 111-G
mechanical properties, 232-J
permanent mold casting, 151-E
quality control, 213-E
riveting, 640-K
sampling techniques, 151-E
spot welding, 640-K
tensile properties, 604-K
volume and dimensional changes, 213-E
Lime
converter process
bessemer
Perrin process, 179-D
Liquid-liquid reactions, 84-D
books, 70-N
testing equipment, 421-N
Liquid metals, 4-T
atomic structure, 80-M
books, 70-N
corrosion
erosion, 822-R
diffusion, 60-N, 398-N, 270-P
self-, 50-N, 382-N
electrical conductivity, 244-P
electrochemical properties, 270-P
electron diffraction, 592-M
entropy, 297-P
heat transfer, 720-P
magnetic properties, 10-P
physical properties, 428-N
sampling techniques, 81-S, 334-S
solidification shrinkage, 221-E
solubility, 261-P
specific heat, 297-P
surface tension, 612-P
temperature measurement, 720-P
thermal convection, 10-P
thermodynamic properties, 9-P, 101-P
transformations, 428-N
viscosity, 60-N, 663-P
Lithium, 147-A, 332-A, 489-A
electrical conductivity, 855-Q
electrical properties
effect of low temperature, 426-P
history, 52-A
martensitic reactions, 855-Q
melting temperatures, 636-M
nuclear properties
resonance, 205-P

Lithium, (cont.)
reduction by gases, 188-C
solidification, 636-M
solubility in aluminum, 427-N
statistics and economics, 52-A
systems, 636-M
binary, 398-M
tensile properties, 855-Q
thermal analysis, 398-M
transformations, 23-N
stress-induced, 855-Q
vacuum reduction and refining, 147-A
Lithium-arsenic alloys
crystal structure, 146-M
Lithium ores
flotation
equipment, 1-B
Low nuclear cross-section metals, 363-A
Low shaft furnace practice, 279-D, 293-D, 429-D, 464-D, 481-D, 482-D, 497-D, 533-D, 589-D
automation, 278-D
Low temperature materials, 461-E
impact properties and tests, 54-Q
Lubricants and oils, 1-E, 106-F, 61-G, 67-G, 92-G, 104-G, 144-G, 269-G, 283-Q, 897-Q, 544-R, 397-W
analysis
special separation, 22-S
applications, 520-A
corrosion prevention, 154-R
in wire drawing, 66-F
molybdenum sulphide, 131-G
Lutetium
spectrographic analysis, 259-S

M

Machinability, 89-G, 90-G, 151-G, 235-G, 388-G
effect of composition, 122-G
effect of heat treatment, 122-G
tests, 261-G
Machine parts, 303-T
centrifugal casting, 423-E
corrosion by inorganic acids, 639-K
die casting, 409-E
electroplating, 409-L
fatigue strength, 1309-Q
heat treatment
induction, 329-J, 1309-Q
materials
nodular cast iron, 319-T
metal spraying on, 483-L, 677-L
resistance welding, 639-K
rolling
surface, 1309-Q
Machine parts, (cont.)
thermit welding, 515-K
wear, 195-J, 321-T
wear properties and tests, 347-T
Machine tools, 334-A, 127-G, 452-G, 278-L, 54-W, 397-W
automation, 6-G
directories, 132-W
jigs and fixtures
magnesium 119-W
Russia, 191-G
wear
radioactive tracer study, 442-Q
Machining, 17-G, 63-G, 85-G, 120-G, 127-G, 143-G, 165-G, 229-G, 415-G, 173-T
chemical, 22-G, 49-G, 133-G, 176-G, 186-G, 271-G, 304-G, 407-G, 422-G
electrochemical, 84-G, 186-G, 268-G, 333-G, 416-G, 433-G
finish, 15-G, 306-G
lubricants and oils, 214-F, 67-G, 156-G
lubrication, 104-G
mechanical, 2-G, 4-G, 6-G, 12-G, 24-G, 34-G, 41-G, 46-G, 53-G, 56-G, 66-G, 78-G, 79-G, 80-G, 90-G, 94-G, 96-G, 158-G, 234-G, 244-G, 245-G, 247-G, 272-G, 273-G, 277-G, 281-G, 340-G, 361-G, 377-G, 434-G, 85-T, 218-T
automation, 357-G
lubricants and oils, 30-G, 246-G, 260-G
stress analysis, 296-G, 389-G
temperature measurement, 339-G
non-mechanical, 249-G
research, 169-G
spark, 28-G, 58-G, 69-G, 77-G, 81-G, 84-G, 88-G, 126-G, 128-G, 137-G, 186-G, 203-G, 209-G, 275-G, 288-G, 310-G, 326-G, 343-G, 370-G, 371-G, 428-G, 444-G
stress analysis, 430-G
stresses
residual, 419-G
tolerances, 351-G
ultrasonic, 68-G, 175-G, 262-G, 268-G, 448-G, 458-G, 459-G
Magnesium, 2-A, 110-A, 535-A, 299-T, 317-T
analysis, 309-S
anodizing, 70-L
arc welding
gas shielded
standards and specifications, 23-K
castings
mechanical properties, 10-A
colorimetric determination, 6-S, 234-S
corrosion
atmospheric, 712-R, 793-R

Magnesium, corrosion, (cont.)
by organic acids, 291-R
chemical
inorganic, 528-R
organic
effect of radiation, 751-R
stress, 151-Q
corrosion prevention, 76-R
crystal structure
imperfections, 431-M
deoxidizers, 284-D
determination, 98-S, 170-S, 189-S
die casting, 311-E, 518-E, 527-E
diffusion
in alloy systems, 51-N
in cast iron, 552-N
in nickel, 656-N
interfacial, 525-N
drawing, 208-G
elastic properties
Poissons ratio, 711-Q
electron beam welding, 715-K
electron emission, 636-P
electroplated, 159-T
electroplating
baths, 352-L
electroplating of, 497-L
electrorefining, 239-C
electrowinning, 107-C, 311-C, 385-C
equipment, 404-C
extraction and refining, 87-C
chemical, 406-C
distillation, 51-C
vacuum, 297-C
halide reduction, 89-C
halogenation, 335-C
extrusion, 136-F
fatigue life, 43-Q
fatigue properties and tests, 151-Q
fluidity and castability, 526-E
forging practice, 182-F
drop, 290-F
foundry practice, 51-E, 52-E, 434-E, 453-E
fluidity and castability, 1395-Q
melting, 376-E, 451-E
molding
shell, 547-E
pouring, 375-E
quality control, 509-E
fracture
brittle, 151-Q, 1523-Q
hardness
micro-, 525-N
heat treatment, 52-E
high purity, 233-A
hydrogen solubility, 146-P

Magnesium, (cont.)
in automobiles
parts and fittings, 129-T
in iron and steelmaking, 148-E
machining
chemical
equipment, 338-G
magnesium system, 87-C
mechanical properties, 212-A
microstructure, 1395-Q
nodulizing agents, 270-E, 284-E, 222-W
oxidation, 228-R, 275-R
painting on, 33-L
passivation, 291-R
phase diagrams, 471-M
physical properties, 212-A
plastic deformation, 97-Q
porosity, 527-E
powder metallurgy, 94-H
reduction by metals, 458-C
rolling, 370-W
safety, 212-A, 484-A
sand casting, 525-E, 526-E
single crystals
cleavage, 1520-Q
compression properties and tests, 732-Q
creep strength, 410-Q
plastic deformation
slip, 410-Q, 732-Q, 1172-Q
x-ray diffraction, 431-M
yield point mechanism, 1404-Q
yield strength, 1404-Q
solubility
beryllium, 700-R
solubility in acid, 113-P
solubility of zirconium, 441-P
solution strengthening, 472-N
spectrographic determination, 70-S, 285-S, 359-S
standards and specifications, 484-A
strain hardening, 410-Q
systems
binary, 358-M, 584-M, 606-M
ternary, 538-M, 543-M, 559-M, 690-M, 441-P
tensile properties, 7-Q
thermodynamic properties, 240-P
uranium system, 87-C
use in aircraft, 314-T
use in electrical and electronic equipment, 159-T
use in nuclear reactors, 183-T
welding, 590-K
Magnesium alloys, 1237-Q
anodic coating, 129-R
anodizing, 52-L, 398-L
applications, 543-A, 312-E

Magnesium alloys, (cont.)
brazing
dip, 92-K
ceramic coating on, 662-L, 719-L
chromate coating, 129-R
composition, 240-A
corrosion, 329-L, 1237-Q, 1278-Q, 1280-Q, 129-R
atmospheric, 218-R
by waters
sea, 677-R
chemical
inorganic, 471-S
concentration cell, 485-R
galvanic, 230-R, 239-R
stress, 272-R, 336-R, 559-R
tropical atmosphere, 230-R
corrosion prevention
cathodic protection, 258-R
corrosion resistance, 240-A
corrosion tests
salt spray, 1328-Q
creep, 40-Q, 121-Q, 333-Q, 485-Q, 958-Q, 1318-Q
effect of temperature, 96-Q
stress-relaxation, 598-Q
creep strength, 1270-Q, 1328-Q
creep tests
stress-relaxation, 794-Q, 876-Q
crystallization, 376-E
damping properties
effect of stress, 423-Q
damping properties and tests, 960-Q
die castings, 457-A, 137-E
dispersion hardening, 71-H
drawing
deep, 29-G
press forming, 352-G
ductility, 1270-Q
elastic properties, 1270-Q
Young's modulus, 959-Q
electrochemical properties, 258-R
electron microscopy, 344-M
extrusion
impact and cold, 231-G
fatigue, 355-Q
fatigue properties, 162-Q
fatigue strength, 216-Q
finishing, 280-L
flaw detection
chemical and electrochemical, 471-S
radiographic, 600-Q
forging practice, 119-F
forming, 144-G
foundry practice, 228-E
fracture
brittle, 1284-Q
crack propagation, 559-R

Magnesium alloys, (cont.)
grain growth, 83-Q
grain size, 600-Q
effect of temperature, 3-M
heat transfer, 259-J
heat treatment
heating and cooling, 259-J
impact properties, 162-Q
impact strength, 1270-Q
liquid, viscosity, 382-P
machining
chemical, 133-G, 139-G, 180-G
non-mechanical, 43-G
macrostructure, 600-Q, 1318-Q
mechanical properties, 240-A, 457-A, 468-A, 297-E, 182-F, 231-G, 71-H, 122-J, 42-Q, 120-Q, 281-Q, 444-Q, 840-Q, 1237-Q, 1278-Q, 1279-Q, 1280-Q, 1284-Q, 1395-Q, 1438-Q
effect of composition, 83-Q
effect of high temperature, 335-Q, 798-Q
effect of heat treatment, 1394-Q
effect of low temperature, 680-Q
metallography
etching, 344-M
microstructure
primary, 344-M, 1278-Q, 1280-Q
radioactive tracer study, 151-M
oxidation, 375-E, 275-R
painting, 129-R
physical properties, 240-A, 422-Q, 840-Q, 1279-Q
plastic deformation, 485-Q
porosity, 245-S
precipitation, 122-J
precipitation hardening, 122-J
aging, 996-Q
solidification, 584-M
solubility, 681-P
spot welding, 579-K, 721-K
standards and specifications, 1438-Q
tensile properties, 924-Q, 996-Q, 1270-Q, 1328-Q
effect of high temperature, 422-Q
tensile properties and tests, 122-Q, 600-Q
effect of deformation, 955-Q
thermal diffusivity, 259-J
use in airframes, 312-T
use in automobiles, 119-W
use in missiles, 43-G, 960-Q, 61-T
use in photographic equipment, 190-T
use in rocket component, 840-Q
weldability, 840-Q
weldments
fatigue, 216-Q
macrostructure, 721-K

Magnesium-aluminum alloys
corrosion
erosion, 750-R
creep, 185-Q
crystal structure
dislocations, 185-Q
energy of activation, 185-Q
hardness
micro-, 1462-Q
specific heat, 100-P
Magnesium-aluminum-zinc alloy castings
metallurgical control
porosity, 487-E
Magnesium-antimony alloys
thermodynamic properties, 471-M
Magnesium-beryllium alloys
oxidation
effect of high temperature, 700-R
use in nuclear reactors
fuel elements, 700-R
Magnesium-bismuth alloys
thermodynamic properties, 620-P
Magnesium-cadmium alloys
corrosion
by inorganic acids
radioactive tracer study, 566-R
damping properties, 746-Q
elastic properties
Young's modulus, 746-Q
vapor pressure, 515-P
Magnesium-calcium alloys
thermodynamic properties, 418-P
Magnesium castings, 239-A, 96-E
bend properties and tests, 552-Q
bibliographies, 71-E
corrosion, 1485-Q
cracks, 280-E
data books, 223-A
design, 303-A, 84-E, 95-E
machining
mechanical, 321-G
mechanical properties, 155-E, 191-E, 251-E, 516-Q, 1396-Q
tests, 608-Q
solidification phenomena, 202-E, 280-E, 584-M
structure control, 376-E
tensile properties, 434-E
tensile properties and tests, 552-Q, 1485-Q
use in aircraft, 525-E
Magnesium cermets, 84-H
Magnesium-chromium-aluminum alloys
crystal structure, 87-M
Magnesium-copper alloys
electrical and electrochemical properties, 29-P
thermal expansion, 29-P
Magnesium die castings
forging practice, 79-F
machining
mechanical, 78-A
mechanical properties, 79-F, 652-Q
physical properties, 652-Q
vacuum, 207-E
Magnesium extrusions
corrosion, 983-Q
design, 231-G
mechanical properties, 468-A, 983-Q
use in aircraft, 32-T
Magnesium forgings
mechanical properties, 182-F, 281-Q
Magnesium foundry practice, 251-E, 297-E
addition agents, 191-E
bibliographies, 71-E
mechanical properties
effect of composition, 136-E
pouring, 155-E
rigging, 155-E
Magnesium industry
statistics and economics, 219-A
Magnesium investment castings
tensile properties and tests, 653-Q
Magnesium-lead alloys
activity coefficient, 408-P
entropy, 507-P
Magnesium-manganese alloys, 388-A
Magnesium-manganese ferrites
electrical conductivity, 675-P
Magnesium-neodymium system, 121-M
Magnesium ores
fluid bed process, 168-C
halogenation, 168-C
Magnesium oxide
bend properties
strength and ductility, 466-Q
crystal structure
dislocations, 1091-Q
friction, 873-Q
plastic deformation, 1091-Q
wear, 873-Q
Magnesium permanent mold castings
mechanical properties, 654-Q
physical properties, 654-Q
Magnesium sheet, 175-T
forming and machining, 162-G
oxidation, 299-R
pickling, 352-L
riveting, 416-K
roll bonding, 390-L
use in missiles, 92-T
Magnesium-silver alloys
age hardening, 694-M
crystal structure, 694-M, 695-M

Magnesium-silver alloys, (cont.)
microstructure
primary, 695-M
x-ray microscopy, 694-M, 695-M
Magnesium solid solutions
structure, 642-M
Magnesium-thorium alloys
creep strength, 1125-Q
tensile properties, 1125-Q
Magnesium-thorium-zinc alloys
applications, 443-A
mechanical properties, 443-A
physical properties, 443-A
Magnesium-thorium-zirconium alloys
tensile properties and tests, 600-Q
Magnesium-zinc-zirconium alloys
oxidation, 699-R
Magnesium-zirconium alloys
ductility, 1465-Q
elastic properties, 1465-Q
grain size, 1465-Q
oxidation, 699-R
tensile properties, 1465-Q
Magnetic domains, 701-M
Magnetic instruments, 564-P, 27-X, 53-X
Magnetic metals, 453-A, 556-A, 383-M, 485-M, 598-M, 701-M, 643-N, 256-P, 319-P, 354-P, 362-P, 419-P, 444-P, 447-P, 448-P, 451-P, 474-P, 476-P, 489-P, 490-P, 496-P, 500-P, 511-P, 528-P, 584-P, 615-P, 622-P, 642-P, 728-P, 732-P, 733-P, 28-X
annealing, 54-J, 202-J
atomic structure, 174-M
books, 395-P
crystal structure
texture and preferred orientation, 226-M, 305-M
effect of heat treatment, 365-P, 370-P
effect of irradiation, 244-M
effect of stress, 248-Q
effect of temperature, 361-P
electrical conductivity, 203-P, 204-P
electron microscopy, 66-P
free energy, 216-P
machinability, 18-G
magnetic properties, 8-P, 180-P, 211-P, 216-P, 356-P, 27-X
domain theory, 66-P, 67-P
magnetostriction, 5-P
nuclear properties
cross sections, 227-P
order-disorder, 5-P
properties, 186-P
superlattice formation, 107-N
Magnetic properties, 453-A, 13-P, 142-P
Magnetic properties, (cont.) 415-P, 444-P, 474-P, 1122-Q
books, 395-P
domain theory, 301-P
effect of stress, 289-P
effect of radiation, 528-P
hysteresis loop
effect of heat treatment, 329-P
magnetostriction, 145-P
effect of stress, 362-P
paramagnetism, 549-P, 728-P
saturation induction, 728-P
testing equipment, 615-P
tests, 429-P
Magnetite
magnetic properties, 158-P, 165-P, 167-P
Magnets, 444-P, 447-P
permanent, 183-P, 28-X
Manganese
addition agents, 530-Q
alloying agents, 377-D
colorimetric determination, 125-S, 425-S
crystal structure, 57-M
determination, 13-S, 146-S, 432-S, 443-S
diffusion, 527-N
interfacial, 525-N
electroplating, 271-L
electrowinning, 99-C
extraction and refining
arc melting, 392-C
degassing, 479-C
distillation, 139-C
hardness
micro-, 525-N
in cast iron, 238-P
in iron and steelmaking, 157-D, 212-D
polarographic determination, 116-S, 124-S
reaction rates, 710-P
spectrographic determination, 523-K, 8-S, 239-S
systems
binary, 332-M, 551-M, 585-M
ternary, 53-M, 189-M, 372-M, 406-M, 506-M, 515-M, 537-M, 539-M, 542-M, 543-M, 553-M, 598-M, 666-M, 677-M
thermal analysis, 710-P
Manganese alloys
atomic structure
co-ordination number, 616-M
crystal structure, 372-M, 598-M, 616-M
magnetic properties, 598-M
Manganese-aluminum alloys
magnetic properties, 325-P
Manganese-bismuth alloy powder
magnetic properties, 158-P

Manganese-bismuth alloys
magnetic properties, 183-P
Manganese-cobalt-carbon alloys
crystal structure, 304-M
magnetic properties, 304-M
Manganese-copper system, 166-M
Manganese iron alloys
single crystals
magnetic domains, 139-M
Manganese ores
flotation, 27-B
leaching, 71-C
smelting, 204-C
sources, 88-A, 137-A, 340-A
Manganese oxides, 190-N
Manganese powder
mixing and blending, 60-H, 150-H
Manganese powder metallurgy, 183-P
Manganese steel, 82-T
austenite formation and decomposition, 73-N
foundry practice, 208-E
Manganese-steel castings
explosive hardening, 202-G
hardness and hardness tests, 208-E
Manganese steel ingots
ladle casting, 160-D
Manganese steel plate
notch sensitivity, 808-Q
Manganese sulphides, 190-N
Manganese-tin alloys
magnetic properties
Curie temperature, 393-P
diamagnetism, 393-P
Manganese-titanium-aluminum steel
weldability, 19-K
Manganese-zinc-cobalt system, 142-P
Manganese-zinc-germanium system, 142-P
Marine equipment
bituminous coating, 185-L
corrosion, 820-R
by waters
sea, 592-R
synthetic resin coating, 185-L, 559-L
use of copper, 200-T
welding, 368-K
Martensite and martensite reaction, 487-A, 144-M, 67-N, 362-N
effect of vibration, 85-N
ferrous, 5-N, 81-N, 545-N, 566-N, 232-Q
effect of stress, 146-N
testing equipment, 238-N
nonferrous, 441-N
Materials handling, 131-A, 229-A, 261-A, 141-E
Materials handling equipment, 350-A, 181-E, 484-Q, 138-T, 97-W, 294-W, 295-W
automation, 2-W
conveyors, 293-W
remote, 41-M
Mechanical properties, 285-M, 242-Q 1134-Q, 1218-Q, 1409-Q
book, 904-Q
effect of low temperature, 404-Q, 755-Q
effect of radiation, 282-M, 676-P, 905-Q, 1286-Q, 1287-Q
research, 599-Q
testing equipment, 1215-Q
tests, 128-Q, 157-Q, 797-Q, 868-Q, 1057-Q, 1178-Q, 1259-Q
effect of high temperature, 163-Q
magnetic, 1122-Q
standards and specifications, 780-Q
ultrasonic, 611-Q
Mechanical testing equipment, 635-Q 838-Q, 8-X, 32-X, 34-X, 49-X, 73-X 74-X, 78-X, 94-X
Medical and dental equipment
materials
tantalum, 539-A
painting, 387-L
Melting furnaces and equipment
oxygen injection, 340-D, 347-D, 348-D, 349-D, 189-W, 418-W
Melting temperatures, 483-C
Mercury
crystal structure, 69-M, 35-P
determination, 400-S
diffusion, 500-N
diffusion in tin, 397-N
electrical conductivity, 45-P
electrochemical properties
ionization potential, 248-P
extraction and refining
distillation, 365-C, 422-C
leaching, 365-C
safe handling, 227-A
single crystals
electron emission, 35-P
solubility of plutonium in, 335-P
systems
binary, 682-N
Mercury alloys
electrochemical properties, 607-P
optical properties
reflection, 424-P
Mercury-indium alloys
electrical conductivity, 244-P
Mercury industry
statistics and economics, 219-A

Mercury ores
flotation, 66-B
fluid bed processes, 66-B
Mercury solid solutions
formation, 69-M
Mercury-tellurium alloys
electrical conductivity, 244-P
electrical properties, 97-P
single crystals
electrical conductivity, 175-P
Mercury-zinc system, 123-M
Metal industry
statistics and economics, 161-A
Metal products and parts, 25-T
materials
zinc, 284-T, 285-T
Metal spraying, 151-L, 158-L, 245-L, 314-L, 347-L, 408-L, 482-L, 483-L, 490-L, 522-L, 554-L, 558-L, 598-L, 605-L, 670-L, 736-L, 748-L, 130-R, 49-W
automation, 754-L
equipment, 572-L
Metal systems
binary, 698-M, 480-P
Metallographic equipment, 368-M, 11-X, 35-X, 43-X, 52-X, 57-X, 86-X
Metallography, 68-M
etching, 91-M, 96-M, 109-M, 214-M, 220-M, 292-M, 321-M, 376-M, 414-M, 422-M
effect of aging, 160-M
effect of composition, 160-M
polishing, 17-M, 64-M, 89-M, 92-M, 220-M, 278-M, 298-M, 375-M, 563-M, 57-X, 86-X
replica technique, 13-M, 56-M, 242-M, 322-M, 363-M, 563-M
specimen preparation, 93-M, 267-M, 349-M, 397-M, 523-M, 535-M, 629-M
equipment, 630-M
standards and specifications, 780-Q
techniques, 170-M, 228-M, 229-M, 230-M, 368-M, 497-M
electrical, 309-M, 604-R
Metallurgy, 166-A, 185-A, 333-A, 339-A, 360-A, 419-A, 460-A, 475-A, 486-A, 552-A, 566-A
books, 276-A, 403-M
dictionaries, 214-A
documentation, 451-A, 527-A, 528-A, 529-A, 569-A, 576-A, 577-A
education, 173-A, 491-A
effect of high temperature, 575-A
etching
cathodic, 702-M
glossaries, 214-A, 371-A
Metallurgy, (cont.)
history, 125-A, 183-A, 184-A, 199-A, 207-A, 297-A, 300-A, 305-A, 329-A, 331-A, 356-A, 537-A, 545-A, 553-A, 578-A, 152-D, 4-K
instrumentation, 345-A
nonferrous
research, 211-A
radioactive tracer study, 236-A, 374-A
replica techniques, 268-M
research, 178-A, 209-A, 224-A, 481-A, 491-A, 547-A
Japan, 324-A
Metals
chemical kinetics, 194-A
coated
corrosion, 85-R
atmospheric, 391-L
size, thickness and mass measurement
radiographic, 310-S
thickness, 326-S
effect of radiation, 178-A
electroplated
flaw detection, 450-S
painted
corrosion tests, 382-R
properties, 114-A, 115-A
specifications, 552-A
statistics and economics, 458-A
Meters
rate
time and flow, 385-D, 388-D, 227-W
Microcrack formation, 343-Q
Microradiography, 25-M, 72-M, 622-M
testing equipment, 512-M
Microscopes, 295-S, 19-X, 39-X, 54-X
metallographic, 524-M, 22-X, 52-X
Microscopy, 32-L, 86-M, 524-M
Microstructure
effect of stress, 158-M
primary, 629-M, 637-M
effect of high temperature, 204-N
Mild steel sheet
deep drawing, 300-G
mechanical properties, 300-G
stamping, 300-G
Mill practice, 224-D, 15-F, 254-F, 42-T
canning and sheathing, 60-T
explosive, 347-G
grinding
statistical analysis, 195-F
heating for working, 115-F, 227-F, 68-W, 441-W
lubricants and oils, 190-F, 214-F
research, 403-D, 156-F
sampling techniques, 376-Q

Mill practice, (cont.)
scarfing
statistical analysis, 195-F
surface preparation, 39-G
Millers, 31-G
automation, 100-G, 24-W
Milling and hobbing, 126-F, 31-G, 40-G 348-G
automation, 100-G
Mineral resources, 34-A, 137-A
Minerals
composition analysis, 25-S
nonmetallic
roasting, 112-B
Mining and oil field equipment, 180-A, 484-Q, 138-T
use of manganese steel, 82-T
use of stainless steel, 169-T
Mining equipment, 135-L, 305-T
wear, 266-T
Minor metals
metallurgy, 479-A
Missiles, 453-E, 2-G, 542-K, 828-L, 42-Q, 100-T, 225-T, 262-T
brazing
induction, 145-K
carburizing, 310-J
electroplating on, 815-L
fatigue
strength, 1213-Q
heat transfer, 594-P
heat treatment
controlled atmosphere, 310-J
homogenization, 279-J
materials, 594-P, 1097-Q, 92-T, 117-T, 162-T, 213-T
castings, 288-T
ceramics, 229-T
magnesium alloys, 960-Q
molybdenum, 1174-Q, 219-T
titanium, 301-T
notch sensitivity, 339-T
seam welding, 457-K
soldering
induction, 145-K
spot welding, 457-K, 560-K
welding, 292-K, 426-K
yield strength, 339-T
Mixer and ladles, 220-W
design, 245-D
refractories, 312-W
Molybdenum, 26-A, 165-A, 238-A, 258-A, 284-A, 347-A, 359-A, 418-A
adhesive joining
metal-to-metal, 594-K
analysis
special separation, 380-S
Molybdenum, (cont.)
anelastic properties, 1539-Q
annealing, 167-K
applications, 532-A
alloy steel, 922-Q
arc welding
gas shielded, 121-K, 331-K, 352-K
atomic structure
coordination number, 618-P
interatomic bond, 479-M
brazing, 219-K, 331-K, 359-K, 487-K
brittle transition temperature, 1087-Q, 1519-Q, 1523-Q
centrifugal casting
vacuum, 151-C
ceramic coating, 348-L
ceramic coating on, 410-L
chemical reduction coating of, 743-L
chromizing on, 747-L
cladding on, 410-L
clad
use in electrical and electronic equipment, 28-T
cleaning
electrolytic, 472-L
cleaning and polishing, 167-K
chemical, 472-L
coated
oxidation, 599-R
coating, 1026-Q
coating on, 466-L
colorimetric analysis, 10-S, 82-S
colorimetric determination, 230-S
corrosion, 76-A
by chemicals
organic, 321-R
chemical
inorganic, 65-R
organic, 65-R
determination, 87-S, 147-S, 171-S, 443-S, 455-S
diffusion, 166-N, 541-N
graphite, 559-N
dip coating on, 636-L
effect of high temperature, 54-A
effect of radiation, 198-N
elastic properties
Poissons ratio, 711-Q
electrical conductivity, 618-P
effect of deformation, 31-P
electrical properties, 70-X
electrochemical properties
ionization potential, 666-P
electron emission, 288-P, 525-P
electrophoretic plating, 154-L
electroplating, 154-L, 157-L
baths, 249-L, 584-L

Molybdenum, (cont.)
electroplating on, 93-L, 103-L, 401-L, 410-L, 472-L
extraction and refining
arc melting, 93-H, 546-M
vacuum, 151-C, 219-C
decomposition, 68-B
melting, 72-X
vacuum, 485-C
extrusion, 211-F, 216-T
direct, 256-G
impact and cold, 187-G, 256-G, 1351-Q
fiber metallurgy, 131-H
flame plating, 154-L
forge welding, 331-K
forging practice, 152-F, 211-F, 216-T
forming, 78-F, 400-G, 216-T
forming and machining, 134-G, 181-G
fracture
brittle, 1087-Q, 1519-Q
friction, 1407-Q
gas analysis, 168-S
grinding, 182-G
hard surfacing, 302-L
hard surfacing on, 410-L
high temperature effects, 113-A
in stainless steel, 473-Q
isotope
nuclear properties
radioactive decay, 247-P
machining, 78-F
chemical, 174-G
mechanical, 258-G
mechanical properties, 76-A, 78-F, 1026-Q
effect of high temperature, 547-Q, 564-Q, 1174-Q
melting temperatures, 328-M
metal spraying, 160-L, 302-L
metal spraying of, 392-L, 651-L
metal spraying on, 410-L
mill practice, 256-F
nuclear properties
radioactive decay, 695-P
optical properties
emission, 133-P
ores
sources, 204-A
oxidation, 466-L, 1026-Q, 197-R, 428-R, 573-R
effect of high temperature, 748-R
pickling, 473-L
plastic deformation
lines and bands, 857-Q
polarographic determination, 321-S
polishing
chemical, 473-L

Molybdenum, (cont.)
powder metal compacts
sintering, 173-H
powder metallurgy, 44-H
recovery, 198-N
recrystallization, 152-F, 256-G, 104-N, 1239-Q
research, 123-A
rolling, 211-F
spectrographic determination, 8-S
spot welding, 331-K
sprayed metal
wear, 651-L
spraying, 154-L, 296-L
systems
binary, 51-M, 198-M, 228-M, 328-M, 384-M, 400-M, 231-N, 344-N
ternary, 14-M, 113-M, 492-M, 517-M, 553-M, 161-N
tensile properties, 857-Q, 1239-Q, 1351-Q, 1439-Q
effect of grain size, 853-Q
tensile properties and tests, 28-T
thermal properties, 44-T
thermodynamic properties
effect of low temperature, 372-P
ultrasonic welding, 231-K, 245-K
use in aircraft engines, 219-T
use in chemical processing equipment, 220-T
use in die casting dies, 336-W
use in electrical and electronic equipment, 174-G, 216-T
use in missiles, 219-T, 1174-Q
use in nuclear reactors, 221-T
vacuum fusion welding, 191-K
vapor deposition coating of, 455-L, 681-L, 743-L
vapor deposition on, 410-L
volume and dimensional changes
effect of radiation, 403-P
wear properties and tests
effect of pressure, 557-Q
weldability, 193-K
welding, 167-K, 529-K, 643-K
effect of temperature, 201-K
wire drawing, 216-T
x-ray analysis
composition, 122-S
zone melting, 264-C, 280-C

Molybdenum alloys
aluminizing on, 468-L
annealing, 202-J
arc welding, 358-K
coated electrode, 391-K
gas shielded, 361-K

Molybdenum alloys, (cont.)
bend properties
strength and ductility, 830-Q
brazed joints
tensile properties, 613-K
brazing
furnace, 613-K
brittle transition temperature, 358-K, 361-K, 354-N
ceramic coating, 468-L
cladding, 468-L
cladding on, 467-L
creep, 1033-Q
diffusion coating on, 468-L
dispersion hardening, 448-N
electroplating on, 468-L
extrusion, 186-F, 831-Q
finishing, 696-Q
flash welding, 361-K
forging practice, 153-F, 831-Q, 215-T
forming, 696-Q
grain growth, 354-N
hardness, 831-Q
heat treatment, 201-Q
machinability, 184-G
machining, 696-Q
mechanical, 255-G
magnetic properties, 202-J
mechanical properties, 448-N, 201-Q
effect of high temperature, 696-Q
melting and casting, 85-C
oxidation, 830-Q
physical properties, 696-Q
recrystallization, 186-F, 361-K, 354-N
resistance welding, 358-K
rolling, 186-F, 831-Q
stress rupture properties and tests, 830-Q, 831-Q, 1033-Q
tensile properties, 186-F, 361-K, 830-Q, 831-Q
ultrasonic welding, 360-K
use in aircraft engines, 361-K, 467-L, 215-T
use in airframes, 308-T
use in die casting dies, 327-W
welding, 696-Q
Molybdenum bars and rods
ductility, 832-Q
grain size, 832-Q
tensile properties, 832-Q
Molybdenum brazed joints
tensile properties, 359-K
Molybdenum cermets
mechanical properties, 131-H, 1039-Q
mixing and blending, 128-H
molding and compacting
hot pressing, 128-H, 130-H, 131-H
Molybdenum cermets, (cont.)
oxidation, 1039-Q
sintering, 85-C, 131-H
thermal conductivity, 130-H
Molybdenum electrodes
mechanical properties, 156-T
Molybdenum extrusions
tensile properties, 1197-Q
Molybdenum forgings
mechanical properties, 153-F
Molybdenum ingots
grain size, 546-M
Molybdenum powder
fatigue strength, 1542-Q
molding and compacting
rolling, 74-H
spectrographic analysis, 442-S
tensile strength, 1542-Q
Molybdenum powder compacts
sintering, 93-H
Molybdenum powder metals
molding and compacting, 68-H
Molybdenum sheet
ductility, 832-Q
grain size, 832-Q
tensile properties, 832-Q
Molybdenum strip
oxidation, 548-R
pitting corrosion, 548-R
Molybdenum-titanium alloys
corrosion
by molten metals, 702-R
forming, 368-G
joining, 368-G
mechanical properties, 1027-Q
effect of high temperature, 899-Q
physical properties, 899-Q
Molybdenum tubing and pipe
mechanical properties, 256-G
Molybdenum-zirconium alloys
electron microscopy, 204-M
Movie cameras, 23-X

N

National metallurgical laboratory
Jamshedpur, India, 341-A
National physics laboratory
England, 547-A
Neodymium
heat of reaction, 494-P
magnetic properties, 26-P
Neptunium
electroplating of, 418-L
extraction and refining
chemical, 10-C
solvent extraction, 65-C

Nickel, 53-A, 148-A, 321-A, 414-A
adhesive joining
metal-to-metal, 592-K
anelastic properties, 1012-Q, 1539-Q
effect of heat treatment, 629-Q
applications, 143-A, 532-A
arc cutting, 302-G
arc welding, 558-K
atomic structure, 110-M, 1012-Q
austenitic
crystal structure
dislocations, 564-M
barrel plating, 389-L, 523-L
bend properties and tests, 661-M
blast furnace practice, 349-C, 389-C, 431-C
fluxes and slags, 302-C
blasting, 470-L
brazed joints
fatigue, 483-Q
tensile properties and tests, 483-Q
buffing, 700-L
centrifugal castings, 513-Q
chemical reduction coating, 86-L, 170-L, 379-L
chemical reduction coating of, 393-L, 600-L, 625-L, 752-L
chromizing on, 747-L
cladding, 730-L
cladding of, 447-L
cleaning and polishing
chemical, 374-L, 470-L
electrochemical, 48-L
mechanical, 374-L
coating by, 466-L
colorimetric determination, 327-S
composition, 47-S
converter practice, 464-C
corrosion
atmospheric, 426-R, 712-R
by sulphur compounds, 426-R
chemical
inorganic, 216-R
fatigue, 754-R
creep, 640-Q, 1031-Q, 1333-Q, 1347-Q
rate
effect of high temperature, 412-Q
crystal structure, 44-M, 661-M, 640-Q
dislocations, 377-M, 433-M, 496-M, 611-M, 459-P
imperfections, 157-M
damping
magnetic, 150-Q
damping properties and tests, 1157-Q
degreasing, 470-L
determination, 187-M, 13-S, 30-S, 59-S, 172-S, 443-S
x-ray analysis, 342-S
Nickel, (cont.)
diffusion, 177-N, 684-N
aluminum, 656-N
graphite, 559-N
hydrogen, 754-R
magnesium, 656-N
silicon, 419-N, 656-N
titanium, 419-N
zirconium, 656-N
diffusion in silicon, 192-P
dip coating, 297-L
dip coating of, 458-L
ductility, 435-C, 1333-Q
effect of low temperature, 412-Q
effect of radiation, 155-T
elastic properties, 364-Q
Poisson's ratio, 711-Q
electrical conductivity, 680-N
effect of impurities, 253-P
electrical properties
effect of low temperature, 427-P
electrochemical properties, 254-P, 438-P, 686-P
electrodeposit structures, 375-C, 22-N, 76-N, 604-N
electroforming, 711-L
electroforming of, 37-L, 462-L
electroplating, 74-L, 92-L, 93-L, 100-L, 103-L, 110-L, 159-L, 222-L, 261-L, 266-L, 309-L, 329-L, 331-L, 350-L, 355-L, 358-L, 374-L, 376-L
baths, 136-L, 164-L, 165-L, 202-L, 375-L, 378-L, 714-L, 741-L
radioactive tracer study, 402-L
bright, 132-L
defects, 377-L
on titanium, 218-L
properties and tests, 98-L, 216-L, 101-S
electroplating of, 9-L, 37-L, 343-L, 401-L, 410-L, 414-L, 432-L, 458-L, 462-L, 472-L, 497-L, 520-L, 527-L, 575-L, 588-L, 591-L, 627-L, 648-L, 663-L, 665-L, 669-L, 671-L, 674-L, 715-L, 740-L, 744-L, 761-L, 764-L, 797-L, 806-L, 816-L, 825-L, 826-L, 829-L, 1004-Q, 492-R
baths, 42-L, 46-L, 54-L, 603-L, 656-L, 787-L, 47-S, 61-S
radioactive tracer study, 416-L
control, 534-L, 579-L, 589-L
history, 550-L
properties and tests, 54-L
electroplating on, 581-L, 823-L
electrorefining, 198-C, 375-C
electrowinning, 420-C, 463-C
extraction and refining, 172-C, 372-C, 373-C

Nickel, extraction and refining, (cont.)
arc melting, 433-C
chemical, 243-C, 396-C
decomposition, 68-B
degassing
vacuum, 355-C
induction melting, 433-C
vacuum, 221-C, 222-C, 943-Q
leaching, 358-C
melting
vacuum, 290-C, 355-C
melting and casting, 435-C
precipitation, 26-C
solvent extraction, 174-C
vacuum
tests, 351-D
flame cutting, 302-G
foundry practice, 139-E
melting, 499-E
vacuum, 251-C
fracture
brittle, 754-R
crack propagation
effect of deformation, 412-Q
effect of high temperature, 412-Q
gases in, 337-N, 338-N
grain boundaries, 177-H, 684-N
grain growth, 105-N
effect of deformation, 257-N
hall effect, 24-P
effect of low temperature, 277-P
hardness
micro-, 496-M
hydrogen adsorption, 143-P
hydrogen in, 338-N
induction melting
vacuum, 56-W
intermetallic compounds
crystal structure, 649-M, 655-M
mechanical properties, 1368-Q
investment casting
vacuum, 222-C
liquid
viscosity, 465-P
machinability, 421-G
magnetic damping, 1157-Q
magnetic properties, 24-P, 117-P, 476-P, 150-Q
diamagnetism, 129-P
domain theory, 1157-Q
effect of deformation, 459-P
effect of temperature, 74-P, 75-P
hysteresis loop, 511-P
effect of temperature, 83-P
magnetostriction, 707-P
nuclear magnetic resonance
effect of temperature, 342-P
Nickel, magnetic properties, (cont.)
permeability
effect of temperature, 342-P
mechanical properties, 355-C
effect of radiation, 1285-Q
melting temperatures, 687-P
metal spraying of, 392-L
metallography
etching, 684-N
mill practice, 139-E
nitrogen in, 416-N
oxidation, 44-M, 1368-Q
effect of high temperature, 335-R
passivation, 416-R
pickling, 791-L
plastic deformation, 364-Q, 1333-Q
slip, 1347-Q
polarographic analysis, 440-S
polishing
electrolytic, 710-L
mechanical, 700-L
recovery
after deformation, 680-N
effect of radiation, 680-N
recrystallization, 105-N, 253-P
effect of deformation, 257-N
reduction by gases, 395-C
resistance welding, 201-K, 708-K
riveted
tensile properties, 645-K
rolling, 117-W
scaling, 179-R
single crystal
mechanical properties and tests
ultrasonic, 611-Q
neutron diffraction, 710-M
x-ray diffraction, 433-M
solid solutions
diffusion, 8-N
formation, 98-N, 513-N
structure, 1101-Q
solubility, 294-P
solubility in stainless steel, 416-N
specific heat, 86-P
spectrographic analysis, 46-S
spectrographic determination, 8-S, 240-S, 359-S
spot welding, 621-K
statistics and economics, 63-A
strain aging, 661-M
stress rupture properties and tests, 407-Q, 1031-Q, 1032-Q
surface roughness
measurement, 267-S
surface tension, 163-P
systems, 84-M
binary, 7-M, 269-M, 334-M, 384-M,

Nickel, systems, (cont.)
binary, (cont.)
521-M, 552-M, 667-M, 678-M, 5-P
ternary, 194-M, 371-M, 372-M, 406-M, 506-M, 556-M, 572-M, 610-M, 295-N
tensile properties
effect of impurities, 253-P
tensile properties and tests, 572-Q
texture, 104-M
thermal properties, 696-P
thermodynamic properties, 22-P, 359-P
thin films
adherence tests, 488-L
electrical conductivity, 303-P, 310-P
hall effect, 303-P, 307-P, 524-P
magnetic properties
hysteresis loop, 296-P
ultrasonic cleaning, 470-L
use in permanent magnets, 28-X
vacuum fusion welding, 191-K
vapor deposited
mechanical properties, 549-L
vapor-deposition coating, 422-L
vapor-deposition coating of, 493-L, 549-L
volume and dimensional changes, 687-P
weldability, 708-K
welding, 590-K
weldments
fatigue, 483-Q
tensile properties and tests, 483-Q
x-ray analysis
composition, 178-S
x-ray determination, 441-S
yield point mechanism, 933-Q
zone melting, 132-C, 264-C
Nickel alloy weldments
stresses
residual, 1038-Q
Nickel alloy wire
thermal expansion, 722-P
Nickel alloys, 267-A
age hardening, 221-J, 301-N, 302-N, 303-N
annealing, 202-J, 306-J
bright, 21-J
applications, 143-A, 643-P, 781-Q
chemical processing equipment, 80-T
arc welding, 160-K, 558-K, 1038-Q
coated electrode, 585-K
gas shielded, 129-J, 170-K, 278-K, 585-K
equipment, 419-K
atomic structure, 10-N
spatial arrangement, 655-M
Nickel alloys, (cont.)
bend properties
strength and ductility, 501-Q, 1544-Q
brazing, 219-K, 328-P, 626-Q
vacuum, 691-K
centrifugal casting, 511-E
ceramic coating
glass, 644-L
cladding with, 467-L
colorimetric analysis, 230-S, 232-S
composition analysis, 232-S
corrosion, 393-A, 516-A, 1385-Q, 324-R, 388-R, 583-R, 817-R, 74-T
atmospheric
industrial, 427-W
by chemicals
organic, 321-R
by fuels, 365-R
by inorganic acids, 1386-Q, 365-R, 467-R, 469-R, 725-R
by molten metals, 817-R
by sulphur compounds, 80-R
chemical
inorganic, 264-R, 363-R, 417-R, 421-R
galvanic, 230-R
tropical atmosphere, 230-R
creep, 153-J, 187-N, 121-Q, 158-Q, 230-Q, 485-Q, 679-Q, 781-Q, 1120-Q, 1384-Q
effect of heat treatment, 685-Q
effect of high temperature, 228-Q
creep strength, 231-Q
crystal structure, 372-M, 689-M
texture and preferred orientation, 330-N
data books, 223-A
diffusion, 10-N, 144-N
diffusion of carbon, 325-N
dispersion hardening, 448-N, 510-N
elastic properties and tests, 263-T
electrical conductivity
effect of low temperature, 69-P
electrical properties, 105-P, 126-P
electrochemical properties
ionization potential, 431-P
electron diffraction, 303-N
electron microscopy, 302-N, 303-N
electroplating of, 766-L
electroplating on, 607-L
explosive forming, 196-G
extraction and refining
induction melting, 142-C, 1170-Q
vacuum, 312-D
fatigue, 394-A, 70-Q
thermal, 69-Q, 70-Q, 179-Q, 504-Q, 1282-Q, 1292-Q, 1426-Q

Nickel alloys, (cont.)
fatigue properties and tests, 1265-Q
fatigue tests
variable stress, 505-Q, 1426-Q
formability, 150-G, 1049-Q
forming, 318-A, 1385-Q
forming and machining, 106-G, 150-G, 129-J, 781-Q
foundry practice
melting, 1049-Q
vacuum, 418-E, 1029-Q
fracture, 418-E, 156-Q
brittle, 1284-Q
effect of heat treatment, 685-Q
gas welding
pressure, 444-K
grain boundaries, 343-M
grain size, 474-Q
hardness, 144-H, 129-J, 510-N, 1393-Q
hardness tests
spherical indenter, 1369-Q
heat resisting materials
corrosion, 248-R
heat treatment, 129-J
high temperature effects, 112-A
ingots
recovery, 145-N
recrystallization, 145-N
inspection, 781-Q
investment casting, 1028-Q
machinability, 184-G
machining, 431-G, 663-Q
chemical, 180-G
mechanical, 395-G
spark, 119-G
magnetic properties, 393-A, 202-J, 51-P, 69-P, 116-P, 126-P
effect of high temperature, 354-P
effect of temperature, 361-P
hysteresis loop
effect of temperature, 224-P
magnetostriction, 362-P, 448-P
paramagnetism, 76-P
saturation induction, 1100-Q
mechanical properties, 393-A, 462-A, 498-A, 448-N, 88-Q, 474-Q, 1022-Q, 1097-Q, 1149-Q, 1284-Q, 1385-Q, 1386-Q, 1525-Q, 233-T
effect of heat treatment, 1387-Q
effect of high temperature, 313-A, 468-Q, 639-Q, 663-Q, 781-Q, 798-Q, 943-Q, 1399-Q
metallography
etching, 210-M
specimen preparation, 303-N
techniques
electrical, 689-M

Nickel alloys, (cont.)
microstructure, 504-N
primary, 418-E, 301-N, 330-N
effect of high temperature, 501-Q
mill practice, 1385-Q
order-disorder, 448-P
oxidation, 498-A, 338-R, 421-R, 430-R, 581-R
internal
effect of composition, 367-R
phase diagrams, 126-M
physical properties, 1525-Q
effect of heat treatment, 1387-Q
effect of high temperature, 313-A
mass and volume, 144-H
pickling, 473-L, 1386-Q
plastic deformation, 485-Q
slip, 1100-Q
polishing
chemical, 473-L
powder production, 144-H
precipitation, 102-N, 187-N, 219-N, 225-N, 302-N, 330-N, 504-N, 510-N
precipitation hardening, 504-N
aging, 153-J, 221-J, 330-N, 1393-Q
properties
effect of high temperature, 287-Q
quenching, 306-J
recovery, 10-N
recrystallization
effect of composition, 19-N
research, 1021-Q
resistance welding, 574-K, 683-K
riveting, 645-K
scaling, 421-R, 581-R
segregation, 343-M
solution heat treatment, 1393-Q
spinning, 293-G
spot welding, 129-J, 579-K, 663-Q
spraying, 287-L
strain aging, 301-N
stress relief heat treatment, 306-J
stress rupture properties and tests, 418-E, 504-N, 156-Q, 381-Q, 504-Q, 626-Q, 981-Q, 1021-Q, 1022-Q, 1028-Q, 1029-Q, 1049-Q, 1170-Q, 1369-Q, 1376-Q, 1397-Q, 1449-Q
stresses
thermal, 505-Q
surface tension, 328-P
tensile properties, 129-J, 153-J, 47-Q, 513-Q, 626-Q, 924-Q, 1029-Q, 1369-Q, 1386-Q, 1439-Q, 1449-Q
tensile properties and tests, 122-Q, 1028-Q, 1120-Q, 1170-Q
thermal properties, 643-P

Nickel alloys, (cont.)
thin films
properties, 303-Q
transformations, 468-Q
ultrasonic welding, 245-K
use in aircraft, 145-T, 233-T
use in airframes, 663-Q, 308-T
use in forging dies, 424-W
use in heat treating equipment, 172-W
use in heat treating furnaces, 172-W, 427-W
use in missiles, 1097-Q
use in nuclear reactors, 417-R, 196-T
use in oil field equipment, 316-T
use in oil refining equipment, 324-R, 365-R
use in turbine blades and rotors, 254-A
volume and dimensional changes, 1282-Q
wear, 536-Q
welding, 384-K, 1386-Q
x-ray analysis, 18-S
Nickel alloys tubing and pipe
corrosion
chemical, 637-R
inhibition, 637-R
Nickel-aluminum alloys
mechanical properties, 97-H
oxidation, 97-H, 289-R
powder compacts
sintering, 97-H
powder production, 97-H
scaling, 62-H
solution hardening, 647-N
strain aging, 647-N
Nickel-aluminum intermetallic compounds
crystal structure, 675-M
Nickel bars and rods
mechanical properties, 1387-Q
physical properties, 1387-Q
roll forming, 136-G
Nickel-beryllium alloys
mosaic structure, 222-M
precipitation, 222-M
superlattice formation, 74-N
transformations
isothermal, 452-N
Nickel borides
crystal structure, 667-M
Nickel-boron solid solutions
structure, 556-M
Nickel brass
superlattice formation, 215-N
Nickel castings
mechanical properties, 516-Q, 577-Q
solidification phenomena, 342-E
Nickel cermets, 1-H
Nickel cermets, (cont.)
impact strength, 1058-Q
mechanical properties, 1039-Q
oxidation, 1039-Q
tensile properties, 1058-Q
Nickel-chromium alloys
age hardening, 128-J, 451-N, 766-Q
case hardening, 1059-Q
creep, 382-Q
effect of temperature, 18-Q
creep strength, 205-Q, 984-Q, 1059-Q, 1101-Q
effect of composition, 766-Q
crystal structure, 375-P, 1377-Q
dislocations, 611-M
imperfections, 451-N
texture and preferred orientation, 310-M
diffusion bonding, 417-K
ductility, 984-Q
electrical conductivity, 629-N, 287-P, 375-P, 407-P, 486-P
fatigue strength, 205-Q
hall effect, 407-P
hard surfacing of, 773-L
hardness, 629-N, 1101-Q, 1377-Q
magnetic properties
diamagnetism, 36-P
paramagnetism, 36-P
mechanical properties, 128-J, 1526-Q
effect of impurities, 1391-Q
microstructure, 382-Q
oxidation, 1526-Q, 262-R, 591-R
internal
effect of composition, 367-R
physical properties, 1526-Q
effect of impurities, 1391-Q
precipitation, 1377-Q
precipitation hardening, 128-J
specific heat, 255-P
strain aging, 629-N
stress rupture properties, 438-Q
superlattice formation, 286-N
tensile properties, 984-Q, 1377-Q
transformation
stress induced, 18-Q
use in resistors, 43-T
Nickel-chromium-cobalt alloys
elastic properties, 1013-Q
Nickel-chromium-copper alloys
electrical conductivity, 287-P
transformations, 534-M
Nickel-chromium electroplate
corrosion
atmospheric, 194-R
Nickel-chromium-iron alloys
corrosion by nitrogen compounds, 296-R

Nickel-chromium-iron alloys, (cont.)
creep strength, 186-M
electrical conductivity, 407-P
Hall effect, 407-P
microstructure
primary, 186-M
tensile properties, 1455-Q
thin film, 303-Q
Nickel-chromium-manganese steel
machinability, 207-G
Nickel-chromium-molybdenum-vanadium steel, 112-W
Nickel-chromium steel, 112-W
creep, 455-Q
Nickel-chromium-titanium alloys
age hardening
ultrasonic, 342-N
Nickel-cobalt alloys
annealing, 496-P
converter practice, 427-C
crystal structures
dislocations, 459-P
gases in, 547-N
magnetic properties, 496-P
domain theory, 188-P
effect of deformation, 459-P
magnetostriction, 546-P
oxidation
effect of composition, 383-R
recrystallization, 617-N
single crystals
plastic deformation
slip, 827-Q
thermodynamic properties, 547-N
use in airframes, 312-T
Nickel-cobalt-copper alloys
magnetic properties, 622-P
Nickel-copper alloys
arc welding, 423-K, 510-K
electrical conductivity, 287-P, 486-P
magnetic properties
effect of composition, 352-P
magnetostriction, 546-P
mechanical properties
effect of deformation, 327-Q
effect of temperature, 327-Q
passivation, 781-R
Nickel electrodes
mechanical properties, 156-T
Nickel electroplate, 197-R
adherence tests, 712-L
corrosion, 351-L, 661-Q, 176-R
atmospheric, 316-R, 530-R
hardness, 661-Q
mechanical properties
effect of high temperature, 615-Q
Nickel electroplate, (cont.)
on alloy steel, 358-Q
properties and tests, 712-L
Nickel ferrites
electrical conductivity, 285-P,
magnetic properties
permeability, 285-P
Nickel films
electrical conductivity, 234-P
Nickel foil
x-ray diffraction
effect of deformation, 437-M
Nickel forgings
mechanical properties, 1387-Q
physical properties, 1387-Q
Nickel graphite electrodes
physical properties, 156-T
Nickel industry
statistics and economics, 219-A
Nickel ingots
heat treatment
induction, 316-J
mechanical properties, 251-C
microstructure
primary, 251-C
Nickel investment castings, 498-A
Nickel-iron alloys
corrosion by nitrogen compounds, 296-R
crystal structure
texture and preferred orientation, 475-M
gases in, 547-N
magnetic properties, 130-D, 193-P, 528-P
core losses, 189-P
domain theory, 189-P
effect of temperature, 72-P, 135-P, 225-P
hysteresis loop, 168-P, 224-P, 485-P
paramagnetism, 419-P
permeability, 110-P, 120-P
oxidation
effect of orientation, 242-R
properties, 95-T
single crystals
magnetic domains, 139-M
tensile properties, 1455-Q
thermodynamic properties, 547-N
thin films
texture and preferred orientation, 687-M
transformation, 270-N
allotropic, 3-N
Nickel-iron-cobalt alloys
annealing, 485-M
crystal structure, 485-M
magnetic properties, 642-P

Nickel-iron-molybdenum alloys
crystal structure
texture and preferred orientation, 364-P
magnetic properties, 156-P, 364-P
effect of heat treatment, 365-P
Nickel-iron-molybdenum system, 116-M
Nickel-manganese alloys
anelastic properties, 1244-Q
electrical properties, 380-P
magnetic properties, 380-P, 1242-Q
plastic deformation
slip, 1242-Q
single crystals
magnetic properties, 387-P
superlattice formation, 387-P
superlattice formation, 380-P
thermodynamic properties, 266-P
Nickel-molybdenum alloys
arc welding, 510-K
gas shielded, 667-K
case hardening, 1059-Q
cobalt diffusion, 91-N
corrosion
effect of heat treatment, 881-Q
creep strength, 1059-Q
mechanical properties
effect of heat treatment, 881-Q
weldability, 178-K
Nickel-molybdenum-chromium alloys
oxidation, 622-R
Nickel-molybdenum-iron alloy weldments
corrosion
intergranular, 489-R
Nickel-palladium alloys
magnetic properties
magnetostriction, 421-P
Nickel powder
fatigue strength, 1542-Q
molding and compacting, 62-H
cold pressing, 144-H
rolling, 123-H, 134-H, 147-H
production, 117-H, 119-H
atomization, 57-H, 116-H
properties, 116-H, 119-H, 448-N
sintering, 24-H
Nickel powder compacts
diffusion, 140-H
sintering, 62-H, 111-H, 123-H, 134-H, 140-H, 177-H, 169-P
Nickel sandwich structures
brazing
design, 218-K
Nickel sheet
mechanical properties, 1387-Q
physical properties, 1387-Q
Nickel-silicon-boron alloys, 136-K
Nickel silver
corrosion, 420-A
heat treatment, 420-A
mechanical properties, 420-A
tensile properties and tests, 572-Q
Nickel steel
effect of low temperature, 389-A
fatigue strength, 595-Q
heat treatment, 523-Q
martensite and martensite reaction, 254-N
mechanical properties
effect of low temperature, 523-Q, 563-Q
residual stress, 595-Q
Nickel steel ingots
ladle casting, 160-D
Nickel strip
mechanical properties, 134-H
rolling, 433-C
tensile properties, 147-H
thermal properties, 376-P
Nickel thin films
magnetic properties
Curie temperature, 712-P
Nickel-titanium alloys
eutectics
formation, 194-M
precipitation hardening, 186-J
solution heat treatment, 186-J
surface tension, 251-P
thin films, 303-Q
Nickel tubing
corrosion
intergranular, 162-R
effect of heat treatment, 162-R
Nickel tubing and pipe
arc welding, 224-K
Nickel weldments
flaw detection, 683-K
Nickel wire
electrical conductivity, 287-P
mechanical properties, 1387-Q
physical properties, 1387-Q
Niobium (see Columbium)
oxidation, 11-R
Nitrides
magnetic properties, 170-P
Nitriding, 62-J, 63-J, 192-J
history, 550-A
ultrasonic, 305-S
Nitrogen
adsorption on tungsten, 259-P
determination, 174-S, 206-S
diffusion of, 267-N
in calcium, 84-C

Nitrogen, (cont.)
in cast iron, 157-E, 154-N
in columbium, 583-N
in iron, 418-N
in molten iron, 55-N
in nickel, 416-N
in stainless steel, 416-N
in steel, 453-D, 409-N, 418-N, 292-S
in tantalum, 117-N, 595-P
in titanium, 3-P
solubility in columbium, 583-N
Noble metals, 746-R
electrical conductivity, 644-P
Nodular iron
crystal structure, 393-E
mechanical properties, 393-E
structure control, 393-E
Nodulizing agents
aluminum, 220-E
calcium, 362-E, 444-E
cerium, 444-E
magnesium, 185-E, 217-E, 218-E, 219-E, 233-E, 444-E, 439-N, 1002-Q
manganese, 225-E
silicon, 217-E, 218-E, 219-E, 362-E
Nonferrous castings
defects
surface, 493-P
precipitation hardening, 70-J
surface roughness
measurement, 493-P
surface tension, 493-P
Nonferrous metals
amalgamation, 428-C
applications, 136-T
arc welding
gas shielded, 36-K
brazing, 641-K
composition analysis, 287-S
corrosion, 556-L
atmospheric, 712-R
biological, 221-R
stress, 708-R
continuous casting, 182-D
extraction and refining, 160-C, 594-N
arc melting, 50-C, 278-C, 353-C, 188-W
degassing, 353-C
distillation
radioactive tracer study, 483-C
electron beam melting, 267-C, 356-C
induction melting, 278-C, 353-C
melting and casting, 580-A, 40-C, 213-C, 21-D
melting
equipment, 72-X
vacuum, 38-C, 110-C, 665-D, 670-D
Nonferrous metals, (cont.)
foundry practice, 427-E
melting, 348-W
furnaces
melting, 231-W
melting, 263-E
fuel fired, 369-C
painting, 556-L
permanent mold casting, 555-E
processing
byproducts, 17-A
reclamation, 278-C
reduction by metals and gases, 70-C
rolling
cold, 23-F
rubber coating, 556-L
smelting, 40-C
standards and specifications, 311-S
stud welding, 641-K
tubemaking
rolling, 282-F
tubing and pipe
drawing, 265-F
flaw detection
magnetic induction, 352-S
rolling, 265-F
use in automobiles
parts and fittings, 73-T
welding, 590-K, 331-T
Nonferrous powder metal parts, 651-Q
Notch sensitivity, 646-Q
Nuclear properties, 168-M, 506-P, 115-W
instrumentation, 332-L, 201-M
Nuclear reactors, 22-A, 24-A, 503-A, 472-D, 1059-Q, 78-R, 218-S, 7-T, 12-T, 31-T, 243-T, 244-T, 287-T, 300-T, 16-W, 34-W, 52-W, 115-W, 116-W, 217-W, 345-W
arc welding, 251-K, 484-K, 439-W
coated electrode, 456-K
gas shielded, 351-K, 623-K
clad
arc welding, 282-K
control rods, 154-H, 242-T
materials
boron steel, 309-A
roll bonding, 344-L
corrosion, 247-R, 346-T
chemical
inorganic, 575-R
creep, 325-T
design, 729-P, 325-T, 346-T
flaw detection, 346-T
forge welding, 441-L
fuel elements, 223-F, 488-M, 1279-Q, 238-T, 299-T, 317-T, 328-T
brazing, 405-K

Nuclear reactors, fuel elements, (cont.)
cladding, 720-L
creep, 1318-Q, 1319-Q
dimensional changes, 656-P
effect of radiation, 664-M
electroplating, 663-L
extrusion, 238-F
flaw detection, 427-S, 472-S
materials, 700-R
zirconium, 275-T
reprocessing, 455-C, 329-T
size, thickness and mass measurement, 372-S
stress rupture properties and tests, 580-Q
uranium, 457-P
volume and dimensional changes, 657-P
welding, 229-F, 506-K, 622-K
x-ray analysis, 393-S
fuels, 56-A, 72-A, 186-A, 9-C, 12-C, 14-C, 21-C, 43-C, 61-C, 147-F, 108-G, 22-H, 530-N, 39-P, 40-P, 78-P, 598-P, 1-R, 52-S, 8-T, 9-T, 20-T, 21-T, 35-T, 45-T, 60-T, 64-T, 66-T, 68-T, 99-T, 139-T, 143-T, 150-T, 151-T, 152-T, 155-T, 158-T, 185-T, 201-T, 214-T, 217-T, 236-T, 248-T, 91-W, 22-X
cladding, 440-L
corrosion
by inorganic acids, 450-R, 451-R
diffusion bonding, 247-K, 319-K, 571-K
effect of radiation, 255-T
flaw detection
penetrant, 338-S
radiographic, 383-S
ultrasonic, 338-S
metallography
specimen preparation, 200-M
plutonium, 298-A, 172-T, 212-T
processing spent, 18-C
reprocessing, 72-A, 247-A, 9-C, 12-C, 14-C, 253-C, 294-C, 450-R, 451-R
rolling, 114-W
rolling mill equipment, 245-W
size, thickness and mass measurement
electrical, 337-S
uranium, 394-A, 253-G, 23-H, 296-M, 361-M, 5-T, 6-T, 203-T, 212-T
uranium carbide, 193-C
use of aluminum, 46-T
use of ceramics and cermets, 75-T
use of plutonium, 46-T
use of powder metals, 76-T
volume and dimensional changes, 398-P
Nuclear reactors, (cont.)
materials, 175-A, 259-A, 32-H, 64-H, 94-H, 609-Q, 1278-Q, 109-T, 111-T, 142-T, 146-T, 147-T, 152-T, 183-T, 191-T, 193-T, 196-T, 197-T, 234-T, 295-T
alloy steel, 701-P
books, 95-A
molybdenum, 221-T
nickel alloys, 417-R
stainless steel, 204-T, 246-T
steel, 167-T, 249-T
zirconium alloys, 204-T
mechanical properties
effect of radiation, 1286-Q
moderators, 39-P
oxidation, 699-R
primary loop, 141-R, 4-T, 9-T
soldering, 439-W
stainless steel, 144-W
stresses
thermal, 1281-Q, 325-T
weld tests, 456-K
welding, 15-K, 221-K, 288-K, 384-K, 477-K, 518-K, 527-K, 224-T, 256-T, 257-T, 346-T
zirconium, 144-W
Nucleation, 61-N, 62-N, 63-N, 65-N, 365-N, 414-N
effect of impurities, 287-N
energy of activation, 121-N

O

Office equipment, 180-J
finishing, 130-L
projection welding, 129-K
Oil field equipment
corrosion
by sulphur compounds, 675-R
fatigue, 338-T
stress, 675-R
materials
alloy steel, 316-T
cast iron, 316-T
copper alloys, 316-T
nickel alloys, 316-T
prestressing, 338-T
Oil refining equipment, 60-R, 40-T
corrosion, 165-R, 324-R, 388-R, 74-T
by sulphur compounds, 330-R
stress, 511-R
materials, 324-R
aluminum alloys, 348-T
carbon steel, 366-R
molybdenum, 220-T

Oil refining equipment, materials, (cont.)
nickel alloys, 365-R
pitting corrosion, 511-R
steels for, 163-R
Oil well pipe, 637-R
cathodic protection, 108-R
corrosion
by soils, 244-R
stress, 244-R, 640-R
fracture, 640-R
heat treatment, 96-J
mechanical properties, 244-R
Openhearth furnaces, 36-B, 17-D, 33-D, 65-D, 73-D, 74-D, 175-D, 176-D, 189-D, 250-D, 327-D, 340-D, 416-D, 421-D, 442-D, 490-D, 596-D, 614-D, 636-D, 659-D, 115-S, 21-W, 121-W, 167-W, 168-W, 181-W, 240-W, 272-W, 361-W, 435-W
automation, 251-D
combustion, 442-D
design, 187-D, 397-D, 129-W, 152-W, 175-W, 290-W, 291-W
fuels, 136-D
maintenance, 58-W, 291-W
refractories, 642-D, 360-W
basic, 243-W, 244-W, 283-W, 284-W, 285-W, 286-W, 288-W, 311-W
carbon, 287-W
refractory linings, 206-W, 305-W, 307-W
repair, 77-W, 123-W
temperature measurement, 25-D, 213-S, 421-S
Openhearth practice, 41-D, 58-D, 63-D, 83-D, 175-D, 189-D, 255-D, 318-D, 320-D, 371-D, 372-D, 384-D, 416-D, 453-D, 466-D, 489-D, 499-D, 559-D, 587-D, 614-D, 616-D, 617-D, 627-D, 636-D, 690-D, 329-S, 181-W, 288-W, 290-W
alloying, 204-D, 590-D, 687-D
alloying agents, 391-D
automation, 82-D
charging, 54-D, 120-D, 157-D, 350-D, 386-D, 528-D, 568-D, 641-D, 659-D, 293-W
effect of impurities, 430-Q
pig iron, 295-W
scrap, 294-W, 295-W
combustion, 121-D, 187-D, 299-D, 380-D, 385-D, 388-D, 397-D, 492-D, 555-D, 557-D, 618-D, 272-W, 291-W
combustion control, 73-D, 134-D, 136-D, 409-D, 553-D, 440-W, 10-X
computers, 647-D
degassing, 95-D
Openhearth practice, (cont.)
deoxidation, 361-D, 389-D, 391-D, 392-D, 551-D, 206-E, 430-Q
flow control, 250-D
fluxes and slags, 649-P
fuels
liquid, 334-D
heat transfer, 567-D
history, 454-D
oxygen enrichment, 248-D
physical chemistry, 162-D
slag control, 393-D, 483-D, 496-D, 501-D, 535-D, 558-D, 609-D, 430-Q
stirring, 125-D, 681-D
temperature measurement, 214-S
testing equipment, 4-X
thermodynamic properties, 618-D
use of digital computers, 532-D
use of oxygen, 11-D, 17-D, 32-D, 33-D, 65-D, 72-D, 74-D, 82-D, 176-D, 203-D, 210-D, 256-D, 301-D, 327-D, 340-D, 348-D, 374-D, 421-D, 422-D, 430-D, 431-D, 432-D, 490-D, 491-D, 519-D, 554-D, 595-D, 596-D, 613-D
waste control, 355-A
Openhearth steel
basic
annealing
isothermal, 203-J
composition analysis, 165-S
corrosion
by waters
sea, 380-R
fatigue, 270-T
forging, 564-N
fracture
brittle, 564-N
graphitization, 564-N
inclusions, 165-S
mechanical properties, 978-Q
spectrographic analysis
testing equipment, 435-S, 436-S
tensile properties, 270-T
torsion properties, 270-T
twinning
thermal, 577-M
Optical instruments, 99-S, 110-S, 14-X, 15-X, 16-X, 21-X, 47-X, 58-X, 79-X
Optical properties, 108-P
refraction, 1231-Q
Order-disorder, 328-N, 401-N, 453-N, 483-N, 519-N, 580-N, 646-P
Ordnance material
tensile properties, 1439-Q
thermal properties, 696-P
Ore and raw material preparation, 63-B

Ore and raw material preparation equipment, 16-B, 44-B, 104-B, 484-Q, 246-W, 266-W, 337-W, 444-W
automation, 9-W
Ore crushers and grinders, 215-W
wear properties and tests, 1158-Q
Ore preparation, 118-B, 143-B
Ores, 167-D
assaying, 477-S, 478-S
colorimetric analysis, 33-S, 419-S, 475-S
composition analysis, 11-S, 476-S
concentration, 92-B, 9-W
magnetic, 7-B, 23-B
crushing, grinding and sizing, 7-B, 16-B, 28-B, 9-W, 76-W, 337-W
dressing, 9-W
flotation, 4-B, 39-B, 62-B, 108-B, 117-B
radioactive tracer study, 67-B
fluid bed process, 68-B, 94-B, 103-B
roasting, 17-B, 34-B, 71-B
sintering, 13-B, 104-B, 137-B, 243-D
automation, 53-B
sources, 36-A, 37-A, 89-A, 90-A, 91-A
statistics and economics, 60-A
Organic compounds, 437-R
corrosion
inhibition, 212-R
nonmetallic, 436-R
Oscilloscope, 586-Q, 37-X
Osmium
corrosion, 88-R
extraction and refining
precipitation, 333-C
zone melting, 264-C
Ovens
drying and baking, 289-E, 10-L, 3-W, 96-W
temperature control, 402-W
Oxidation, 175-A, 149-R, 407-R, 711-R
effect of composition, 289-R
effect of high temperature, 402-R
reaction rates, 678-R
tests, 375-R
Oxidation and deoxidation equilibria, 252-D
Oxide films
crystal structure, 140-M
mechanical properties, 270-Q
Oxides
electroplating, 222-L
in electroplate, 159-L
thermodynamic properties, 578-P
Oxygen, 162-A
determination, 26-S, 51-S, 206-S, 209-S 320-S
determination in magnesium, 309-S
determination in zinc, 309-S
Oxygen, (cont.)
diffusion in silicon, 677-N
diffusion in steel, 284-J
diffusion in titanium, 543-N
diffusion in zirconium, 115-N, 529-N
diffusion of, 267-N
in barium, 726-P
in cast iron, 157-E, 454-S
in copper, 85-H
in iron and steelmaking, 72-D
in liquid metals, 261-P
in steel, 409-N, 292-S, 366-S
in tantalum, 117-N
in titanium, 3-P
production, 110-B
solubility in iron, 389-P
solubility in titanium, 674-M
systems
ternary, 261-P
use in roasting, 96-B
Oxygen furnace processes, 564-D

P

Packaging and wrapping
materials, 198-T
Paint, 123-L
aluminum, 439-L
corrosion
atmospheric, 401-R
safe handling, 227-A
silicone, 439-L
standards and specifications, 35-S
testing, 140-R
tests, 255-L
zinc, 454-L
Painting, 16-A, 36-L, 38-L, 64-L, 65-L, 80-L, 88-L, 91-L, 189-L, 191-L, 269-L, 371-L, 417-L, 420-L, 423-L, 439-L, 503-L, 514-L, 563-L, 565-L, 597-L, 609-L, 129-R, 533-R, 35-S, 3-W
hot, 137-L
lacquering, 16-R
review, 163-L
waste control, 81-A
Palladium
adhesive joining
metal-to-metal, 594-K
colorimetric determination, 65-S
corrosion, 503-P
chemical
inorganic, 576-R
determination, 144-S
diffusion, 538-N
measurement, 15-N

Palladium, (cont.)
electrical properties
effect of low temperature, 427-P
electrochemical properties, 503-P
electroplating of, 551-L
extraction and refining
solvent extraction, 97-C
gases in, 538-N
solid solutions
magnetic properties
paramagnetism, 295-P
spectrographic analysis, 70-S
spectrographic determination, 155-S
systems
binary, 207-M, 328-M, 348-M, 355-M, 491-M, 568-M
thermal properties, 529-P
use in chemical processing equipment, 250-T
zone melting, 268-C
Palladium electroplate
mechanical properties
effect of high temperature, 615-Q
Palladium-rhodium alloys
crystal structure, 561-M
transformations
allotropic, 561-M
Passivation, 176-L, 399-L, 62-R, 180-R, 353-R, 397-R, 709-R
radioactive tracer study, 250-R
Pattern making, 271-E, 548-E
Pearlite and pearlite reaction, 134-N
Peening, 91-G, 159-G, 250-G, 284-L
Permalloys
transformations, 116-M
Permanent mold casting, 54-E, 113-E, 151-E, 402-E, 492-E, 550-E
equipment, 199-E
tolerances, 93-E
vacuum, 315-E
Phase diagrams, 218-A, 84-M, 196-M, 270-M, 456-M, 583-M, 499-N, 1259-Q
history, 207-A
testing equipment, 162-M, 265-M
Phosphate coating, 27-L, 176-L, 177-L, 217-L, 223-L, 399-L, 502-L, 765-L, 779-L, 785-L
Phosphor bronze
shell mold casting, 248-E
Phosphorous
determination, 443-S
activity coefficient, 683-P
in cast iron, 257-P
in iron and steelmaking, 166-D
in steel, 364-S
transformations, 189-N
Photographic equipment, 103-S
cameras, 89-R, 87-X, 88-X, 89-X, 90-X, 91-X, 92-X
materials
magnesium alloys, 190-T
movie cameras, 86-M, 112-Q
Physical properties, 447-M, 448-M, 434-P
density, 214-P
effect of radiation, 676-P
standards and specifications, 780-Q
tests, 434-P, 868-Q
effect of high temperature, 635-P
Physical properties and their measurement
effect of high temperature, 163-Q
Pickling, 41-L, 446-L, 480-L, 547-L, 614-L
waste control, 23-A, 408-A, 716-L
Pickling and degreasing, 312-L
Pig iron, 127-D, 194-D
composition, 76-D
composition analysis, 197-S, 443-S
spectrographic analysis, 41-S, 420-S
testing equipment, 435-S, 436-S
spheroidization
effect of composition, 7-N
standards and specifications, 83-S
Pipelines, 23-R, 59-R
arc welding, 295-K, 596-K, 304-T
coated electrode, 140-K
gas shielded, 226-K
submerged arc, 306-K, 483-K, 712-K
bituminous coating, 318-L
cathodic protection, 232-R, 278-R, 334-R, 348-R, 372-R, 384-R, 504-R, 672-R, 272-T
coatings
nonmetallic, 178-T
copper, 47-T
corrosion, 436-K, 372-R, 570-R
by fuels, 307-R, 311-R
by inorganic acids, 540-R
by soils, 384-R
by waters
sea, 329-R, 384-R
inhibition, 307-R, 311-R
flaw detection, 596-K, 676-K
radiographic, 451-S, 459-S
ultrasonic, 451-S, 459-S
materials
cast iron
nodular, 233-E, 180-T, 239-T
spot welding, 436-K
synthetic resin coating, 318-L
welding, 111-K, 307-K, 365-K, 676-K

Pipes
arc welding, 155-K
cast iron
corrosion, 106-R
fatigue strength, 323-Q
flame cutting, 103-G
steel
arc welding, 144-K
cathodic protection, 96-R, 97-R, 127-R
corrosion, 187-R
by soils, 96-R, 97-R, 98-R
by waters, 107-R
stray current, 98-R
corrosion prevention, 95-L
packaging and wrapping, 127-R
Pistons
aluminum, 141-T
Pitting corrosion, 160-R, 161-R, 172-R, 434-R, 801-R
Plant cooling equipment, 180-W
corrosion, 247-R
inhibition, 260-R, 113-W
Plant equipment, 149-T
corrosion
fatigue, 662-R
fatigue life, 662-R
welding
repair, 534-K
Plant heating equipment, 23-W
Plant management, 71-A, 83-A, 455-E
Plant water supply equipment, 12-B, 216-D
Plasma arc process, 289-G, 383-G, 631-K, 19-L, 421-L, 668-L
Plaster casting, 504-E
design, 329-E
Plastic coated steel, 291-A
corrosion, 1206-Q
joining, 680-K
mechanical properties, 1206-Q
Plastic deformation, 259-F, 224-G, 24-M, 233-M, 385-M, 407-M, 449-M, 49-Q, 62-Q, 75-Q, 207-Q, 255-Q, 293-Q, 311-Q, 324-Q, 343-Q, 392-Q, 524-Q, 712-Q, 1015-Q, 1046-Q, 1136-Q, 1255-Q, 1256-Q, 1291-Q, 1341-Q, 1423-Q, 44-X
anisotropic, 946-Q
design, 970-Q
effect of stress, 269-Q
grain boundaries, 448-Q
lines and bands, 630-Q, 785-Q, 814-Q, 857-Q, 903-Q
slip, 347-M, 386-M, 476-Q, 499-Q, 542-Q, 556-Q, 743-Q, 769-Q, 785-Q, 811-Q, 828-Q, 954-Q, 1491-Q
testing equipment, 1500-Q
Plastic properties, 62-Q, 152-Q, 266-Q, 866-Q, 1136-Q
Plastic properties and tests, 1370-Q
Plastic wave propagation, 1141-Q
Plasticity, 255-Q
Plastics, 685-R
metal spraying, 347-L
thermosetting
use in dies, 187-W
use in foundry practice, 112-E
use in pattern making, 271-E
Plate
flaw detection
ultrasonic, 346-S, 437-S
waste control, 25-A
Platinum
adsorption of bromine and iodine, 139-P
annealing, 440-M
atomic structure
spatial arrangement, 647-M
bonding
glass-to-metal, 220-K
cladding of, 629-L
corrosion, 86-R
by inorganic acids
effect of radiation, 294-R
by waters, 321-P
chemical
inorganic, 575-R, 576-R
crystal structure
imperfections, 440-M
determination, 144-S
diffusion
self-, 440-M, 172-N
electrical conductivity, 440-M
electrical properties
effect of low temperature, 427-P
electrochemical properties, 198-P, 199-P, 321-P, 378-P, 477-P
electroplating, 222-L
electroplating of, 55-L, 551-L
high temperature effects, 113-A
hydrogen adsorption, 143-P
intermetallic compounds
crystal structure, 647-M
magnetic properties, 184-P
melting temperatures, 631-P, 687-P
optical properties
emission, 133-P
oxidation, 149-R
quenching, 440-M
recovery
after deformation, 728-Q
specific heat
effect of low temperature, 340-P
spectrographic analysis, 70-S

Platinum, (cont.)
systems
binary, 393-C, 400-M
thallium adsorption, 137-P
thermal properties, 529-P, 696-P
ultrasonic welding, 231-K
use in cathodic protection, 321-P, 351-R, 352-R
use in chemical processing equipment, 250-T
volume and dimensional changes, 687-P
zone melting, 264-C, 268-C
Platinum alloys
magnetic properties
saturation induction, 1100-Q
oxidation, 170-R
plastic deformation
slip, 1100-Q
Platinum-cobalt alloys
magnetic properties, 1242-Q
plastic deformation
slip, 1242-Q
Platinum electrodes
electrochemical properties
ionization potential, 373-P
mechanical properties, 156-T
Platinum electroplate
mechanical properties
effect of high temperature, 615-Q
Platinum metals, 417-A
applications, 582-A
atomic structure, 209-M, 239-M, 544-M
corrosion, 503-P
crystal structure, 544-M
electrical conductivity
effect of radiation, 6-P
electrochemical properties, 503-P
transformations, 544-M
volume and dimensional changes, 6-P
Plutonium, 255-A, 298-A, 382-A, 151-T, 299-T, 317-T
analysis
special separation, 120-S
applications, 310-A
composition analysis, 23-S, 30-S
crystal structure, 291-M, 623-M
effect of radiation, 155-T
electroplating of, 418-L
extraction and refining, 192-A
ion exchange, 66-C
precipitation, 62-C
reduction by metals, 319-C
solvent extraction, 97-C
halide decomposition, 318-C
hardness, 677-Q
Plutonium, (cont.)
metallography
etching, 422-M
specimen preparation, 41-M, 200-M
microscopy, 41-M
phase diagrams, 291-M
physical properties, 431-A
radiological safety, 55-A 275-A
reduction by metals, 167-H
research, 248-T
solubility in mercury, 335-P
solvent extraction, 247-A
spectrographic, 120-S
systems
binary, 431-A, 623-M, 715-M
tensile properties, 677-Q
thermal analysis, 402-N
thermal expansion, 290-P
transformations
allotropic, 402-N
isothermal, 97-N
stress-induced, 443-Q
use in nuclear reactors, 212-T
fuels, 8-T, 20-T, 172-T
preparation by halide decomposition, 55-C
Plutonium-iron alloys
thermal conductivity, 384-P
Plutonium isotopes
nuclear properties, 40-P
Plutonium-nickel system, 166-M
Plutonium powder metallurgy, 43-H
Poisson's ratio, 212-Q
Polishing
chemical, 611-L
electrolytic, 61-L, 78-L, 139-L, 233-L, 299-L, 529-L, 540-L, 638-L, 667-L
mechanical, 18-E, 366-G, 259-L, 530-L, 540-L, 64-M, 79-Q
automation, 25-L
Polishing and buffing equipment, 25-L, 198-L, 259-L, 74-W, 142-W
Polonium
extraction and refining
decomposition, 181-C
solvent extraction, 97-C
Porosity
flaw detection
radiographic, 245-S
Potassium
contact potential, 652-P
determination, 51-S, 140-S
electrical conductivity, 855-Q
electrical properties
effect of low temperature, 426-P
martensitic reactions, 855-Q
spectrographic determination, 285-S

Potassium, (cont.)
systems
ternary, 261-P
tensile properties, 855-Q
transformations
stress-induced, 855-Q
Potentiameters, 69-X
Powder metal compacts
diffusion, 138-H, 139-H
grain growth, 138-H
infiltration, 164-H
post-sintering operations, 83-H, 156-H
sintering, 1-H, 3-H, 10-H, 12-H, 34-H, 71-H, 100-H, 111-H, 136-H, 137-H, 138-H, 139-H, 169-H, 178-H, 179-H
applications, 365-E
atmospheres, 125-H, 137-H
tests, 171-H
vacuum, 125-H
volume and dimensional changes, 111-H
Powder metal parts, 6-H, 156-H
applications, 78-H
case hardening, 2-J
cost, 364-A
fracture, 271-Q
magnetic properties, 256-P
mechanical properties, 101-Q
physical properties
density, 159-H
porosity, 78-H
tumbling, 44-L
use in automobiles, 195-T
Powder metallurgy, 2-H, 5-H, 6-H, 9-H, 11-H, 22-H, 23-H, 43-H, 44-H, 73-H, 101-H, 102-H, 103-H, 115-H, 141-H, 149-H, 181-H, 182-H
book, 35-H, 36-H
design, 81-H
glossaries, 8-H
Russia, 99-H
sintering furnaces
vacuum, 341-W, 437-W
slip casting, 39-H
Soviet Union, 27-H
statistics and economics, 128-A, 129-A
Powder metals
apparent density, 78-H
applications
fuels, 91-T
compressibility, 70-H
diffusion coating, 152-L
elastic properties, 70-H
fuels, 241-T
magnetic properties, 14-P
mixing and blending
ceramic additions, 60-H
molding and compacting, 28-H, 71-H, 80-H, 159-H
Powder metals, molding and compacting, (cont.)
cold pressing, 122-H, 162-H
explosives, 365-G
extrusion, 66-H, 76-H
hot pressing, 42-H
rolling, 33-H, 74-H
physical properties, 241-T
production, 108-H, 121-H
properties, 170-H
safety, 127-A
sintering, 13-H, 15-H
atmospheres, 30-H, 31-H
effect of temperature, 48-H
spectrographic analysis, 107-S
use in automobiles, 315-T
use in bearings, 364-A
use in nuclear reactors, 32-H
Powders
metal
applications, 40-H
Power equipment, 100-R
corrosion, 360-R, 549-R
corrosion prevention, 360-R
Power mowers
design, 277-T
Power plants, 279-N
corrosion by waters
boiler, 419-R
Praseodymium
magnetic properties, 26-P
nuclear properties
radioactive decay, 197-P
reaction energy, 197-P
Precious metals
plasma arc process, 421-L
Precipitation, 48-N, 102-N, 204-N, 242-N, 272-N, 284-N
Precipitation hardening, 126-J, 242-N
Presses, 51-G, 60-W
automation, 399-W
repair, 7-G
Pressure
instrumentation, 165-D, 81-X
Pressure vessels
welding, 98-K, 99-K
Presswork, 50-G, 270-G, 365-G, 84-W
cold, 217-G
Printing equipment, 258-L
materials
zinc, 225-F
Printing on metals
sheet, 258-L
Process control, 23-D
testing equipment, 434-S
Production and consumption
statistical analysis, 167-A
Professional activities, 184-A

Profilometers, 17-X
Progressive loading test, 377-Q
Projection welding, 129-K
Protactinium
  crystal structure, 651-M, 652-M
Pulp and papermaking equipment
  corrosion, 740-R
  steel, 373-L
Pumps
  corrosion
    by molten metals, 1041-Q
  fatigue properties and tests, 1041-Q
  laboratory, 55-X
    vacuum, 48-X
  vacuum, 65-X
Punches
  machining
    spark, 126-G
Pyrometers, 115-S, 213-S, 214-S, 219-S, 246-S, 403-S, 421-S, 62-X, 82-X

Q

Quenching, 189-J, 154-W
  die, 320-J
  interrupted, 56-J, 65-J, 272-J
Quenching media, 69-J, 142-J, 143-J, 183-J, 213-J, 214-J, 286-J, 154-W, 235-W, 323-W

R

Radar equipment, 7-X
  flaw detection, 201-S
Radiation detection instruments, 670-Q
Radioactive material
  reclamation, 192-A
  waste control, 416-A
    corrosion, 394-A
Radioactive tracer methods
  metallography, 249-M, 399-M, 308-N
    history, 454-A
Radioactive tracer study, 11-A, 157-A, 210-A, 280-A, 39-S
  electrical and electrochemical, 80-P
Radioactivity, 439-P
Radiochemical analysis, 39-S, 242-S
Radiological safety, 292-A
Radium
  extraction and refining, 166-C
  statistics and economics, 62-A
Railroad cars, 61-K, 88-K, 42-T, 124-T 264-T
  aluminum, 125-T
Railroad cars, (cont.)
  arc welding, 5-K
    submerged arc, 137-K
  fracture, 605-Q
  repair, 128-L
  resistance welding, 336-T
  wheels
    flaw detection, 215-S
    heat treatment, 74-J
Railroad equipment, 63-K
  arc welding
    coated electrode, 538-K
  stresses, 1294-Q
Railroad locomotives
  arc welding
    submerged arc, 313-K
Railroad rails, 61-Q, 2-S, 3-S
  annealing, 1078-Q
  arc welding
    coated electrode, 532-K
  fatigue properties and tests, 1473-Q
  fatigue strength, 1472-Q, 1474-Q
  flash welding, 544-K
  flaw detection
    magnetic induction, 166-S, 211-S
  forge welding, 109-K
  fracture
    crack propagation, 369-Q
  hardness and hardness tests, 1078-Q
  impact properties and tests, 1473-Q
  impact strength, 1474-Q
  quenching, 1078-Q
  rolling, 13-F
  tensile properties, 1474-Q
  tensile properties and tests, 1473-Q
  welding, 249-W
Rare earth metals, 530-A, 520-P
  amalgamation, 360-C
  analysis
    special separation, 37-S
  applications, 410-A
  atomic structure, 149-M
  borides, 369-A
  carbides, 337-A
  colorimetric determination, 14-S
  effect of high temperature, 235-A
  extraction and refining, 208-C
    chemical, 42-C, 36-S
    electrolytic, 360-C
    separation, 178-C
  heat of reaction, 494-P
  intermetallic compounds
    crystal structure, 649-M
  powder metallurgy, 105-H
  solubility in uranium, 391-P
  statistics and economics, 62-A
  thermodynamic properties, 243-P

Rare earth metals, (cont.)
x-ray analysis
composition, 36-S
Rare earth ores
concentration
magnetic, 130-B
Rare earths, 322-A, 332-A
electrical conductivity, 643-M
extraction and refining, 252-A
ion exchange, 90-C, 161-C, 276-C
magnetic properties, 643-M
sources, 252-A
spectrographic analysis, 259-S
spectrographic determination, 257-S, 374-S
Recovery, 556-Q
effect of radiation, 937-Q
Recrystallization, 385-M, 34-N, 35-N, 130-N, 372-N, 373-N
Refractories, 55-B, 56-B, 8-D, 237-D, 406-E, 14-W
alumina, 36-B
basic
use in openhearth furnaces, 283-W, 284-W, 285-W, 286-W, 288-W
carbon, 208-W
use in openhearth furnaces, 287-W
corrosion by molten metal, 131-B
drying, 35-D
furnace linings, 65-D, 421-D
processing, 218-A, 10-B
production and consumption, 262-A
properties, 2-B, 6-B, 25-B, 35-B, 36-B, 41-B, 69-B, 131-B
volume and dimensional changes, 649-P
Refractory linings, 206-W
Refractory metals, 284-A, 464-A, 493-A, 564-Q, 873-Q, 1239-Q, 288-T
applications, 68-H
extraction and refining
arc melting, 282-C
vacuum, 219-C, 226-C
decomposition, vacuum, 226-C
melting, 134-C
separation
vacuum, 226-C
vacuum, 478-C
fabrication, 78-F
forming and machining, 134-G
grinding, 305-G
heat treatment, 288-J
machining, 62-G
electrochemical, 101-G
mechanical properties, 675-Q
melting temperatures, 76-X
physical properties, 675-Q
plasma arc process, 421-L
Refractory metals, (cont.)
research, 123-A
use in cutting tools, 240-T
wear, 843-Q
welding, 487-K
zone melting, 281-C
Refrigeration equipment, 100-J
Research, 208-A, 312-Q
Research laboratories, 84-A
Resinous coatings, 129-L
corrosion prevention, 778-R
Resistance welding, 52-K, 100-K, 148-K, 179-K, 225-K, 324-K, 362-K, 533-K, 589-K, 629-K
automation, 128-K
effect of temperature, 201-K
equipment, 100-K, 199-K, 252-K, 341-K, 550-K, 225-W
Resistors, 44-T
corrosion, 70-T
cracks, 70-T
distortion, 70-T
materials, 297-T
Reverberatory furnaces, 155-W
Reverberatory smelting
nonferrous, 435-W
Rhenium, 26-A, 335-A, 382-A, 565-A
adhesive joining
metal-to-metal, 594-K
applications, 504-A
chemical extraction, 391-C
corrosion, 76-A, 770-R
ductility, 1454-Q
electrical properties, 70-X
extraction and refining
distillation, 142-B
forming and maching, 181-G
hardness, 67-J, 1454-Q
mechanical properties, 76-A, 464-A, 504-A, 78-F
oxidation, 464-A
effect of high temperature, 234-R
physical properties, 464-A, 504-A
recrystallization, 67-J, 1239-Q
spectrographic analysis, 143-S
statistics and economics, 62-A
systems
binary, 356-M, 384-M, 551-M, 344-N
tensile properties, 1239-Q, 1454-Q
weldability, 193-K
zone melting, 281-C
Rhenium alloys
tensile properties, 924-Q
Rhenium extraction and refining
halide decomposition, 67-C
Rhenium-iron alloys
crystal structure, 551-M

Rhenium-manganese alloys
crystal structure, 551-M
Rhenium-molybdenum alloys
peritectics
formation, 344-N
Rhenium ores
fluid bed process, 142-B
Rhenium-titanium alloys
physical properties, 356-M
Rhenium wire
electrical properties, 619-P
optical properties, 619-P
Rhodium, 235-A, 413-A
atomic structure
coordination number, 618-P
corrosion, 503-P
electrical conductivity, 618-P
electrochemical properties, 503-P
electroplating, 122-L, 264-L
baths, 148-L
electroplating of, 551-L, 289-T
extraction and refining
precipitation, 333-C
melting temperatures, 328-M, 687-P
powder metallurgy, 413-A
spectrographic analysis, 278-S
systems
binary, 328-M
volume and dimensional changes, 687-P
zone melting, 264-C, 268-C
Rhodium electroplate
mechanical properties
effect of high temperature, 615-Q
Riveted joints
fatigue life, 353-Q
Riveting, 101-K, 142-K
Rocket components, 71-L, 161-T
arc welding, 99-J
heat treatment, 99-J
materials, 1097-Q, 117-T, 176-T
magnesium alloys, 840-Q
Roll bonding, 290-L
Roll forming, 1-G, 136-G, 353-G, 410-G, 437-G
cold, 354-G
Rolling, 81-D, 2-F, 13-F, 19-F, 35-F, 45-F, 47-F, 55-F, 59-F, 71-F, 81-F, 83-F, 98-F, 99-F, 105-F, 116-F, 161-F, 166-F, 170-F, 259-F, 295-F, 44-W, 88-W, 89-W
automation, 53-B, 122-F
cold, 12-F, 101-F, 263-F
automation, 26-F
stress analysis, 260-F
communication equipment, 26-X
effect of deformation, 162-F
effect of pressure, 231-F, 232-F
Rolling, (cont.)
effect of stress, 196-Q
finish, 126-F, 150-F, 151-F, 185-F, 221-F
automation, 5-F
gages
thickness, 85-X
hot, 31-F, 263-F, 280-F
instrumentation, 180-S
lubricants and oils, 108-F, 132-F
lubrication, 106-F
materials handling methods, 97-W
mechanical testing equipment, 77-X
operations research, 73-F
plant layout, 72-F
theory, 217-F
vacuum, 474-A
Rolling mill equipment, 4-F, 31-F, 170-F, 64-T, 30-W, 43-W, 44-W, 68-W, 90-W, 114-W, 141-W, 168-W, 245-W, 255-W, 256-W, 257-W, 260-W, 261-W, 322-W, 339-W, 356-W, 362-W, 370-W, 377-W, 379-W, 9-X
automation, 142-A, 71-F, 164-F, 151-W, 197-W, 378-W, 381-W
design, 116-F, 120-W
lubrication, 125-W
Russia, 194-W
welding
repair, 543-K, 661-K
Rolling mill rolls, 559-E, 101-F, 108-F, 33-J, 321-W, 365-W, 412-W
arc welding
repair, 537-K
annealing, 203-J, 366-W
design, 185-F, 197-F, 193-G, 122-W, 156-W, 163-W, 274-W
grinding, 168-G, 423-G, 118-W
hard surfacing, 283-L, 321-L, 345-L
hardness, 1304-Q
heat treatment
induction, 204-J
repair, 302-L
stresses
transformation, 368-Q
thread rolling, 193-G
thermit welding, 454-K
wear, 1304-Q
Rolling mills, 105-F, 88-W, 159-W
bar and rod, 67-W, 310-W
bearings and housings, 105-W, 106-W 107-W
fatigue life, 404-W
lubrication, 414-W
blooming and slabbing, 47-W, 57-W, 167-W, 276-W, 390-W
drives, 176-W
lubricants and oils, 31-D

Rolling mills, (cont.)
cold, 91-W, 258-W, 377-W
gages
thickness, 84-X
drives, 47-W, 85-W, 98-W, 379-W, 425-W
automation, 378-W
finish, 125-F
furnaces, 177-W
instrumentation, 101-F
plates, 41-W, 42-W, 94-W, 314-W, 315-W
sheet and strip, 58-F, 90-F, 230-F, 276-F, 93-W, 261-W, 276-W, 277-W, 426-W
tube, 46-F, 65-F, 80-F, 79-W, 196-W, 347-W
automation, 80-W
design, 274-W
Rope and cable, 104-T, 270-T
fatigue strength, 290-T
lubricants and oils, 311-T
materials
steel, 327-T
Rotary furnaces, 15-A, 119-B, 517-D, 82-W, 190-W, 338-W
Rotors
turbine
foundry practice, 378-E
Rubber coating, 323-L, 324-L, 325-L
Rubber pad forming, 406-G
Rubidium
determination, 51-S
electrical conductivity, 688-M
electrical properties
effect of low temperature, 426-P, 427-P
statistics and economics, 62-A
systems, 688-M
binary, 63-P
Russia
industry and economics, 104-A
metallurgy
vacuum
books, 206-D
mineral resources, 139-A
nickel
electroplating, 164-L
openhearth practice, 176-D
steel industry, 139-A
steel ingot casting, 193-D
Ruthenium, 235-A, 568-A
adsorption, 252-P
catalytic behavior, 252-P
diffusion
in silver, 494-N
electrochemical properties, 503-P
Ruthenium, (cont.)
electroplating of, 551-L
extraction and refining
precipitation, 333-C
fluid bed extraction, 26-B
systems
binary, 491-M
zone melting, 264-C, 268-C

S

Safety, 16-A, 127-A, 133-A, 194-A
Samarium 243-P
spectrographic analysis, 29-S
heat of reaction, 494-P
Sampling techniques, 128-S, 370-S, 11-E
Sand and binders, 126-E
reclamation, 170-A
Sand casting, 13-E, 36-E, 37-E, 43-E, 44-E, 66-E, 239-E, 325-E, 402-E, 484-E, 504-E, 556-E, 560-E
addition agents, 192-E
aluminum, 127-E
automation, 22-E
defects, 117-E
pouring, 165-E
Sand castings
design, 517-E
flaw detection, 306-Q
grain size, 26-M
hardness and hardness tests, 306-Q
yield strength, 306-Q
Sandwich structures, 1-A
adhesive joining
metal-to-metal, 200-K, 459-K, 604-K, 714-K
aluminum, 253-A, 119-T
brazing, 276-G, 152-K, 337-K, 610-K
design, 127-T
fatigue life, 353-Q
flaw detection, 225-S
thermal, 276-G
machining
mechanical, 276-G
materials, 578-Q
aluminum, 187-T
stainless steel, 1275-Q
shear properties, 119-T
spot welding, 447-K
use in aircraft, 320-T
use in radar equipment, 7-X
weldments, 152-K
Satellites, 225-T
materials, 213-T
Sawing, 175-E
Scales, 18-X

Scaling, 604-R
  effects of composition, 189-R
Scandium
  crystal structure, 593-M
  spectrographic analysis, 257-S, 259-S
  x-ray diffraction, 593-M
Scrap, 71-A, 4-E
  statistical analysis, 100-S
Screws
  diffusion coating on, 594-L
Seam welding, 203-K
  equipment, 118-K
Segregation
  spectrographic analysis, 303-S
Selenium
  bibliographies, 216-A
  cathodic protection, 100-R
  determination, 132-S
  electron emission, 122-P
  electrowinning, 367-C
  extraction and refining
    decomposition, 79-C
    distillation, 44-C
    leaching, 112-C
    melting and casting, 44-C
  solidification, 122-P
  statistics and economics, 62-A
  systems
    complex, 574-M
  thermal conductivity, 48-P
Selenium-hafnium system, 100-M
Selenium-thorium system, 100-M
Selenium-titanium system, 100-M
  electrical properties, 130-P
Selenium-zirconium system, 100-M
  electrical properties, 130-P
Semiconductors, 151-A, 487-A, 3-H, 594-N, 543-P, 602-P, 724-P, 732-P
  applications, 84-P
  atomic structure, 108-M, 244-M
  bibliographies, 216-A
  crystal structure
    dislocations, 480-M
  effect of irradiation, 244-M
  electrical conductivity, 480-M, 514-P, 531-P
  electrical properties, 532-P
  grain boundaries, 108-M
  Hall effect, 278-P, 514-P, 531-P
  magnetic properties, 509-P
  phase diagrams, 79-M
  precipitation, 480-M
  properties, 181-P
  specific heat, 425-P
  thermal conductivity, 531-P
Shapes
  rolling, 12-F
Shearing, 59-G, 87-G
Shears and saws, 126-W
Sheet
  bend properties and tests, 169-Q, 1415-Q
  bending
    theory, 228-G
  defects
    surface, 332-S
  dip coated
    flaw detection, 471-P
    porosity and permeability, 471-P
  drawing, 169-Q
    press forming, 38-G
  ductility, 439-Q
  electroplated
    flaw detection, 471-P
    porosity and permeability, 471-P
  flaw detection
    ultrasonic, 332-S
  formability, 169-Q
  forming, 154-G
    hot, 349-G
  galvanized
    passivation, 519-R
  machining, 60-G
  painted, 258-L
  plastic properties
    tests, 402-G
  resistance welding, 418-K
  rolling, 273-F
  size, thickness and mass measurements, 298-S
  stresses
    residual, 356-G
  stretch forming, 356-G
  weldability, 418-K
  welding
    design, 273-F
Shell mold casting, 17-E, 25-E, 38-E, 166-E, 212-E, 320-E, 504-E, 552-E, 557-E, 570-E
  automation, 68-E
  design, 182-E, 538-E
  refractories, 570-E
Ships
  cathodic protection, 797-R, 804-R, 805-R
  corrosion, 796-R
    galvanic, 753-R
    prevention, 796-R
  hulls, 16-R, 57-R, 88-T
    arc welding
      coated electrode, 1035-Q
    cathodic protection, 185-R, 560-R, 584-R, 628-R
    corrosion, 538-R, 632-R

Ships, hulls, (cont.)
cracks, 258-T
flaw detection
radiographic, 369-S, 423-S, 439-S
fracture
brittle, 589-Q, 808-Q
painting, 184-L, 538-R
stress relief heat treatment, 237-J
welding, 258-T
propulsion equipment, 87-E, 245-E, 190-P
cavitation corrosion, 184-R
materials
bronze, 247-T
wear, 399-E
pumps
aluminum, 130-T
structures
arc welding, 87-K, 329-K
corrosion prevention, 654-R
fracture, 1088-Q
metal spraying, 654-R
synthetic resin coating, 654-R
welding, 450-K
weldments
flaw detection, 222-S
Shrink fitting, 79-K
cold, 166-J
Silica
in iron and steelmaking, 100-D
Silicon, 145-A
bibliographies, 216-A
cleaning and polishing
chemical, 471-L
colorimetric determination, 378-S
composition analysis, 9-S
crystal structure, 457-M
dislocations, 30-M, 190-M, 216-M, 518-M, 703-M, 30-N
texture and preferred orientation, 302-M
crystallization, 30-N
deoxidizers, 284-D
determination, 89-S, 160-S, 443-S
diffusion, 419-N
antimony
radioactive tracer study, 683-N
bismuth, 94-N, 192-P
gold, 191-P
interfacial, 525-N
nickel, 192-P
oxygen, 677-N
silver, 192-P
diffusion coating, 273-R, 231-L, 232-L
diffusion in iron, 256-N
diffusion in molybdenum, 256-N
diffusion in nickel, 656-N
Silicon, (cont.)
diffusion in tantalum, 256-N
diffusion in titanium, 256-N
elastic properties, 935-Q
electrical conductivity, 535-P, 539-P, 573-P
effect of heat treatment, 191-P, 613-P
electrical properties, 115-P, 174-P, 192-P, 573-P, 574-P
electrochemical properties
ionization potential, 279-P
electron emission, 575-P
electroplating of, 410-L
etching
electrolytic, 179-L
extraction and refining, 155-C
gas analysis, 168-S
grain size and shape, 163-M
Hall effect, 559-P
hardness
micro-, 525-N
in iron steelmaking, 97-D
in steel, 76-D
magnetic properties, 4-P
domain theory, 71-P
microstructure, 558-M
nuclear properties
cross-section, 535-P, 539-P
optical properties
reflection, 367-P
refraction, 574-P
oxidation, 623-R
phase diagrams, 471-M
pickling, 471-L
plastic deformation, 190-M
slip, 216-M
plastic wave propagation, 935-Q
polishing
mechanical, 471-L
reduction by metals and gases, 136-C
single crystals
electrical conductivity, 16-P, 231-P
growth, 1-N, 616-N
Hall effect, 16-P
heat treatment, 231-P
magnetic properties, 68-P
optical properties
emission, 21-X
solubility of carbon, 592-P
specific heat, 425-P
spectrographic determination, 8-S, 70-S, 119-S, 198-S, 285-S, 359-S
statistics and economics, 62-A
systems
binary, 398-M, 424-M, 516-M, 5-P, 592-P
ternary, 401-M, 537-M, 538-M, 666-M, 677-M

Silicon, (cont.)
thermal analysis, 398-M
thermal expansion, 49-P
thermodynamic properties, 89-P, 107-P, 677-P
x-ray diffraction, 518-M, 703-M
zone melting, 135-C, 189-C
Silicon carbide
cemented, 86-H
molding and compacting
hot pressing, 86-H
Silicon carbide cermets
molding and compacting
hot pressing, 86-H
oxidation, 86-H
wear, 702-Q
Silicon-carbon alloys
single crystals
growth, 96-N
Silicon iron
crystal structure
texture and preferred orientation, 644-M, 464-N
magnetic properties, 164-P, 207-P, 528-P
permeability, 713-P
recrystallization, 644-M, 464-N
scaling
effect of temperature, 312-R
volume and dimensional changes, 312-R
Silicon-manganese steel
fatigue strength
effect of peening, 627-Q
Silicon oxide
friction, 873-Q
wear, 873-Q
Silicon powder
compressibility, 110-H
Silicon steel
crystal structure
texture and preferred orientation, 245-M
magnetic properties
magnetostriction, 522-P
metallography, 137-M, 712-M
properties, 186-P
single crystals
magnetic properties, 330-P
tempering, 380-N
Silicon systems
binary, 584-M
Siliconizing, 747-L
Silver
adhesive joining
metal-to-metal, 594-K
anelastic properties, 1212-Q, 1539-Q
assaying, 343-S
Silver, (cont.)
boiling temperatures, 360-P
cladding of, 629-L
compression properties, 129-Q
contact potential, 652-P
corrosion
chemical, inorganic, 576-R
galvanic, 771-R
tarnishing, 198-R
creep
activation energy, 239-P
crystal structure, 182-M
dislocations, 216-M, 1212-Q
imperfections, 309-M
texture and preferred orientation, 489-L, 519-M
effect of orientation, 365-M
dislocations, 377-M, 496-M
imperfections, 392-P
diffusion, 527-N, 555-N
diffusion bonding, 382-K
diffusion in silicon, 192-P
diffusion
ruthenium, 494-N
self-, 109-N, 179-N
energy of activation, 578-N
electric furnace smelting, 447-C
electrical conductivity, 582-R, 705-M, 239-P
electrochemical properties, 254-P, 366-P, 378-P
electrochemistry, 172-P, 173-P
electron diffraction, 182-M, 248-M
electron microscopy, 248-M
electroplating, 148-F, 62-L, 105-L, 124-L, 222-L, 297-L, 339-L, 355-L, 460-L, 497-L, 534-L, 551-L, 607-L, 649-L, 740-L
baths, 202-L
extraction and refining
distillation, 405-C
precipitation, 333-C
separation, 333-C
fatigue life, 43-Q
gases in metals, 555-N
grain boundaries, 705-M
grain growth
energy of activation, 578-N
hardness and hardness tests, 582-R
hardness tests
diamond pyramid, 102-Q
hardness
micro-, 496-M
scratch, 102-Q
liquid
physical properties
density, 467-P

Silver, liquid, (cont.)
physical properties, (cont.)
thermal expansion, 467-P
metallography
polishing, 182-M
nuclear properties
radioactive decay, 695-P
oxidation, 771-R
internal, 582-R
passivation, 144-R
plastic deformation, 182-M, 216-M, 13-N, 77-N
polishing
electrolytic, 615-L
powder production, 145-H
quenching, 213-J, 214-J
radiochemical determination, 343-S
recovery
after deformation, 728-Q
recrystallization, 77-N
reduction by gases, 54-C
single crystals
plastic deformation, 856-Q
tensile properties, 856-Q
strain aging, 856-Q
diffusion
self-, 77-N
smelting, 125-A
solid solutions
thermodynamic properties, 411-P
solidification, 349-P
solubility, 272-P
solubility of arsenic, 299-M
solubility
krypton, 709-P
specific heat, 109-P
statistics and economics, 64-A
surfaces, 182-M
systems
binary, 269-M, 299-M, 332-M, 351-M, 283-N, 349-P
ternary, 23-M
thermodynamic properties, 103-P, 349-P, 392-P
thin films
crystal structure
texture and preferred orientation, 489-L
twinning
thermal, 248-M
vapor deposition of, 489-L
vapor pressure
radioactive tracer study, 442-P
x-ray diffraction, 771-R, 102-Q
yield point mechanism, 933-Q
Silver alloy wire
thermal expansion, 722-P
Silver alloys
atomic structure
co-ordination number, 616-M
crystal structure, 598-M, 616-M
Hall effect, 422-P
liquid
viscosity, 382-P
magnetic properties, 598-M, 422-P
nuclear magnetic resonance, 423-P, 428-P
mechanical properties, 280-Q
nuclear properties
resonance, 428-P
peritectoid reactions, 305-N
phase diagrams, 79-M
surface tension, 328-P
thermal conductivity, 604-P
vapor deposition of, 527-N
Silver-aluminum alloys
oxidation
internal, 645-N
recrystallization, 645-N
Silver-cadmium alloys
electrical conductivity, 582-R
hardness and hardness tests, 582-R
specific heat, 339-P
oxidation
internal, 582-R
Silver compacts
sintering, 140-H
Silver-copper alloys
corrosion
by sulphur compounds, 51-R
Silver-copper-zinc alloys
tensile properties, 1348-Q
Silver-indium alloys
oxidation
internal, 472-R
superlattice formation, 283-N
thermal conductivity
effect of low temperature, 317-P, 336-P
Silver-indium-cadmium alloys
corrosion, 242-T
nuclear properties, 242-T
Silver industry
statistics and economics, 219-A
Silver-manganese alloys
magnetic properties, 386-P, 685-P
superlattice formation, 386-P
thermal conductivity
effect of low temperature, 336-P
Silver-manganese-aluminum alloys
microstructure, 156-M
Silver powder
molding and compacting
cold pressing, 70-H
properties, 145-H

Silver powder compacts
diffusion, 140-H
sintering, 111-H
Silver single crystals
diffusion
self-, 13-N
Silver systems
ternary, 598-M
Silver-tin alloys
vapor deposition coating of, 680-L
Silver wire
crystal structure
texture and preferred orientation, 311-M
fracture
brittle, 1168-Q
thermal expansion, 722-P
Silver-zinc alloys
diffusion of zinc, 298-N
Single crystals
creep, 783-Q
fracture, 902-Q
grain growth, 629-M
growth, 207-C, 17-N, 96-N, 131-N, 360-N, 375-N, 505-N, 553-N, 594-N
history, 131-N
magnetic properties, 201-P
mechanical properties, 73-Q
metallography
specimen preparation, 630-M
physical properties, 73-Q
plastic deformation
lines and bands, 630-Q
research, 801-Q
tensile properties, 131-N, 801-Q
Sintering
lubricants and oils, 163-H
Size, thickness and mass measurement, 26-F, 180-S, 85-X
electrical, 52-S, 251-S, 337-S
instrumentation, 122-F, 314-S, 3-X, 9-X
magnetic flux, 271-P
testing equipment, 428-S
radiographic, 338-E, 39-S, 242-S
thermal, 405-S
ultrasonic, 411-D, 238-S, 467-S
electrical, 260-S
Skull melting
equipment, 442-C
Slabs
heat transfer, 591-P
thermodynamic properties, 591-P
Slag welding, 103-K, 105-K
Slags
analysis, 152-S, 153-S
Slip casting, 28-H, 61-H, 96-H, 161-H
Smoke
dust and fume control equipment, 102-A, 354-A, 355-A, 375-A, 158-W
Soaking pit practice
temperature measurement, 160-F
Soaking pits, 3-F, 95-F, 115-F, 170-F, 17-W, 167-W, 221-W, 262-W, 375-W, 410-W, 420-W
layout, 376-W
Sodium
contact potential, 652-P
corrosion, 212-T
determination, 51-S, 140-S
electrical conductivity, 426-P, 855-Q
in aluminum alloys, 124-M
martensitic reactions, 855-Q
radiochemical analysis, 608-P
solubility
cobalt, 608-P
tantalum, 608-P
tensile properties, 855-Q
transformations, 23-N
stress-induced, 855-Q
Sodium-antimony alloys
crystal structure, 147-M
Sodium systems
ternary, 261-P
Soldering, 182-K
furnace, 165-K, 672-K
induction, 688-K
ultrasonic, 421-K
Solid solutions
atomic structure, 228-M
crystal structure, 185-M, 497-N
crystallization, 676-N
diffusion, 166-N
formation, 18-M, 64-N, 128-N, 335-N
magnetic properties
paramagnetism, 295-P
order-disorder, 632-N
plastic deformation, 294-Q
precipitation, 225-N
solubility, 680-P
transformations
allotropic, 497-N
transition structure, 319-N
Solidification, 56-C, 103-D, 104-D, 113-D, 61-N, 62-N, 139-N, 297-N, 367-N, 415-N, 437-N, 475-N, 499-N, 619-N, 114-R, 75-X
books, 70-N
defects, 63-N
effect of alloying agents, 112-N, 124-N
nucleation, 105-D
thermodynamic properties, 102-P
Solution heat treatment, 1-W
Solvent extraction, 166-C

Sonic properties, 932-Q, 1484-Q
Sorting and identification equipment, 351-S
Soviet Union
  blast furnace practice, 127-D
  welding, 96-K
Specific heat, 17-B, 580-N, 491-P, 526-P
  testing equipment, 394-P
Spectrographic analysis, 19-S, 99-S, 103-S, 105-S, 111-S, 434-S, 90-T, 15-X
  equipment, 458-S
  testing equipment, 57-S, 290-S, 319-S, 387-S
Spinning, 145-G, 179-G, 408-G
  stress analysis, 293-G
Spot welding, 147-K, 353-K
  automation, 413-K
  effect of temperature, 201-K
  equipment, 330-K, 425-K, 491-K, 586-K
Sprayed aluminum
  corrosion tests, 172-L
Sprayed metal
  corrosion, 598-L
  crystal structure, 482-L
  fatigue strength, 1522-Q
  inclusions, 511-L
  painting, 776-L
  porosity, 507-L
  stresses
    residual, 198-Q
  wear properties and tests, 748-L
Spring metals, 442-A, 672-L, 521-Q, 1034-Q, 263-T, 330-T
Spring steel
  age hardening, 135-N
Springs, 263-T
  creep, 833-Q
  design, 11-T
  ductility, 273-T
  elastic properties, 1016-Q
    Young's modulus, 273-T
  extrusion
    inverted, 11-F
  fatigue properties and tests, 273-T
  heat treatment, 114-J
  materials
    copper, 330-T
  quenching, 201-J
  stainless steel, 110-T
  standards and specifications, 396-S
  steel, 94-T
  tempering, 201-J
  tensile properties, 273-T
Stainless steel, 46-A, 77-A, 571-A
  absorption, 45-N
  adhesive joining, 97-K
    metal-to-metal, 594-K
Stainless steel, (cont.)
  age hardening, 40-N, 303-N, 1381-Q
  aging, 628-N
  analysis
    special separation, 44-S
  anelastic properties, 1539-Q, 756-R
  annealing, 257-J, 269-N, 320-N, 804-Q
    bright, 5-J
    continuous, 165-W
    recrystallization, 435-N
  applications, 428-A, 447-A, 219-Q, 313-R
    chemical processing equipment, 116-A
    mining and oil field equipment, 169-T
  arc cutting, 350-G
  arc welding, 156-K, 183-K, 276-K, 380-K, 424-K, 664-K, 678-K, 621-Q
    coated electrode, 10-K, 320-K, 321-K, 464-K, 578-K, 637-K, 275-W
    cracks, 437-K
    gas shielded, 291-F, 166-K, 202-K, 242-K, 278-K, 320-K, 321-K, 344-K, 626-K, 357-R
    submerged arc, 522-K, 535-K
  atomic structure, 660-M
  austenite
    retained, 346-N, 1213-Q
  austenite formation and decomposition, 636-K, 637-K, 34-M, 411-M, 628-M, 40-N, 251-N, 269-N, 650-N
  austenitic
    age hardening, 346-N
    anelastic properties, 186-Q
    annealing, 312-J
    applications, 446-A
    arc welding, 154-K, 232-K, 236-W
      coated electrode, 74-K, 465-K, 638-K,
      gas shielded, 32-K
    austenite formation and decomposition, 638-K, 154-M
    cathodic protection, 625-R
    cleaning
      chemical, 246-R
    corrosion, 246-R
      by inorganic acids, 478-P, 279-R, 370-R
      by waters
        boiling, 738-R
        steam, 738-R
      chemical
        inorganic, 246-R
        organic, 370-R
      inhibition, 432-R, 713-R
      intergranular, 536-N, 674-Q, 222-R, 317-R, 370-R, 501-R, 507-R, 605-R, 738-R
      stress, 53-R, 67-R, 220-R, 319-R,

Stainless steel, austenitic, (cont.)
corrosion, stress, (cont.)
432-R, 507-R, 563-R, 625-R, 673-R, 713-R
corrosion resistance, 222-R
corrosion tests, 386-A
cracks, 72-K
creep, 673-Q
rate, 97-M
strength, 638-K, 1102-Q, 1164-Q, 1189-Q
tests
notch, 1192-Q
crystal structure, 466-M, 852-Q
dislocations, 564-M, 597-M
crystallization, 436-N
ductility, 560-A
diffusion of carbon, 432-N
elastic properties, 1367-Q
effect of high temperature, 238-W
electrochemical properties
ionization pot, 478-P
electron microscopy, 597-M
electron diffraction, 603-M
explosive forming, 386-G, 446-G
fatigue
thermal, 1367-Q
flame cutting, 291-G
flash welding, 401-K
forging practice, 250-F
forming, 248-G
foundry practice, 464-E
fracture, 673-R
brittle, 465-K, 674-Q
crack propagation, 563-R
friction, 1411-Q
gas welding
oxyacetylene, 568-K
grain boundaries, 97-M
grain size, 34-M
hardness, 1102-Q, 1330-Q, 1453-Q
heat treatment, 421-A, 674-Q
homogenization, 312-J
impact strength, 638-K, 1330-Q
machining, 223-G
magnetic properties, 249-P
martensite and martensite reaction, 178-F
mechanical properties, 386-A, 421-A, 446-A, 852-Q, 1086-Q, 1176-Q, 1190-Q,
melting, 571-E
microstructure, 1102-Q
molding, 571-E
nitriding, 19-J, 88-J
notch sensitivity, 1192-Q
oxidation, 1164-Q, 309-R, 468-R

Stainless steel, austenitic, (cont.)
pearlite and pearlite reaction, 134-N
pitting corrosion, 507-R
plastic deformation, 178-F, 648-Q
lines and bands, 597-M
slip, 466-M
plastic properties, 1367-Q, 1453-Q
polishing
mechanical, 248-G
pouring, 571-E
precipitation, 536-N, 1190-Q
precipitation hardening, 675-N
aging, 571-E, 465-K
radioactivity, 309-P
rolling, 8-F
effect of low temperature, 178-F
segregation, 674-Q
solid solutions
structure, 852-Q
solidification, 675-N
sonic properties, 103-Q
strain aging, 146-G
stress relief heat treatment, 560-A
stress rupture properties and tests, 1148-Q, 1192-Q, 1263-Q
surface tension, 328-P
systems
complex, 154-M
tensile properties, 464-E, 648-Q, 1086-Q, 1189-Q, 1224-Q, 1263-Q, 1330-Q, 1367-Q, 1453-Q
tubemaking
piercing and sinking, 287-F
use in nuclear reactors, 7-T
weld tests, 517-K
weldability, 386-A, 72-K, 567-K
welding, 421-A, 232-K, 331-T
weldments
corrosion
intergranular, 232-K, 378-R
stress, 791-R
austenitizing, 315-K, 320-N
bend properties
strength and ductility, 1390-Q
bend properties and tests, 53-Q
brazing, 219-F, 291-F, 405-K, 328-P, 1-W
furnace, 185-K
brittle transition temperature, 98-Q
effect of radiation, 1142-Q
buffing, 700-L
carbides in, 685-M, 474-N
carburizing, 89-J
cathodic protection, 319-R
cavitation corrosion, 707-R
centrifugal casting, 340-E, 511-E, 513-Q
ceramic coated
effect of temperature, 296-L

Stainless steel, (cont.)
ceramic coating on, 642-L, 574-R
ceramic mold casting, 494-E
chemical milling, 161-G
cladding of, 447-L, 561-L, 720-L, 730-L
cladding with, 166-H
cleaning and polishing
chemical, 305-L, 494-L, 949-Q
electrochemical, 48-L
mechanical, 51-L, 305-L, 606-L
compression properties and tests, 1437-Q, 1511-Q
corrosion, 153-A, 391-A, 422-A, 428-A, 500-A, 432-L, 85-M, 282-Q, 545-Q, 1182-Q, 1190-Q, 1275-Q, 1338-Q, 84-R, 110-R, 132-R, 163-R, 243-R, 345-R, 440-R, 518-R, 557-R, 574-R, 583-R, 614-R, 648-R, 651-R, 726-R, 817-R, 44-S, 176-T
atmospheric, 546-R
by chemicals
organic, 321-R
by fuels, 641-R
by inorganic acids, 639-K, 517-P, 650-Q, 156-R, 207-R, 211-R, 271-R, 293-R, 303-R, 422-R, 509-R, 510-R, 513-R, 531-R, 558-R, 626-R, 725-R, 792-R
by molten metals, 817-R
by organic acids, 792-R
by sulphur compounds, 305-R, 675-R, 731-R
by waters, 817-R
sea, 151-R, 525-R
steam, 479-R, 724-R
chemical
inorganic, 650-Q, 305-R, 310-R, 363-R, 462-R, 562-R, 575-R, 598-R, 716-R, 765-R
organic, 310-R, 520-R, 569-R
effect of radiation, 751-R
effect of high temperature, 316-A
galvanic, 517-P, 322-R, 597-R, 665-R, 798-R
inhibition, 207-R, 667-R
intergranular, 540-A, 240-M, 200-N, 206-N, 6-R, 38-R, 208-R, 223-R, 288-R, 310-R, 502-R, 510-R, 551-R, 617-R, 626-R, 756-R, 757-R
prevention, 340-R, 574-R
stress, 64-R, 146-R, 193-R, 224-R, 346-R, 458-R, 493-R, 658-R, 667-R, 675-R, 687-R, 817-R
corrosion tests, 422-R, 551-R, 617-R, 800-R
electrochemical, 84-R, 613-R
stress corrosion, 224-R, 341-R, 631-R, 667-R

Stainless steel, (cont.)
cracks, 118-F
creep, 30-Q, 121-Q, 433-Q, 435-Q, 455-Q, 471-Q, 492-Q, 833-Q, 916-Q, 1137-Q, 1384-Q, 1434-Q, 1437-Q, 1452-Q
creep strength, 637-K, 159-Q, 417-Q, 724-Q, 1193-Q, 1355-Q, 1381-Q
effect of high temperature, 426-Q
rate, 1193-Q
crystal structure, 685-M, 436-N, 1322-Q
dislocations, 216-M, 341-M, 390-M
imperfections, 380-M
texture and preferred orientation, 411-M, 650-N
crystallization, 243-N, 1381-Q
damping properties, 826-Q
data books, 223-A
deep drawing, 455-G
defects, surface, 468-E, 199-F
diffusion, 181-N
graphite, 559-N
measurement, 556-N
diffusion bonding, 371-K, 528-K
vacuum, 267-K, 718-K
diffusion of carbon, 325-N
dip coating, 200-F, 777-L
drawing
deep, 37-G, 1411-Q
rods and shapes, 199-F
ductility, 452-K, 636-K, 614-N, 145-Q, 1390-Q, 1535-Q
effect of high temperature, 269-A, 390-A, 492-Q
elastic properties, 1452-Q, 263-T
Young's modulus, 724-Q
electrical properties, 378-Q
electrochemical properties, 517-P, 566-P, 756-R
ionization potential, 654-P
electroforming on, 828-L
electron beam welding, 255-K, 530-K, 715-K
electron diffraction, 1414-Q, 303-N
electron microscopy, 341-M, 303-N
electroplating on, 458-L
evaporation
vacuum, 113-N
explosive forming, 196-G, 325-G
extrusions
design, 249-A
impact and cold, 187-G
fatigue, 213-Q, 338-Q, 403-Q, 471-Q
strength, 209-Q, 341-Q, 1137-Q, 1213-Q
thermal, 504-Q, 209-Q

Stainless steel, (cont.)
fatigue tests
torsion, 1464-Q
ferrite and ferrite reaction, 324-N, 374-N
ferritic
annealing, 258-J
arc welding
gas shielded, 194-K
corrosion, 326-N
by molten metals, 19-R
diffusion of carbon, 326-N
effect of high temperature, 371-Q
fatigue, 160-L
grain growth, 275-N
mechanical properties, 258-J, 1316-Q
metal spraying on, 160-L
flame and arc cutting, 114-G, 237-G
flash welding, 116-K, 614-K
flaw detection
ultrasonic, 228-S
forgeability, 652-D, 93-F, 111-F
forging practice, 36-F, 113-F, 200-F, 399-S
drop, 253-F
tests, 1535-Q
formability, 1535-Q
forming, 318-A, 542-A, 211-J
forming and machining, 106-G, 123-G, 163-G, 200-G
foundry practice, 222-E, 430-E, 1158-Q
melting, 468-E
induction, 332-E
quality control, 545-E
rigging, 545-E
structure control, 436-N
fracture, 540-A, 452-K, 880-Q, 1137-Q, 1331-Q, 1538-Q, 631-R
brittle, 567-K, 594-Q, 648-R, 1190-Q
crack propagation, 424-K
effect of composition, 92-Q
effect of temperature, 92-Q
galvanizing, 1412-Q
grain boundaries, 1251-Q
grain size, 659-N
grinding, 112-G, 443-G
hard surfacing of, 650-K
hard surfacing on, 321-L, 773-L
hardenability, 235-W
hardness, 636-K, 628-N, 1275-Q, 707-R
effect of radiation, 1408-Q
micro-, 660-M
hardness and hardness tests, 283-A, 417-Q
heat transfer, 324-P, 803-Q, 230-T
heat treatment, 422-A, 36-F, 455-G, 103-J, 210-J, 211-J, 218-J, 293-J, 472-Q, 1158-Q

Stainless steel, (cont.)
high temperature effects, 112-A
history, 397-A
impact properties and tests, 98-Q, 752-Q, 1331-Q
impact strength, 637-K, 1412-Q
inclusions, 436-N
investment casting, 243-E, 258-E
joining, 1343-Q
low
rolling
design, 102-F
machinability, 428-A, 184-G, 207-G, 342-G, 421-G, 426-G, 455-G, 730-Q, 96-T
machine parts, 303-T
machining, 8-G, 10-G, 23-G, 73-G, 259-G, 263-G, 1343-Q
chemical, 180-G, 422-G
macrostructure, 633-M
magnetic properties
effect of heat treatment, 327-P
martensite and martensite reaction, 181-N, 206-N, 295-N, 346-N, 571-N, 587-N, 614-N, 659-N, 672-N
martensitic
arc welding, 1260-Q
corrosion, 518-A
fracture
brittle, 1260-Q
mechanical properties, 518-A
notch sensitivity, 1260-Q
sheet
mechanical properties
effect of high temperature, 900-Q
surface tension, 328-P
weldments
wear properties and tests, 1145-Q, 1534-Q
mechanical properties, 6-A, 288-A, 381-A, 391-A, 422-A, 428-A, 437-A, 447-A, 500-A, 571-A, 321-D, 343-D, 448-D, 126-J, 30-Q, 42-Q, 120-Q, 219-Q, 280-Q, 282-Q, 471-Q, 545-Q, 578-Q, 619-Q, 621-Q, 650-Q, 713-Q, 880-Q, 949-Q, 1182-Q, 1283-Q, 569-R, 176-T
effect of composition, 717-Q
effect of heat treatment, 810-Q
effect of high temperature, 316-A, 239-Q, 335-Q, 472-Q, 473-Q, 547-Q, 715-Q, 730-Q, 798-Q, 809-Q, 1321-Q, 1343-Q, 651-R
effect of low temperature, 736-Q, 680-Q
effect of radiation, 792-Q, 804-Q, 862-Q, 1510-Q
melting, 188-D
vacuum, 254-D

Stainless steel, (cont.)
metal spraying of, 392-L, 507-L
metallography
etching, 633-M
polishing, 341-M, 390-M
radioactive tracer methods, 240-M
specimen preparation, 303-N
techniques
magnetic, 525-M
microstructure, 267-K, 718-K, 62-M, 619-Q, 1213-Q, 614-R
mill practice
scarfing, 117-F
nitriding, 172-J, 557-R, 687-R
nitrogen in, 416-N, 1190-Q
notch sensitivity, 1331-Q, 631-R
oxidation, 540-A, 45-N, 338-R, 458-R, 646-R, 687-R, 808-R, 1343-Q
effect of high temperature, 426-Q, 430-R
passivation, 333-L, 517-P, 68-R, 180-R, 345-R, 614-R
physical properties, 730-Q, 949-Q
effect of high temperature, 316-A
pickling, 333-L, 777-L
pitting corrosion, 160-R, 161-R, 172-R, 386-R, 619-R, 647-R, 758-R, 787-R
plastic deformation, 67-N, 571-N, 784-Q, 1538-Q
lines and bands, 413-N
slip, 216-M, 1464-Q
plastic properties
effect of radiation, 1408-Q
polishing
electrolytic, 335-L, 429-L, 494-L, 541-L, 710-L
mechanical, 248-L, 700-L
porosity, 578-K
powder cutting, 438-G
powder production, 117-H
precipitation, 129-N, 200-N, 225-N, 469-N, 417-Q, 1251-Q
precipitation hardening, 126-J, 291-J, 578-Q
aging, 229-J
presswork, 206-G
prices and cost studies, 486-D
properties, 130-D, 94-T
quenching, 140-J, 159-J, 213-J, 214-J, 235-W
interrupted, 158-J
radiochemical analysis, 44-S
recrystallization, 103-J, 435-N, 659-N
resistance welding, 291-F, 639-K, 708-K
rolling, 118-F, 200-F, 163-W
sandwich structures
brazing, 298-K
Stainless steel, sandwich structures, (cont.)
machining
mechanical, 341-G
scaling, 309-R, 747-R
seam welding, 118-K, 253-K
segregation, 343-D
shear properties and tests, 159-Q
sheet
cladding, 117-G
spinning, 117-G
shell mold casting, 242-E
single crystals
growth, 512-N
solubility
hydrogen, 305-P
of nickel, 416-N
solution strengthening, 521-M
sorting and identification, 413-S
spectrographic analysis, 413-S, 461-S
spinning, 293-G, 455-G
standards and specifications, 53-Q, 45-S 90-S
strength, 1275-Q
stress relief heat treatment, 257-J
stress rupture properties and tests, 505-K, 504-Q, 927-Q, 1511-Q
stresses
thermal, 803-Q
transformation, 1414-Q
stretch forming, 455-G
superfinishing, 51-L
superlattice formation, 374-N
surface roughness
measurement, 267-S
surface tension, 414-P
temperature measurement, 399-S
tempering, 7-J, 158-J, 982-Q, 399-S
tensile properties, 636-K, 97-M, 614-N, 417-Q, 471-Q, 513-Q, 724-Q, 924-Q, 1251-Q, 1322-Q, 1338-Q, 1452-Q
effect of radiation, 1142-Q
tensile properties and tests, 505-K, 53-Q, 726-Q, 784-Q, 145-Q, 1437-Q
effect of aging, 913-Q
effect of radiation, 1408-Q
tension properties and tests, 635-Q
tension test
notched, 159-Q
thermal conductivity, 724-R
effect of low temperature, 322-P
thermodynamic properties, 295-N
transformations, 534-M, 181-N, 192-N
allotropic, 321-N, 1263-Q, 648-R
effect of radiation, 792-Q
stress-induced, 492-Q
transition structure, 251-N
tubemaking

Stainless steel, tubemaking, (cont.)
drawing, 219-F
rolling, 165-F
welding, 42-F, 89-F
tumbling, 316-L
ultrasonic welding, 6-K, 11-K, 245-K, 360-K, 715-K
use in aircraft, 713-Q, 1452-Q, 168-T
use in airframes, 730-Q, 312-T
use in automobiles, 148-T
use in buildings, 59-T
use in chemical processing equipment, 53-Q, 189-T
use in dairy equipment, 210-T
use in fasteners, 166-T
use in food processing equipment, 303-R
use in forming dies, 252-W
use in missiles, 61-T, 162-T
use in nuclear reactors, 133-T, 142-T, 191-T, 196-T, 204-T, 246-T, 295-T, 144-W
use in sandwich structures, 1275-Q
use in turbine blades and rotors, 254-A
vacuum fusion welding, 191-K
vacuum melting, 646-D
wear, 500-A, 378-Q, 539-Q, 752-Q
effect of pressure, 538-Q
wear properties and tests, 153-A, 557-Q, 1158-Q
weld tests, 21-K
effect of composition, 102-K
effect of heat treatment, 102-K
weldability, 291-J, 10-K, 33-K, 183-K, 267-K, 443-K, 452-K, 708-K, 718-K, 730-Q, 569-R
welding, 542-A, 200-G, 91-K, 149-K, 176-K, 261-K, 384-K, 385-K, 443-K, 505-K, 527-K, 572-K, 643-K, 6-R, 518-R, 257-T
distortion, 580-K
joining and assembling, 636-K
physics, 315-K
quality control, 380-K
weldments, 192-N
corrosion
intergranular, 73-R
stress, 18-R
diffusion of carbon, 320-N
tensile properties, 1155-Q
yield strength, 614-N, 1322-Q
Stainless steel castings, 476-A, 222-E
corrosion, 313-R
ductility, 545-E
grain boundaries, 190-K
mechanical properties, 430-E, 577-Q, 313-R
effect of low temperature, 877-Q
Stainless steel castings, (cont.)
quality control, 717-Q
reclamation, 255-E
recrystallization, 190-K
segregation, 255-E
soldification phenomena, 342-E, 468-E
structure control, 250-F
welding, 190-K
Stainless steel cermets
molding and compacting
hot pressing, 130-H
thermal conductivity, 130-H
Stainless steel extrusions
design, 39-F
Stainless steel foil
spot welding, 560-K
Stainless steel forgings
tolerances, 113-F
Stainless steel ingots, 188-D
inclusions, 443-D
Stainless steel investment castings, 306-E
mechanical properties, 982-Q
Stainless steel plate
arc cutting, 283-G
arc welding
gas shielded, 330-W
Stainless steel powder
mixing and blending, 75-H
production
atomization, 116-H
properties, 28-H, 116-H
Stainless steel sandwich structures, 332-K
brazing, 263-K, 280-K, 422-K, 684-K
furnace, 218-K, 583-K, 214-W, 226-W
corrosion, 280-K
flaw detection, 293-S
mechanical properties, 280-K
Stainless steel sheet
annealing, 489-K
arc cutting, 292-G
arc welding, 489-K
cleaning and polishing
mechanical, 489-K
ductility, 1344-Q
forming, 447-G
gas welding, 489-K
mechanical properties, 67-D
spot welding, 632-K
yield strength, 1344-Q
Stainless steel strip
annealing, 304-J
continuous, 165-W
thermal properties, 376-P
Stainless steel tubing and pipe, 455-Q
annealing, 78-J, 148-W
arc welding
coated electrode, 257-K, 493-K

Stainless steel tubing and pipe, (cont.)
bending, 190-G, 414-G, 493-K
cladding, 240-L
corrosion
chemical, 637-R
inhibition, 637-R
intergranular, 493-K
creep
rate, 930-Q
strength, 930-Q
diffusion bonding, 694-K
extrusion, 264-F
mechanical properties
tests, 1364-Q
pickling, 492-L
stresses
thermal, 1064-Q
Stainless steel weldments
brittle transition properties, 321-N
corrosion, 522-K, 490-R
atmospheric, 357-R
by inorganic acids, 491-R
intergranular, 321-K, 491-R
stress, 460-R
cracks, 443-K, 464-K, 635-Q
creep
strength, 929-Q
crystal structure, 711-M
crystallization, 243-N
diffusion, 620-N
effect of heat treatment, 491-R
electron microscopy, 620-N
fatigue life, 623-Q
fracture
crack propagation, 321-K
impact strength, 464-K, 1098-Q
magnetic properties, 249-P
saturation induction, 525-M
mechanical properties, 512-Q
notch sensitivity, 929-Q
stress relief
heat treatment, 276-J
stress rupture properties and tests, 929-Q
stresses, 623-Q
tensile properties, 1-K
transformations, 620-N
allotropic, 474-N
wear properties and tests, 791-Q, 1533-Q
Stamping, 140-E, 9-G, 125-G, 324-G, 456-G
cold, 51-G
dies, 115-G
ceramic coating, 737-L
cost, 364-A
design, 456-G
Standards and specifications, 201-A, 325-S, 347-S, 370-S
alloy steel, 217-S
Statistical analysis, 167-A, 51-Q, 172-Q, 53-S, 72-S
Steel, 140-A, 163-A, 573-A
adhesive joining
metal-to-metal, 592-K
age hardening, 28-N, 226-N, 407-N
alloying agents, 84-D
analysis, 88-S, 250-S
oxides, 150-S
silicon, 137-M, 712-M
special separation, 194-S, 249-S
anelastic properties, 259-Q, 1207-Q
annealing, 39-J, 79-J, 524-L, 604-M, 951-Q
bright, 21-J, 209-J, 385-W
cold, 33-J
continuous, 163-J
applications, 5-W
arc welding, 32-G, 26-K, 49-K, 124-K, 270-K, 308-K, 435-K, 537-K, 651-K, 673-K, 732-L, 445-W
automation, 20-K
coated electrode, 123-K, 140-K, 187-K, 233-K, 303-K, 329-K, 363-K, 585-K, 1035-Q, 408-W
cracks, 2-K
gas shielded, 291-F, 12-K, 84-K, 264-K, 278-K, 488-K, 524-K, 585-K, 612-K, 666-K, 373-L, 223-W
repair, 593-K
submerged arc, 159-K, 205-K, 259-K, 313-K, 329-K, 521-K, 524-K, 657-L, 223-W
distortion, 317-K
porosity, 400-K
atomic structure, 164-M, 749-Q
interatomic bond, 193-N
austempering, 294-J
austenite
retained, 476-M, 258-N, 542-N, 663-N
austenite formation and decomposition, 169-J, 252-N, 411-N, 626-N, 137-Q
effect of deformation, 562-N
pearlite and pearlite reaction, 330-M
austenitizing, 315-K
bend properties
strength and ductility, 573-Q
bend properties and tests, 285-F, 216-J, 86-Q, 527-Q, 963-Q, 1108-Q
bend tests
notched
slow, 1515-Q
blanking, 27-G, 269-W
blasting, 7-L, 183-L, 209-L, 315-L, 619-L, 672-L, 709-L, 733-L

Steel, (cont.)
bolting, 440-K
brazing, 396-K
induction, 126-K
vacuum, 281-K
brittle transition temperature, 99-Q, 421-Q, 1044-Q, 1334-Q, 1513-Q, 1523-Q, 1524-Q
effect of radiation, 1142-Q, 1515-Q
buildings, 184-T
carbides in, 329-M, 402-M, 255-N, 477-N, 587-N, 621-N, 669-N, 605-R
carbonitriding, 324-J, 590-Q
carburizing, 329-A, 20-J, 101-J, 147-J, 196-J, 236-J, 281-J, 284-J, 331-J, 569-Q, 389-W
selective, 29-J
case hardening, 3-J, 23-J, 50-J, 150-J, 184-J, 208-J, 222-J, 285-J, 323-J, 458-Q
sulfinuz process, 120-J
cast
quenching, 40-J
casting, 470-E
cathodic protection, 477-L, 704-L, 52-R, 57-R, 59-R, 178-R, 187-R, 542-R, 584-R, 628-R, 670-R, 672-R, 679-R, 730-R, 762-R, 821-R
ceramic coated
compression properties and tests, 836-Q
corrosion
chemical
inorganic, 705-R
organic, 705-R
metallography
specimen preparation, 373-M
use in buildings, 293-T, 298-T
volume and dimensional changes, 409-P
ceramic coating on, 343-L, 448-L, 706-L, 718-L, 733-L, 409-P, 835-Q
ceramic mold casting, 494-E
chemical reduction coating on, 743-L
chromizing, 486-L, 820-L
vacuum, 604-L
clad
arc welding
coated electrode, 433-K
gas shielded, 623-K
flame cutting, 433-K
cladding, 247-L, 383-L
cleaning
alkali, 14-L, 306-L
electrolytic, 505-L
solvent, 94-L
cleaning and polishing
chemical, 412-L, 442-L, 528-L
mechanical, 385-L, 442-L

Steel, (cont.)
cleavage, 52-M
cold treatment, 100-J, 169-J
effect of temperature, 130-J
colorimetric analysis, 63-S, 86-S, 112-S, 125-S, 230-S
colorimetric determination, 367-S
composition analysis, 264-J, 247-M, 86-S, 162-S, 286-S, 335-S, 336-S, 364-S, 371-S, 414-S, 445-S
carbon, 24-X
hydrogen, 197-Q
inclusions, 161-S
manganese, 146-S
oxygen, 261-S
compression properties, 309-Q
compression properties and tests, 879-Q
continuous casting, 171-D, 219-D, 228-D, 239-D, 240-D
converter processes, 588-D
bessemer
blowing, 468-D
Perrin process, 179-D
corrosion, 264-J, 438-L, 476-L, 501-L, 581-L, 25-R, 83-R, 256-R, 570-R, 606-R, 176-T
alkaline
inorganic, 137-R
atmospheric, 391-L, 23-R, 194-R, 268-R, 392-R, 476-R, 650-R
industrial, 292-R
marine, 202-R, 549-R, 564-R, 618-R 820-R
by crude petroleum, 209-R
by fuels, 266-R, 311-R, 535-R, 539-R
by halogen compounds, 408-R
by inorganic acids, 308-R, 409-R
by lubricants, 544-R
by soils, 23-R, 187-R, 261-R
by sulphur compounds, 823-R
chemical
inorganic, 535-R, 739-R
organic, 645-R
erosion, 642-R, 822-R
fatigue, 1138-Q, 515-R, 338-T
galvanic, 178-R, 230-R, 669-R
inhibition, 7-R, 306-R, 339-R, 408-R, 437-R, 482-R, 539-R, 642-R, 668-R
stress, 133-R, 252-R, 500-R, 659-R, 708-R
tropical atmosphere, 230-R
corrosion by waters, 739-R
brines, 69-R, 535-R
sea, 52-R, 318-R, 329-R, 618-R, 649-R, 650-R, 762-R, 820-R, 821-R
steam, 508-R

Steel, (cont.)
corrosion prevention, 385-L, 238-R, 354-R, 476-R, 542-R, 782-R
cathodic protection, 820-R
inhibition, 624-R
packaging and wrapping, 624-R
removable coatings, 544-R, 689-R
corrosion tests, 69-R, 539-R
electrochemical, 339-R, 500-R, 669-R, 821-R
salt spray, 689-R
cracks, 469-Q, 985-Q
creep, 192-Q, 220-Q, 245-Q, 321-Q, 463-Q, 485-Q, 489-Q, 640-Q, 1137-Q, 261-T
tests, 136-Q
stress-relaxation, 130-Q
crystal structure, 128-M, 640-Q, 1196-Q
dislocations, 672-L, 604-M, 407-N, 541-Q, 1207-Q
imperfections, 315-Q
texture and preferred orientation, 66-M, 241-M, 732-P, 733-P
damping properties, 690-Q, 1308-Q
damping properties and tests, 582-Q, 1157-Q
decarburization, 976-Q
defects, 224-D, 61-F
surface, 470-E
deformation
stress induced, 749-Q
diffusion
carbon, 1461-Q
hydrogen, 93-N, 986-Q, 588-R
interfacial, 284-J, 525-N
self-, 20-N
diffusion bonding, 609-K, 620-K
diffusion coating on, 28-L, 232-L, 690-L
dilatometry, 626-N
dip coating, 113-L, 180-L
tin, 138-P
dip coating on, 29-L, 808-L
drawing, 345-G
deep, 37-G, 189-G, 161-M
lubricants and oils, 454-G
rods and shapes, 274-F
drilling, 360-G
ductility, 559-A, 573-Q, 974-Q, 1245-Q, 1308-Q, 1314-Q
effect of impurities, 173-F
effect of high temperature, 174-A
effect of irradiation, 1523-Q, 167-T, 193-T
effect of radiation, 1512-Q
elastic properties, 721-L, 259-Q
Young's modulus, 1443-Q
electrical and electrochemical properties, 60-P, 257-Q
Steel, (cont.)
electrical conductivity, 193-N, 220-N
effect of heat treatment, 61-P
electrochemical properties, 721-P, 147-R
ionization potential, 668-R
electron microscopy, 582-M, 682-M
electroplated
adherence tests, 1298-Q
aluminum, 294-L, 544-L
corrosion, 669-L
corrosion tests, 685-R
fracture
brittle, 457-L
mechanical properties, 669-L
electroplating on, 28-L, 443-L, 457-L, 527-L, 544-L, 545-L, 581-L, 587-L, 650-L, 669-L, 687-L, 714-L, 721-L, 746-L, 751-L, 769-L, 792-L, 802-L, 804-L
baths, 54-L
properties and tests, 54-L
standards and specifications, 210-S
electropolishing, 301-L
electroslag welding, 427-K, 430-K, 520-K, 536-K
embrittlement
hydrogen, 383-Q
equilibrium constant, 668-P
explosive forming, 14-G, 196-G
extrusion, 136-F, 243-F
cold, 33-F
impact and cold, 164-G, 187-G, 299-G, 379-G, 382-G, 409-G, 429-G, 432-G, 135-G
design, 241-G
fatigue, 92-J, 150-J, 277-Q, 339-Q, 342-Q, 347-Q, 349-Q, 352-Q, 355-Q, 403-Q, 460-Q, 461-Q, 465-Q, 470-Q, 526-Q, 527-Q, 690-Q
effect of heat treatment, 660-Q
effect of high temperature, 321-Q
thermal, 69-Q
fatigue life, 113-Q, 346-Q, 348-Q, 353-Q, 1152-Q
effect of stress, 520-Q
fatigue properties and tests, 52-M, 28-N, 80-Q, 171-Q, 590-Q, 742-Q, 879-Q, 1081-Q, 1373-Q, 1374-Q
fatigue strength, 8-J, 50-J, 145-J, 244-J, 802-L, 24-Q, 297-Q, 341-Q, 519-Q, 569-Q, 614-Q, 618-Q, 645-Q, 669-Q, 874-Q, 1034-Q, 1069-Q, 1137-Q, 1138-Q, 1150-Q, 1186-Q, 1313-Q, 1448-Q, 1472-Q, 261-T
effect of grain size, 659-Q
effect of heat treatment, 569-Q

Steel, (cont.)
fatigue tests, 351-Q
direct stress, 176-Q
ferrite and ferrite reaction, 597-N
finishing, 391-L
flakes, 206-F
flame and arc cutting, 32-G
flame cleaning, 809-L
flame cutting, 75-G, 618-Q
flaw detection, 258-S
magnetic particle, 164-S
radiographic, 32-G, 697-Q, 75-S, 80-S
ultrasonic, 74-S, 358-S, 409-S
forging practice, 16-F, 22-F, 25-F, 128-F, 157-F, 205-F, 206-F, 269-F, 1245-Q, 399-S
drop, 103-F, 290-F
tolerances, 20-F
effect of impurities, 173-F
history, 368-A
upsetting, 168-F
forgings
bend properties and tests, 391-Q
formability, 345-G, 617-Q
effect of impurities, 1389-Q
testing, 286-Q
forming, 335-G
finish, 374-G
forming and machining, 141-G, 199-M
foundry practice, 67-E, 427-E
chilling, 465-E
cupola, 533-E
electric, 428-E
gating, 80-E
heading, 429-E
melting, 206-E, 230-E, 469-E, 348-W
molding, 542-E
plant layout, 441-E
pouring, 197-E, 347-E
research, 485-A
rigging, 70-E, 536-E
structure control, 532-E
tolerances, 566-E
fractography, 52-M
fracture, 392-D, 290-J, 245-Q, 318-Q, 461-Q, 465-Q, 546-Q, 617-Q, 985-Q, 1081-Q, 1088-Q, 1092-Q, 1137-Q, 1373-Q, 1374-Q, 1512-Q, 1513-Q, 500-R
brittle, 96-F, 576-K, 213-L, 251-M, 67-Q, 86-Q, 131-Q, 137-Q, 258-Q, 301-Q, 322-Q, 421-Q, 541-Q, 796-Q, 806-Q, 951-Q, 962-Q, 1043-Q, 1108-Q, 1114-Q, 1207-Q, 1222-Q, 1254-Q, 1284-Q, 1308-Q, 1314-Q, 1334-Q, 1503-Q, 1515-Q, 1517-Q, 1518-Q, 1524-Q, 1541-Q
hydrogen, 164-Q

Steel, fracture, (cont.)
crack propagation, 22-F, 469-Q, 1541-Q
effect of composition, 132-Q
effect of temperature, 132-Q
free cutting
machinability, 314-G
fretting, 519-Q, 535-Q
friction, 450-G, 454-G, 94-Q, 126-Q, 479-Q, 1509-Q
effect of pressure, 565-Q
friction welding, 553-K
galvanized
corrosion, 610-L, 812-R
atmospheric, 364-L, 526-R
painting, 364-L
passivation, 589-R
seam welding, 283-K
galvanizing, 167-L, 380-L, 476-L, 610-L, 688-L, 769-L, 792-L
gas analysis, 292-S, 329-S, 433-S
hydrogen, 126-S
gas welding, 514-K
oxy-acetylene, 404-K
gases in, 721-L, 337-N, 338-N, 540-N
gear cutting and screw cutting, 244-J
grain boundaries, 227-M
grain growth, 962-Q
grain size, 25-F
effect of composition, 256-M
effect of radiation, 99-Q
graphitization, 262-N
hard facing, 73-L
hard surfacing, 49-K, 373-L, 732-L
hard surfacing of, 524-L
hard surfacing on, 657-L
hardenability, 185-J, 323-J, 235-W
hardening and hardness tests, 173-Q
hardness, 285-F, 253-J, 290-J, 66-M, 24-Q, 1233-Q
hardness and hardness tests, 196-J, 535-Q
micro-, 50-J, 264-J, 525-N, 976-Q
heading, 214-G
heat treatment, 25-F, 37-J, 72-J, 114-J, 132-J, 149-J, 164-J, 212-J, 223-J, 251-J, 256-J, 290-J, 327-J, 227-N, 533-N, 462-P, 227-Q, 1183-Q, 393-W
controlled atmosphere, 18-J, 27-J, 184-J, 209-J, 324-J, 289-W, 385-W
flame, 59-J, 145-J, 146-J, 168-J, 253-J, 1069-Q
furnaces, 72-J, 212-J
stresses, 462-P
fused-bath, 37-J, 51-J, 263-J, 269-J, 270-J, 302-J
induction, 17-J, 146-J, 244-J, 281-J, 329-J, 1069-Q

Steel, (cont.)
heating for working, 56-F
history, 231-A, 553-A, 454-D
hydroforming, 189-G
hydrogen in, 338-N, 418-N, 1314-Q, 1517-Q, 1518-Q
impact, 546-Q
impact properties, 962-Q
impact properties and tests, 54-Q, 86-Q, 131-Q, 176-Q, 1108-Q, 1210-Q, 1402-Q
impact strength, 576-K, 253-N, 418-Q, 573-Q, 1313-Q, 1524-Q, 261-T
inclusions, 132-D, 145-D, 148-D, 255-D, 392-D, 504-D, 587-D, 622-D, 324-E, 55-M, 225-M, 247-M, 459-M, 477-N, 461-Q, 666-Q
radioactive tracer study, 476-D
investment casting, 317-E
killed
composition analysis, 385-S
inclusions, 385-S
machining, 205-G
mechanical properties
effect of heat treatment, 846-Q
stresses, 205-G
lacquering, 320-L
leaded, 309-D, 53-J
forgings
machinability, 197-G
mechanical properties, 197-G
liquid
composition analysis, 410-S
temperature measurement, 279-S, 29-X
weighing, 18-X
machinability, 421-G, 457-G, 23-J, 96-T
machining, 5-G, 78-G, 79-G, 156-G, 188-G, 450-G
chemical, 133-G, 139-G
equipment, 338-G
mechanical, 42-G, 273-G, 287-G, 339-G
stress analysis, 425-G
macrostructure, 171-D, 198-D, 688-D
magnetic damping, 1157-Q
magnetic properties, 435-K, 564-P, 732-P, 733-P, 402-S
domain theory, 1157-Q
martempering, 294-J
martensite and martensite reaction, 58-N, 258-N, 384-N, 602-N, 643-N
ferrous, 133-Q
mechanical properties, 208-D, 358-D, 542-D, 625-D, 91-F, 120-J, 38-Q, 63-Q, 134-Q, 139-Q, 197-Q, 220-Q, 257-Q, 315-Q, 339-Q, 343-Q, 835-Q, 895-Q, 1146-Q, 1183-Q, 1196-Q, 1284-Q, 1438-Q, 176-T

Steel, mechanical properties, (cont.)
effect of composition, 78-Q, 183-Q, 487-Q, 555-Q
effect of deformation, 223-M
effect of heat treatment, 223-M, 78-Q, 1460-Q
effect of high temperature, 221-C, 547-Q
effect of impurities, 430-Q
effect of irradiation, 1523-Q
effect of low temperature, 405-Q, 680-Q
effect of radiation, 898-Q, 1285-Q, 1510-Q
metal spraying of, 392-L, 651-L
metal spraying on, 508-L, 562-L, 587-L, 689-L, 769-L, 775-L, 1522-Q
metal transfer, 114-R
metallography
etching, 130-M, 251-M, 962-Q
replica techniques, 19-M
techniques, 225-M, 459-M
magnetic, 626-N
microradiography, 55-M
microstructure, 63-J, 682-M
effect of deformation, 223-M
effect of fatigue, 321-Q
effect of heat treatment, 223-M
primary, 66-D, 39-J, 62-M, 402-M, 1210-Q
mill practice, 244-F
heating for working, 376-D, 3-F, 25-F
surface preparation, 246-D
milling and hobbing, 25-G, 222-G, 359-G
nitriding, 8-J, 51-J, 91-J, 190-J, 216-J, 243-J, 264-J, 682-M, 659-Q, 660-Q, 669-Q
nitrogen in, 453-D, 418-N
normalizing, 262-N
notch sensitivity, 376-Q, 421-Q, 526-Q, 1210-Q, 1513-Q
nucleation, 588-D
oxidation, 318-R, 701-R
painting, 39-L, 184-L, 186-L, 225-L, 255-L, 322-L, 385-L, 438-L, 454-L, 477-L, 501-L, 528-L, 535-L, 691-L, 704-L, 238-R, 268-R, 354-R, 689-R
automation, 146-L
painting on, 33-L
passivation, 442-L, 147-R, 471-R, 496-R
pearlite and pearlite reaction, 253-N
peening, 358-Q, 614-Q, 1034-Q, 1448-Q
permanent mold casting, 401-E, 555-E
phase diagrams, 252-N
phosphate coating, 253-L, 831-L
phosphate coating on, 14-L
photometric analysis, 288-S
pickling, 69-L, 209-L, 346-L, 473-L, 480-L, 560-L

Steel, (cont.)
piercing, 269-W
pipe
corrosion
by inorganic acids, 285-R
weld tests, 196-S
pitting corrosion, 471-R
plastic coated, 369-L
joining, 680-K
plastic deformation, 134-F, 168-F, 425-G, 193-N, 210-P, 36-Q, 104-Q, 135-Q, 264-Q, 276-Q, 465-Q, 485-Q, 541-Q, 733-Q, 821-Q, 1092-Q, 1269-Q, 1357-Q, 1374-Q, 1512-Q
anisotropic, 867-Q
plastic properties, 38-Q, 59-Q, 1233-Q, 1512-Q
polarographic analysis, 116-S, 254-S, 321-S
polishing
chemical, 473-L
electrolytic, 24-J, 299-L, 436-L, 710-L, 802-L, 804-L
mechanical, 804-L
prestressing, 348-Q, 338-T
production and consumption, 86-A, 87-A, 578-A
quenching, 21-A, 24-J, 79-J, 140-J, 142-J, 159-J, 168-J, 170-J, 604-M, 139-Q, 874-Q, 235-W
automation, 264-W
distortion, 239-J
effect of temperature, 141-J
interrupted, 134-J, 143-J
radiochemical analysis, 456-S, 457-S
recrystallization, 41-J, 115-J, 597-N
effect of composition, 20-N
research, 473-A
rimming, 57-D
annealing, 109-J
cracks, 71-K
crystallization, 281-N
defects
surface, 281-D, 181-F
fatigue strength, 606-Q
fracture
crack propagation, 606-Q
inclusions, 43-M
machining, 205-G
macrostructure, 43-M
mechanical properties, 372-D, 177-Q, 978-Q
microstructure
primary, 109-J
rolling, 181-F
sheet
grain growth, 340-N
magnetic properties, 340-N

Steel, rimming, (cont.)
stress concentration, 606-Q
stresses, 205-G
weldability, 71-K, 177-Q
yield point mechanism, 1171-Q
riveted
tensile properties, 645-K
riveted joints
fatigue strength, 576-Q
roll forming, 358-G
rolling, 246-D, 376-D, 146-F, 274-F, 292-F, 227-Q, 867-Q, 320-R, 362-W
automation, 164-F
cold, 263-F, 285-F
defects, 70-F
effect of deformation, 142-F
effect of stress, 70-F
finish, 159-F, 196-F, 197-F
hot, 263-F, 285-F
vacuum, 342-D
sampling technique, 329-S
sand casting, 287-E, 392-E, 401-E
scaling, 519-A, 499-R, 645-R, 289-W
seam welding, 216-K
segregations, 326-D, 639-N
semikilled
electroplating on, 810-L
sheet
galvanized
forming, 453-G
resistance welding, 453-G
shell mold casting, 318-E, 335-E
size, thickness and mass measurement
magnetic flux, 402-S
ultrasonic, 358-S
slag welding, 108-K
soldering, 249-K
furnace, 672-K
solidification, 171-D, 356-D, 450-E, 275-J, 399-N, 533-N, 639-N, 318-Q
specific heat
effect of deformation, 210-P
specifications, 312-S
spectrographic analysis, 57-S, 108-S, 240-S, 248-S, 275-S, 277-S, 283-S, 349-S, 359-S, 373-S, 422-S, 445-S, 453-S
testing equipment, 274-S, 429-S
spinning, 189-G, 293-G
spot welding, 133-K, 216-K, 499-K, 579-K, 620-Q
sprayed
corrosion
atmospheric, 356-R
by waters
sea, 356-R
solidification shrinkage, 427-D

Steel, (cont.)
sonic properties, 597-Q
sorting and identification
magnetic, 367-S
spark test, 367-S
standards and specifications, 492-K, 1438-Q, 341-S, 449-S
statistics and economics, 85-A
straightening, 59-J
strain aging, 374-G, 226-N, 407-N, 951-Q
stress analysis, 294-G
stress concentration
effect of heat treatment, 657-Q
stress relief heat treatment, 148-J, 161-J, 16-W
stress rupture properties and tests, 246-Q, 851-Q, 1210-Q, 1443-Q
stress-strain laws, 36-Q, 733-Q
stresses, 150-J, 670-Q, 1294-Q, 33-X
effect of heat treatment, 145-J, 146-J
residual, 307-Q, 460-Q, 526-Q, 569-Q, 645-Q, 1054-Q, 1069-Q, 1198-Q
thermal, 663-N, 462-P
transformation, 147-J, 130-Q
sulphurizing, 233-J
surface roughness
measurement, 42-G
swaging, 129-F
synthetic resin coating, 39-L, 318-L, 654-L
temperature measurement, 399-S, 588-D
tempering, 275-J, 287-J, 294-J, 137-Q, 139-Q, 1334-Q, 399-S
tempering reactions, 1334-Q
tensile properties, 559-A, 281-J, 597-N, 24-Q, 155-Q, 796-Q, 894-Q, 924-Q, 1233-Q, 1245-Q, 1308-Q, 1524-Q
effect of deformation, 418-Q
effect of high temperature, 23-Q
effect of radiation, 1142-Q, 1515-Q
effect of stress, 23-Q
tensile properties and tests, 134-J, 216-J, 227-Q, 376-Q, 393-Q, 421-Q, 879-Q, 1222-Q
effect of stress, 367-Q
tension impact test, 574-Q
thermal analysis, 698-P
thermal conductivity, 269-J, 698-P
effect of low temperature, 317-P
thermal properties, 462-P
thermit welding, 454-K
thermodynamic properties, 588-D
tin plated, 263-L
transformations, 227-N
isothermal, 44-N, 193-N
stress induced, 470-Q
Steel, (cont.)
tubemaking
design, 129-F
rolling, 121-F, 210-F
welding, 209-F
twinning
deformation, 1466-Q
thermal, 1466-Q
ultrasonic welding, 245-K
upset welding, 654-K
use in automobiles, 1146-Q
use in chemical processing equipment, 54-Q
use in nuclear reactors, 167-T, 194-T, 249-T
use in pressure vessels, 194-T
use in rope and cable, 327-T
use in structures, 280-T
use in tanks and pressure vessels, 161-J
use in turbine blades and rotors, 254-A
vapor deposition coating on, 456-L, 481-L, 660-L, 743-L
volume and dimensional changes, 640-P, 1269-Q
wear, 454-G, 92-J, 480-Q, 484-Q, 665-Q, 1509-Q
wear properties and tests, 61-Q, 133-Q
radioactive tracer study, 697-Q
wear resistance, 373-Q
effect of deformation, 390-Q
effect of structure, 390-Q
weld tests, 208-K, 647-K, 276-S
weldability, 156-A, 434-K, 576-K, 593-K
welded assemblies, 184-T
welding, 329-A, 258-K, 492-K, 668-Q, 256-T
distortion, 580-K
electroslag welding, 34-K, 37-K
physics, 315-K, 1227-Q
quality control, 233-K, 279-K
repair, 355-G
stresses, 279-K
volume and dimensional changes, 445-K
welding and joining, 184-K, 157-W
welding electrodes, 318-K, 223-W
wire drawing, 64-F, 134-F, 226-F
tensile properties, 130-F
continuous, 619-L
wire mills, 374-G
x-ray diffraction, 476-M
x-ray microscopy
effect of deformation, 159-M
yield strength, 425-G, 963-Q
Steel bars and rods
arc welding
coated electrode, 532-K

Steel bars and rods, (cont.)
blasting, 75-L
cracks, 331-S, 479-S
flaw detection
magnetic induction, 331-S, 479-S
gas welding
pressure, 222-K
production and consumption, 109-A
size
thickness and mass measurement, 353-S
Steel bearings, 342-L
age hardening, 212-N
Steel billets
defects
surface, 369-D, 376-D
flaw detection, 113-S
ultrasonic, 406-S
temperature measurement, 246-S
Steel casting
continuous, 177-D, 181-D, 182-D, 191-D, 192-D, 193-D, 195-D, 199-D
Steel castings
annealing, 698-K
applications, 287-A
arc welding
coated electrode, 698-K
austenite formation and decomposition, 106-N
cleaning, 34-E, 386-E
cracks, 485-E
crystal structure, 487-M
design, 426-A
distortion, 425-E
ductility, 543-E
ferromagnetism, 348-P
flaw detection
radiographic, 543-E, 447-S
flaw detection equipment
x-ray, 447-S
foundry practice, 349-E
graphitization, 274-J, 266-N
hardenability, 274-J
hardness, 52-J, 274-J
hardness tests
spherical indenter, 348-P
heat transfer, 562-D
heat treatment, 52-J, 70-J, 349-E, 964-Q
flame, 274-J
impact properties, 52-J
magnetic properties
hysteresis loop, 638-P
saturation induction, 638-P
tests, 632-P
mechanical properties, 964-Q
effect of high temperature, 411-A
Steel castings, (cont.)
painting, 387-L
porosity, 232-E
quality control, 70-E, 214-E, 324-E
reclamation, 463-E
segregation, 106-D
solidification, 106-D
solidification phenomena, 543-E, 533-N
sonic properties, 274-J
statistical analysis, 214-E
structure control, 450-E, 485-E
porosity, 33-E
tensile properties, 543-E, 1147-Q
use in aircraft, 411-A
use in rolling mill rolls, 368-Q
wear, 274-J
welding, 349-E, 463-E
repair, 618-K
Steel fasteners, 440-K
heat treatment
controlled atmosphere, 79-J
Steel foil
crystal structure, 330-M
machining
electrochemical, 416-G
Steel forgings
flakes, 974-Q
flaw detection, 78-S, 306-S, 227-T
mechanical, 318-S
ultrasonic, 269-F, 306-S, 307-S
fracture
brittle, 78-S, 227-T
heat treatment, 375-D, 6-J
impact properties and tests, 78-S
properties, 172-D
tensile properties, 540-Q
use in turbine blades and rotors, 306-S, 318-S, 207-T, 208-T, 227-T
Steel industry
research, 230-A
statistics and economics, 70-A, 96-A, 205-A
Japan, 323-A
waste control, 82-A, 98-A, 567-A, 158-W
Steel ingot casting, 12-D, 37-D, 40-D, 46-D, 77-D, 81-D, 106-D, 192-D, 195-D, 246-D, 306-D, 368-D, 417-D, 418-D, 419-D, 506-D, 635-D, 649-D, 205-F, 206-F
cracks, 345-D
defects, 310-D
degassing, 61-D, 116-D, 174-D, 283-D, 287-D, 362-D, 575-D, 688-D
vacuum, 180-C, 224-C, 18-D, 55-D, 56-D, 286-D, 311-D, 322-D, 323-D, 324-D, 336-D, 357-D, 358-D, 359-D, 394-D, 426-D, 447-D, 478-D, 514-D,

Steel ingot casting, degassing, (cont.)
vacuum, (cont.)
524-D, 530-D, 531-D, 541-D, 542-D, 543-D, 570-D, 603-D, 629-D, 637-D, 639-D, 652-D, 660-D, 667-D, 675-D, 682-D, 684-D, 685-D, 686-D
Germany, 199-D
mold practice, 138-D
pouring
vacuum, 116-D, 624-D
solidification, 290-C, 103-D, 104-D, 105-D, 113-D, 172-D, 375-D, 526-D 581-D, 584-D, 665-D, 183-W
Steel ingot molds, 150-E, 45-W
wear properties and tests, 182-Q
Steel ingots
cracks, 368-D, 578-D
crystallization, 42-N
defects
surface, 246-D, 281-D, 369-D, 376-D, 379-D, 417-D
degassing, 62-D, 118-D, 288-D, 666-D
dendritic growth, 12-D
flaw detection
ultrasonic, 406-S
fracture
crack propagation
effect of composition, 638-Q
inclusions, 500-D, 579-D
radioactive tracer study, 236-D, 237-D
ladle practice, 146-D, 160-D, 252-D, 377-D, 672-D, 673-D, 583-P, 177-Q
vacuum, 447-D, 565-D, 671-D
macrostructure, 506-D, 526-D
microstructure, 161-M
mold practice, 66-D, 104-D, 281-D, 305-D, 326-D, 342-D, 346-D, 369-D, 383-D, 484-D, 592-D, 111-W, 299-W
effect of temperature, 282-D
porosity, 506-D
pouring, 13-D, 36-D, 128-D, 205-D, 236-D, 245-D, 280-D, 376-D, 379-D, 396-D, 414-D, 578-D, 579-D, 625-D, 628-D, 661-D
automation, 471-D
radioactive tracer study, 369-D
vacuum, 336-D, 404-D, 500-D, 546-D, 671-D, 672-D, 673-D, 268-W
books, 206-D
equipment, 674-D
recovery, 145-N
recrystallization, 145-N
rolling, 91-F
segregation, 506-D, 304-N
solidification, 304-N
solidification shrinkage
effect of temperature, 219-D
Steel ingots, (cont.)
surface defects, 282-D
tapping, 9-D, 58-D, 361-D, 511-D
temperature measurement, 219-S, 330-S
tensile properties, 506-D
volume and dimensional changes, 304-N
Steel investment castings
tensile properties and tests, 653-Q
Steel mills, 117-A
Steel pipe
bituminous coating, 210-R
cathodic protection, 210-R, 274-R
corrosion by soils, 173-R, 210-R
Steel pipelines
cathodic protection, 504-R, 634-R
corrosion by sulphur compounds, 653-R
corrosion by waters
sea, 634-R
Steel plant installations, 121-W
Steel plate
arc welding, 328-K
gas shielded, 602-K
submerged arc, 228-K, 471-K
bainite and bainite reaction, 479-K
bending, 149-G
blasting, 53-L
cladding, 198-K, 204-L
corrosion by waters
sea, 53-L
corrosion prevention, 32-R
creep
strength, 928-Q
cutting
explosive, 213-G
electroslag welding, 471-K, 479-K
flaw detection
radiographic, 357-S, 369-S
ultrasonic, 272-S, 406-S
fracture
brittle, 589-Q
grinding, 12-W
painting, 53-L
stress rupture properties and tests, 928-Q
tensile properties 540-Q, 928-Q
thermal conductivity, 471-K, 479-K
Steel powder
molding and compacting
rolling, 123-H
production, 46-H
Steel powder compacts
impregnating, 146-H
sintering, 123-H
Steel powder metal parts, 187-W
chromizing on, 618-L
fatigue strength, 1463-Q

Steel powder metal parts, (cont.)
hardness, 1463-Q
impact strength, 1463-Q
tensile properties, 1463-Q
yield strength, 1463-Q
Steel rope and cable, 64-F
bend properties and tests, 1441-Q
fatigue properties and tests, 1441-Q, 1444-Q
mechanical properties, 327-T
wear properties and tests, 1444-Q
Steel sand castings
defects
surface, 392-E
grain size, 27-M
inclusions, 392-E
mechanical properties, 240-Q
metallography
etching, 27-M
tensile properties
effect of heat treatment, 22-Q
yield strength
effect of heat treatment, 22-Q
Steel sandwich structures
adhesive joining
metal-to-metal, 542-K
brazing, 542-K
Steel scrap
processing, 114-B
production and consumption, 30-A
Steel shapes
metal spraying, 40-L
Steel sheet
annealing, 41-J
arc cutting, 420-G
arc welding, 540-K
gas shielded, 420-G, 194-K, 650-K
submerged arc, 195-K, 478-K
blasting, 89-L, 464-L
continuous, 798-L
ceramic coating, 372-D
cleaning and polishing
chemical, 464-L, 526-L
compression properties, 50-G
corrosion
by foods, 543-R
corrosion prevention, 359-L
defects
surface, 376-D, 379-D
degreasing, 444-L
dip coated
corrosion
atmospheric, 526-R
drawing
deep, 281-T
ductility, 1329-Q, 1361-Q
elastic properties, 1329-Q
Steel sheet, (cont.)
electroplated
corrosion
atmospheric, 526-R
fatigue strength, 429-Q
flame cutting, 301-G
flaw detection
radiographic, 31-S
formability, 127-Q
forming, 381-G
fracture
brittle, 1361-Q
crack propagation, 1044-Q
galvanized, 372-A
galvanizing, 121-L, 526-L, 696-L
galvanizing on, 692-L
gas welding, 540-K
hard surfacing on, 650-K
heat treatment, 381-G, 289-J
joining, 381-G
magnetic properties
hysteresis loop, 487-P
painted
corrosion
atmospheric, 526-R
painting, 359-L, 387-L
phosphate coating, 359-L
cold, 450-L
pickling, 1361-Q
plastic coated, 175-K
printing on, 319-L
resistance welding, 649-K
rolling, 276-F
finish, 230-F
scaling, 320-R
standards and specifications, 473-S
strain aging, 281-T
stresses, 127-Q
synthetic resin coating, 272-L
equipment, 771-L
tensile properties, 1329-Q, 1361-Q
tubemaking
welding, 201-F
use in buildings, 292-T
use in structures, 309-T
weld tests, 133-K, 196-S
weldability, 133-K
welding and joining, 175-K
Steel slabs
defects
surface, 628-D
Steel springs
heat treatment
controlled atmosphere, 79-J
Steel stampings
tumbling, 17-L
Steel strip

Steel strip, (cont.)
annealing
bright, 124-J, 695-L
blasting, 285-L
cleaning
vapor, 6-L
cleaning and polishing
chemical, 526-L, 685-L, 694-L, 695-L
mechanical, 608-R
electroplating, 685-L
fatigue properties and tests, 834-Q
flame cutting
distortion, 442-G
flaw detection, 164-F
forming, 380-G
galvanizing, 6-L, 400-L, 526-L, 685-L
continuous, 693-L, 694-L, 695-L
heat treatment, 72-J
controlled atmosphere, 124-J
heating and cooling, 75-J
mill practice
heating for working, 37-P
painting, 20-L
continuous, 767-L
pickling, 519-L, 608-R
plastic deformation, 834-Q
production and consumption, 109-A
rolling, 72-F, 132-F
cold, 101-F, 122-F, 275-F, 834-Q
finish, 275-F
hot, 519-L
lubrication, 106-F
scaling, 608-R
size
thickness and mass measurement, 164-F, 353-S
spot welding, 491-K
standards and specifications, 473-S
thermal properties, 37-P, 376-P
Steel tubemaking
drawing, 127-F
rolling, 127-F
use in structures, 342-T
Steel tubing and pipe
arc welding
automation, 20-K
coated electrode, 532-K
bending, 190-G
corrosion, 436-K
halogen compounds, 42-R
inhibition, 517-R
cleaning and polishing
chemical, 684-L, 793-L
creep, 1489-Q
diffusion, 56-K
forge welding, 56-K
flaw detection, 114-S
Steel tubing and pipe, (cont.)
galvanizing, 684-L
hydrostatic tests, 587-K
machining
mechanical, 294-G
normalizing, 94-F
phosphate coating, 539-L
pickling, 517-R
production and consumption, 109-A
properties, 280-T
resistance welding, 453-K
soldering, 165-K
spot welding, 436-K
stresses
residual, 607-Q
tensile properties and tests, 27-Q
welding
repair, 587-K
yield strength, 750-Q
Steel weldments
bend properties and tests, 1055-Q
compression properties, 612-Q
corrosion tests
immersion
alternate, 157-R
cracking, 124-K
distortion, 230-K
ductility, 55-K, 1352-Q
fatigue properties and tests, 118-Q, 1035-Q, 1473-Q
fatigue strength, 622-Q, 1429-Q
fatigue tests
torsion, 575-Q
flaw detection, 676-K, 446-S
radiographic, 328-K, 269-S, 289-S, 459-S
ultrasonic, 328-K, 459-S
fracture, 118-Q, 1429-Q
brittle, 55-K, 66-Q, 589-Q, 612-Q, 668-Q, 861-Q, 1111-Q, 1352-Q
tests methods, 1324-Q
crack propagation, 52-Q, 643-Q
grain growth, 536-K
grain size, 649-K
impact properties and tests, 66-Q, 180-Q, 1473-Q
martensite and martensite reaction
ferrous, 52-Q
mechanical properties, 216-K, 427-K, 434-K, 536-K, 540-K, 647-K, 503-M
effect of composition, 270-K
microstructure
primary, 503-M
plastic deformation, 104-Q
plastic properties, 622-Q
porosity, 303-K, 521-K, 612-K
shear strength, 620-Q

Steel weldments, (cont.)
standards and specifications, 333-S
stress relief
heat treatment, 328-K
stress rupture properties and tests, 928-Q
stresses
residual, 305-Q, 612-Q, 622-Q, 1227-Q, 1352-Q
effect of heat treatment, 607-Q
tensile properties, 303-K
tensile properties and tests, 123-K, 1473-Q
tensile strength, 620-Q
yield strength, 631-Q
Steel wire
adherence tests, 601-L
annealing, 127-W
austenite formation and decomposition formation, 39-N
bend properties, 286-T
bend properties and tests, 1441-Q, 1445-Q
cleaning and polishing
chemical, 683-L
corrosion
atmospheric, 286-T
galvanic, 358-R
corrosion prevention, 755-R
corrosion tests
immersion
total, 755-R
drawing
cold, 427-Q
electrical conductivity, 588-L
electroplating, 588-L, 686-L
fatigue life, 514-Q
fatigue properties and tests, 1441-Q, 1445-Q
fatigue strength
tests, 509-Q
galvanizing
continuous, 633-L
effect of heat treatment, 601-L
lubricants and oils, 755-R
patenting, 39-N, 427-Q
protective coatings, 437-L
spot welding, 491-K
tensile properties, 286-T
effect of heat treatment, 130-F
tensile properties and tests, 427-Q
Steelmaking
byproducts, 281-A
temperature measurement, 91-S
waste control, 49-A, 415-A
Straightening
rolled products
equipment, 57-F
Strain aging, 54-N, 226-N, 596-N, 262-Q, 739-Q
Strain gages, 435-P, 486-P, 1123-Q, 1198-Q, 1-X, 33-X, 59-X, 60-X, 61-X, 63-X, 64-X
stud welding, 254-K
Strain hardening, 233-M, 1403-Q
Stress analysis, 144-F, 4-G, 63-G, 244-G, 245-G, 432-Q
Stress concentration, 1258-Q
testing, 234-Q
Stress concentration factor, 551-Q
Stress relief
mechanical, 155-G
Stress relief heat treatment
cold, 166-J
Stress rupture properties and tests, 504-Q, 506-Q, 633-Q, 721-Q, 851-Q, 1208-Q
review, 312-Q
vacuum, 407-Q
Stress-strain laws, 1136-Q, 1160-Q
Stresses, 392-Q, 662-Q, 838-Q, 1231-Q 1255-Q
residual, 147-G, 159-G, 295-G, 317-M, 263-Q, 446-Q, 453-Q, 705-Q, 1232-Q, 1493-Q, 1495-Q
effect of case hardening, 372-Q
tests, 308-Q, 587-Q
statistical analysis, 1471-Q
thermal, 64-E, 64-Q, 505-Q, 508-Q, 716-Q, 1160-Q
design, 970-Q, 1009-Q
tests, 1281-Q
x-ray diffraction, 212-M, 510-M, 671-Q
Stretch forming, 155-G
equipment, 211-G
Strip
electroplating on, 661-L
Strip steel
heat treatment, 27-J
rolling, 90-F
Strontium
colorimetric determination, 233-S
thermodynamic properties, 240-P
Structural materials, 574-A, 590-D, 545-E, 353-G, 374-G, 434-K, 473-K, 480-K, 567-K, 582-K, 617-K, 652-K, 673-K, 678-K, 638-M, 503-M, 1111-Q, 1278-Q, 1285-Q, 1286-Q, 1426-Q, 1437-Q, 1511-Q, 1527-Q, 751-R, 333-S, 300-T, 445-W
corrosion, 820-R
effect of radiation, 898-Q
painting, 322-L, 796-L
plastic properties, 59-Q
stresses
residual, 1232-Q

Structural materials, (cont.)
use in aircraft engines, 199-T
welding, 256-T
Structures
design, 278-T
heat treatment
flame, 151-J
materials
aluminum, 278-T
steel, 280-T
steel sheet, 309-T
steel tubing, 342-T
standards and specifications, 34-S, 278-T
steel
standards and specifications, 395-Q
tensile properties and tests, 395-Q
stud welding, 286-K
Stud welding, 158-K, 254-K, 286-K
Stud welding equipment, 117-K, 309-K
Sulphides
determination, 194-S
thermodynamic properties, 578-P
Sulphur
colorimetric determination, 336-S
corrosive action, 51-R
determination, 32-S, 418-S, 443-S
in iron and steelmaking, 147-D, 157-D, 158-D
Superfinishing, 21-G
Superlattice formation, 215-N, 284-N, 293-P, 718-P, 891-Q
Surface properties
instrumentation, 47-X, 95-X
Surface roughness
measurement, 503-L, 284-S, 295-S, 382-S
electrical, 267-S
optical, 316-S
Surface tension, 1203-Q, 135-R
Swaging, 10-F, 29-F, 240-F, 251-F
Synthetic resin coating, 34-F, 71-L, 194-L, 260-L, 262-L, 292-L, 318-L, 369-L, 372-L, 559-L, 571-L, 755-L
of aluminum, 506-L

T

Tanks and pressure vessels, 656-K, 66-Q, 15-R, 446-S, 1-T, 65-T
aluminum, 139-K, 116-T, 128-T
arc welding, 300-K, 302-K, 510-K, 597-K, 651-K
coated electrode, 363-K
cracks, 498-K
gas shielded, 139-K, 166-K, 202-K, 299-K, 395-K, 488-K, 602-K, 689-K
submerged arc, 357-K, 478-K
Tanks and pressure vessels, (cont.)
bend testing equipment, 398-Q
bituminous coating, 268-T
cathodic protection, 461-R
ceramic coating, 78-T
corrosion, 118-R, 202-R, 361-R
by fuels, 556-R
by inorganic acids, 531-R
by sulphur compounds, 556-R
by waters, 692-R
steam, 508-R
stress, 692-R
corrosion prevention, 268-T
design, 30-K, 36-T, 134-T, 144-T
electroslag welding, 300-K
fatigue properties and tests, 941-Q
fracture
brittle, 301-Q
hard surfacing on, 784-L
inspection, 181-S
materials, 179-T
alloy steel, 1099-Q, 206-T
steel, 161-J
titanium, 183-G
mechanical properties, 192-T
mill practice, 222-F
pitting corrosion, 577-R
repair, 299-K
rubber coating, 77-T
spot welding, 499-K
steel, 189-G
stress rupture properties and tests, 1413-Q
stresses, 720-Q, 1123-Q
synthetic resin coating, 161-L
synthetic resin coating on, 577-R
tensile testing equipment, 398-Q
tests, 37-T
welding, 222-F, 39-K, 125-K, 130-K, 494-K, 503-K, 140-T, 161-T, 177-T, 306-T
welding tests, 1413-Q
Tantalum, 26-A, 165-A, 258-A, 284-A, 332-A, 336-A, 359-A, 382-A, 399-A, 407-A, 414-A, 539-A
adhesive joining
metal-to-metal, 594-K
anodizing, 257-L
arc welding, 697-K
gas shielded, 352-K, 389-K, 487-K, 562-K
atomic structure
interatomic bond, 479-M
bibliographies, 505-A
brazing, 219-K
brittle transition temperature, 1519-Q

Tantalum, (cont.)
clad, 351-R
corrosion, 76-A
by molten metals, 702-R
chemical
inorganic, 65-R, 363-R
organic, 65-R
crystal structure, 453-M
texture and preferred orientation, 322-M
determination, 25-S, 133-S, 142-S
diffusion of, 267-N
electrical conductivity, 45-P, 595-P, 548-Q
electrical properties
dielectric, 702-P
electrochemical properties, 415-L, 378-P
electron beam welding, 563-K
electroplating of
baths, 584-L
electroplating on, 401-L, 664-L
extraction and refining, 539-A, 24-C, 185-C, 250-C
chemical, 25-C, 379-C, 475-C
ion exchange, 194-C
melting, 72-X
equipment, 339-C
separation, 177-C
extrusion
impact and cold, 1351-Q
forming, 400-G
forming and machining, 181-G
fracture
brittle, 1519-Q
gas analysis, 168-S
gases in, 595-P
halide decomposition, 257-C
hardness, 548-Q
machining
mechanical, 258-G
magnetic properties, 595-P
mechanical properties, 76-A, 464-A, 78-F
effect of high temperature, 564-Q
effect of radiation, 1285-Q
metallography
specimen preparation, 200-M
mill practice, 539-A
nuclear properties
radioactive decay, 695-P
optical properties
emission, 133-P
oxidation, 464-A, 11-R, 503-R, 785-R
physical properties, 464-A
powder metallurgy, 74-A, 44-H, 127-M
powder production, 120-H
Tantalum, (cont.)
radiochemical determination, 457-S
recrystallization, 322-M, 1239-Q
research, 123-A
smelting, 377-C
solid solutions
superlattice formation, 508-N
solubility
hydrogen, 136-P, 736-P
solubility in sodium, 608-P
spectrographic determination, 69-S, 118-S, 461-S
spot welding, 696-K
systems
binary, 325-M, 359-M, 384-M, 396-M, 560-M, 322-N, 758-Q
tensile properties, 548-Q, 758-Q, 1239-Q, 1351-Q, 1439-Q
thermal properties, 696-P, 44-T
transition structure, 322-N
use in chemical processing equipment, 539-A
use in medical and dental equipment, 539-A
weldability, 193-K
welding, 487-K, 563-K, 643-K
zone melting, 264-C
Tantalum alloys
tensile properties, 924-Q
ultrasonic welding, 360-K
Tantalum boride
corrosion, 481-R
Tantalum carbide, 548-A
Tantalum-chlorine system, 138-M
Tantalum electrodes
mechanical properties, 156-T
Tantalum extrusions
tensile properties, 1197-Q
Tantalum ores
sources, 144-A
Tantalum powder metals
molding and compacting, 68-H
Tantalum sheet
brazing
vacuum, 472-K
creep properties and tests
effect of high temperature, 850-Q
Taps and dies, 45-R
hard surfacing, 431-L
Television equipment, 9-X
Tellurium, 256-M
determination, 135-S
electrical conductivity, 568-P
electrical properties
effect of impurities, 334-P
extraction and refining
distillation, 71-N
leaching, 424-C

Tellurium, (cont.)
extrusion, 40-F
Hall effect, 563-P
magnetic properties, 563-P
nodulizing agents, 256-E
single crystals
electrical and electrochemical properties, 32-P
statistics and economics, 62-A
systems
binary, 359-M
complex, 554-M, 570-M, 574-M
ternary, 150-M, 669-M
thermal conductivity, 555-P
thermodynamic properties, 22-P
vapor deposition, 71-N
Tellurium copper
hardness, 233-Q
machinability, 233-Q
Tellurium-hafnium system, 100-M
Tellurium-thorium system, 100-M
Tellurium-titanium system, 100-M
Tellurium-zirconium system, 100-M
electrical properties, 130-P
Temperature measurement, 23-D, 29-E, 307-E, 91-S, 115-S, 138-S, 262-S, 328-S, 398-S, 20-X, 30-X
Temperature measurement instruments, 23-D, 29-E, 328-S, 41-X
Tempering, 32-J
Tempering reactions
ferrous, 57-N, 141-N, 383-N
Tensile properties, 51-Q, 745-Q, 1416-Q
testing equipment, 1115-Q
Tensile properties and tests, 210-Q, 211-Q, 268-Q, 502-Q, 503-Q, 807-Q
effect of high temperature, 83-X
size and shape effects, 896-Q
test specimens, 896-Q
Tensile strength, 432-Q
Tension impact test, 94-X
Tension test
notched, 155-Q, 165-Q
size and shape effects, 375-Q
specimen preparation and design, 375-Q
Terbium
magnetic properties, 46-P
optical properties
emission, 221-P
spectrographic analysis, 29-S
Thallium
adsorption
on platinum, 137-P
amalgamation, 403-C
electrical conductivity, 45-P
extraction and refining
Thallium, extraction and refining, (cont.)
cyanidation, 474-C
precipitation, 91-C, 333-C
statistics and economics, 62-A
systems
binary, 219-M
ternary, 219-M, 257-M
Thallium-bismuth alloys
superlattice formation, 669-P
viscosity, 669-P
Thallium industry
waste control, 403-C
Thallium-lead alloys
superlattice formation, 669-P
viscosity, 669-P
Thallium-selenium alloys
diffusion, 142-N
Thermal analysis
testing equipment, 266-M
Thermal conductivity, 491-P, 589-P, 50-X
effect of low temperature, 323-P
testing equipment, 405-S
Thermal expansion metals, 467-A, 729-L 527-P, 672-P, 729-Q
transformations
allotropic, 357-M
x-ray diffraction, 357-M
Thermal properties, 41-P
instrumentation, 6-X, 50-X
Thermal shock tests, 910-Q
Thermit welding, 589-K, 660-K
Thermocouple metals, 631-P, 67-X
Thermocouples, 487-D, 265-K, 527-P 547-P, 219-S, 20-X, 29-X, 30-X, 67-X, 70-X, 71-X, 93-X
effect of low temperature, 51-X
platinum-rhodium, 25-D
properties, 31-X
welding, 383-K
Thermodynamic properties, 25-B, 270-M, 456-M, 414-N, 415-N, 282-P, 480-P, 591-P, 633-P, 634-P, 646-P
tests, 586-P
Thin films
crystal structure, 686-M
electron diffraction, 686-M
microscopy, 173-M
thermal conductivity, 338-P
Thorium, 39-A, 403-A, 512-A, 151-T, 299-T, 317-T
amalgamation, 191-C
analysis
special separation, 37-S, 66-S
composition analysis, 204-S
crystal structure, 625-M
texture and preferred orientation, 609-M
determination, 11-S, 134-S, 151-S

Thorium, (cont.)
effect of radiation, 155-T
electrical properties, 579-P
electroplating on, 740-L
electrorefining, 108-C
electrowinning, 232-C, 484-C
extraction and refining, 512-A, 153-C, 166-C, 315-C
arc melting, 316-C
chemical, 42-C, 63-C, 248-C
distillation
vacuum, 262-C
electrolytic, 28-C, 73-C, 191-C, 262-C
halogenation, 484-C
induction melting, 317-C
ion exchange, 123-C
solvent extraction, 97-C
halide decomposition, 274-C
leaching
solvent extraction, 484-C
magnetic properties, 579-P
melting temperatures, 548-M
metallography
etching
cathodic, 663-M
polishing, 125-M
specimen preparation, 200-M
nuclear properties, 245-P
radioactive decay, 215-P, 626-P
resonance, 488-P
powder metallurgy, 19-H, 43-H
powder production, 66-T
production and consumption, 31-A
radiochemical determination, 249-C, 95-S
reduction by metals and gases, 248-C
single crystals
elastic properties, 250-Q
smelting, 484-C
solubility of thorium dihydride, 518-P
spectrographic analysis, 257-S
systems
binary, 70-M, 465-M, 584-M, 607-M, 625-M
ternary, 70-M
thermal analysis, 548-M
use in nuclear reactors, 234-T
Thorium alloys
hardness
hot, 1040-Q
intermetallic compounds
crystal structure, 221-M
machining
non-mechanical, 43-G
magnetic properties, 18-P
phase diagrams, 221-M
use in missiles, 43-G
viscosity, 663-P
Thorium-copper system, 166-M
Thorium-iron system, 166-M
Thorium-manganese system, 166-M
Thorium-nickel system, 166-M
Thorium ores
concentration, 65-B
preparation, 153-C
sources, 153-C
Thorium powder
molding and compacting
cold pressing, 183-H
hot pressing, 175-H
Thorium powder compacts
sintering, 127-H, 183-H
Thorium-selenium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Thorium-selenium system, 100-M
Thorium sulphide, 100-M
Thorium sulphides
electrical properties, 132-P
thermodynamic properties, 131-P
Thorium-tellurium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Thorium-tellurium system, 100-M
Thorium-uranium alloys, 253-C
extraction and refining
induction melting, 294-C
grain growth, 481-M
microstructure
primary, 481-M
nuclear properties, 79-P
volume and dimensional changes, 449-P
Thread rolling, 64-F, 1-G, 82-G, 319-G
Thulium, 243-P
spectrographic analysis, 259-S
Tin, 361-A
applications, 84-T
atomic structure, 454-M
coordination number, 618-P
colorimetric determination, 158-S
compression properties, 129-Q
condensation of metals, 450-N
corrosion
by foods, 505-R
chemical
inorganic, 811-R
organic, 520-R
crystal structure
imperfections, 309-M, 495-M
determination, 59-S, 143-S
die casting, 518-E
diffusion, 177-N
effect of temperature, 4-N
mercury, 397-N
self-,
energy of activation, 578-N

Tin, (cont.)
dip coating, 138-L, 188-L, 263-L
dip coating of, 428-L, 570-L, 294-T
electrical conductivity, 45-P, 92-P, 268-P, 618-P
electrical properties, 562-P
electroplating, 101-L, 110-L, 112-L, 282-L, 355-L
standards and specifications, 210-S
electroplating of, 443-L, 459-L, 512-L, 518-L, 545-L, 650-L, 740-L, 810-L, 476-R
electroplating on, 504-L
extraction and refining
chemical, 243-C
distillation, 122-C
electric furnace, 240-C
halogenation, 186-C
precipitation, 333-C
vacuum, 209-C
fluidity and castability, 544-E
forge welding
roll, 376-K
foundry practice
structure control, 546-E
grain growth, 288-N, 457-N, 90-Q
energy of activation, 578-N
liquid
electron emission, 499-P
melting temperatures, 479-P
sonic properties, 543-Q
viscosity, 465-P
magnetic properties, 562-P
melting
fuel fired, 369-C
metal spraying of, 507-L
metallography
specimen preparation, 463-M
phase diagrams, 471-M
plastic deformation, 362-Q
precipitation
from liquid, 425-N
reclamation, 141-A
research, 290-A
roll bonding, 376-K
single crystals
growth, 18-N
plastic deformation
lines and bands, 906-Q
solubility
krypton, 709-P
solubility in acid, 113-P
specific heat, 274-P
spectrographic determination, 70-S, 239-S
statistics and economics, 65-A
Tin, (cont.)
stresses, 90-Q
systems
binary, 219-M, 384-M, 585-M, 599-M, 681-M, 682-N, 274-P, 432-P, 590-P
ternary, 23-M, 150-M, 219-M, 257-M, 596-M
thermal properties, 92-P
thermodynamic properties, 590-P
transformation
allotropic, 4-N, 196-N
use in aircraft, 18-T
use in automobiles, 18-T
x-ray determination, 441-S
zone melting, 135-C
Tin alloys
corrosion
atmospheric
tropical, 568-R
galvanic, 183-R
electrical conductivity, 47-P
hardness
micro-, 689-Q
magnetic properties, 47-P
plastic deformation, 998-Q
specific heat, 432-P
Tin-aluminum alloys
physical properties
density, 209-P
Tin-antimony alloys
electrical properties
effect of high temperature, 281-P
Tin-antimony system, 281-P
Tin-antimony-aluminum alloys
crystal structure, 284-F
rolling
cold, 284-F
Tin-bismuth alloys
compression properties and tests, 222-Q
crystal structures, 714-M
eutectics
formation, 599-M
sonic properties, 222-Q
transformations
diffusionless, 599-M
viscosity, 171-P
Tin-cadmium alloys
eutectics
formation, 599-M
transformations
diffusionless, 599-M
Tin castings
volume and dimensional changes, 242-P
Tin dip coating, 111-L, 112-L
Tin electroplate
corrosion
atmospheric, 463-R, 530-R

Tin industry
Brazil
statistics and economics, 202-A
statistics and economics, 219-A
Tin-lead alloys
fluidity and castability, 544-E
tensile properties, 1348-Q
Tin-mercury alloys
transformations, 682-N
Tin-nickel electroplate
applications, 341-L
corrosion
atmospheric, 194-R
Tin-nickel
electroplating, 341-L
Tin ores
crushing
grinding and sizing, 76-B
Tin plate, 545-L, 650-L
annealing
bright, 97-J
corrosion, 442-R, 802-R
atmospheric
marine, 449-R
blistering and exfoliation, 588-R
by foods, 543-R, 588-R
by inorganic acids, 308-R
chemical, organic, 449-R
crystal structure and preferred orientation, 224-M
galvanic, 669-R
corrosion tests
electrochemical, 669-R
polarographic analysis, 15-S
tubemaking
rolling, 121-F
Tin plating
baths, 116-L
Tin powder compacts
sintering, tests, 89-H
Tin rod
magnetic properties, 267-P
Tin-thallium alloys
thermodynamic properties, 601-P
Tin-titanium alloys
surface tension, 251-P
Tin wire
magnetic properties, 455-P
Tin-zinc alloys
thermodynamic properties, 601-P
Tinning
dip, 193-L
Titanium, 75-A, 92-A, 258-A, 274-A, 338-A, 359-A, 362-A, 399-A, 409-A, 508-A
adhesive joining
metal-to-metal, 200-K, 594-K
Titanium, (cont.)
amalgamation, 191-C
analysis, 142-S
special separation, 66-S
annealing
vacuum, 217-J
anodic coating, 140-L
anodizing, 4-L, 49-R
applications, 430-A, 533-A, 549-A, 291-C, 445-R, 5-W
aircraft, 260-T
arc welding, 510-K
gas shielded, 311-K, 387-K, 487-K, 695-K
atomic structure
interatomic bond, 479-M
blanking, 269-W
brazing, 219-K, 285-K
torch, 138-K
vacuum, 217-J, 281-K
carburizing, 200-J
case hardening, 325-J
clad, 351-R
cleaning and polishing
chemical, 695-K
colorimetric determination, 123-S
composition analysis, 101-C, 206-S
compression properties and tests, 1437-Q
corrosion, 412-A, 533-A, 580-P, 744-R
by inorganic acids, 187-P, 411-R, 459-R, 464-R, 676-R, 763-R, 803-R, 828-R
by organic acids, 464-R
chemical
inorganic, 561-R, 598-R
galvanic, 229-R, 322-R, 457-R
stray current, 744-R
stress, 151-Q
corrosion prevention, 763-R
creep, 1437-Q
crystal structure, 665-M, 704-M
dislocations, 768-Q
imperfections, 665-M
determination, 13-S, 67-S, 131-S, 137-S, 443-S
diffusion, 419-N, 531-N
interfacial, 522-N
oxygen, 543-N
diffusion bonding, 531-N
diffusion coating of, 28-L
diffusion in iron, 502-N
drawing
rods and shapes, 51-F
drilling, 451-G
effect of high temperature, 54-A
electrical properties, 579-P
electrochemical properties, 415-L, 187-P, 565-P, 580-P, 585-P, 596-P, 599-P,

Titanium, electrochemical properties, (cont.)
735-P, 411-R, 828-R
ionization potential, 744-R
electron beam welding, 715-K
electron emission, 119-P
electroplating of, 28-L
baths, 584-L
electroplating on, 230-L, 267-L, 297-L, 401-L, 643-L
electrorefining, 127-C, 742-L
equipment, 121-C, 338-C
electrowinning, 434-C, 448-C, 466-C
explosive forming, 196-G, 325-G, 386-G
extraction and refining, 101-C, 293-C, 468-C
arc melting, 271-C
vacuum, 124-C, 180-C, 218-C, 230-C, 231-C
chemical, 164-C, 291-C, 406-C, 477-C
decomposition, 197-C
degassing
vacuum, 230-C
electrolytic, 187-C, 191-C, 298-C, 303-C, 105-L
electron beam melting, 271-C
halogenation, 39-C, 45-C, 77-C, 125-C, 179-C
induction melting
vacuum, 180-C
ion exchange, 476-C
reduction by metals, 346-C
vacuum, 49-C, 157-C, 205-C
extrusion
impact and cold, 187-G, 1351-Q
fatigue life, 1187-Q
fatigue properties and tests, 123-Q, 151-Q
forging practice, 152-F
drop, 290-F
formability, 787-Q
forming, 400-G
foundry practice, 212-W
fracture
brittle, 151-Q, 260-Q, 768-Q, 1043-Q
friction, 220-F, 1000-Q, 1425-Q
effect of pressure, 565-Q
gas analysis, 26-S, 168-S
gas welding, 120-K
gases in, 313-J
grain growth, 121-N
grinding, 182-G, 252-G, 315-G
surface, 313-G
halide decomposition, 49-C, 275-C
hardness, 291-C
micro-, 543-N
hardness and hardness tests, 51-F

Titanium, (cont.)
heat of reaction, 705-P
heat treatment
controlled atmosphere, 217-J
high temperature effects, 113-A
impact strength, 787-Q
in fluxes and slags, 161-P, 213-P
intermetallic compounds
oxidation, 586-R
investment casting, 231-C, 75-E
machinability, 323-G
machine parts, 303-T
machining, 323-G, 424-G
chemical
equipment, 338-G
magnetic properties, 674-M
mechanical properties, 381-A, 430-A, 438-A, 533-A, 19-Q
effect of high temperature, 547-Q
metallography, 153-M
etching, 741-R
effect of orientation, 337-M
specimen preparation, 498-M
milling, 330-G
nuclear properties
cross sections, 587-P
nucleation, 121-N
oxidation, 424-G, 665-M, 704-M, 11-R, 49-R, 167-R, 615-R, 741-R, 826-R
effect of pressure, 413-R
passivation, 180-R
physical properties, 533-A
piercing, 269-W
porosity and permeability
effect of deformation, 390-P
powder metallurgy, 27-H
powder production, 120-H
radioactive tracer methods
metallography, 522-N
radiochemical analysis, 208-S
recrystallization, 152-F, 121-N, 84-Q
reduction by carbon, 192-C
reduction by metals, 409-A, 214-C, 376-C, 449-C, 451-C, 459-C
vacuum, 157-C
reduction by metals and gases, 136-C, 450-C
resistance welding, 708-K
roll bonding, 344-L
rolling, 220-F
safety, 483-A
sandwich structures
brazing, 285-K
sawing, 328-G, 329-G
soldering, 138-K
solubility, 3-P
calcium, 587-M

Titanium, solubility, (cont.)
iron, 502-N
oxygen, 674-M
specifications, 312-S
spectrographic determination, 118-S, 239-S
spinning, 183-G, 293-G, 378-G
standards and specifications, 483-A, 45-S
stress relief
heat treatment, 84-Q
stretch forming, 98-G
systems
binary, 142-M, 307-M, 356-M, 358-M, 547-M, 552-M, 587-M, 594-M, 674-M
ternary, 14-M, 553-M, 700-M, 161-N
tapping, 451-G
tensile properties, 291-C, 1351-Q
tensile properties and tests, 787-Q, 1169-Q, 1437-Q
thermodynamic properties, 346-C
transformations
diffusionless, 637-N
stress-induced, 84-Q
twinning
deformation, 51-F
ultrasonic welding, 715-K
use in
aircraft, 379-A, 145-T
engines, 245-T
chemical processing equipment, 51-T
electrical and electronic equipment, 275-T
fasteners, 324-T
missiles, 162-T, 301-T
tanks and pressure vessels, 183-G
vacuum fusion welding, 191-K
vapor-deposition coating, 307-L
wear, 275-Q, 1425-Q
weldability, 193-K, 708-K
welding, 487-K, 590-K
zone melting, 132-C
Titanium alloy forgings
tolerances, 113-F
Titanium alloy wire
thermal expansion, 722-P
Titanium alloys, 357-A, 385-A, 75-K
adhesive joining
metal-to-metal, 592-K
age hardening, 395-N, 511-N, 558-N
anelastic properties, 186-Q
annealing, 174-J, 313-J
applications, 526-A, 591-Q, 124-W
arc welding
gas shielded, 426-K, 301-T
blasting, 931-Q
Titanium alloys, (cont.)
brazing
furnace, 332-K, 426-K
vacuum, 406-K, 691-K
chemical kinetics, 275-P
chemical milling, 161-G
colorimetric analysis, 121-S
compression properties and tests, 1511-Q
corrosion, 409-A, 250-T
fatigue, 1138-Q
by inorganic acids, 169-R, 578-R, 585-R, 173-W
stray current, 745-R, 746-R
creep, 121-Q
buckling test, 148-Q, 734-Q
creep strength, 1129-Q
crystal structure, 526-M, 595-N, 275-P, 1045-Q
diffusion
chromium, 394-N
measurement, 609-R
diffusion bonding
vacuum, 406-K
dispersion hardening, 114-H
drawing, 72-G
press forming, 124-G
ductility, 20-Q, 495-Q, 1128-Q
effect of grain size, 1406-Q
effect of high temperature, 190-A, 119-M
elastic properties
Young's modulus, 495-Q
electrical conductivity, 1045-Q
electron microscopy, 339-M
electropolishing, 301-L
fatigue strength, 931-Q, 1138-Q
flame cutting, 266-G
flash welding, 652-K
forging practice, 113-F, 119-F, 143-F
drop, 253-F
forming, 526-A, 144-G, 1116-Q
distortion, 327-G
hot, 320-G
fracture
brittle, 304-Q, 559-Q, 907-Q, 1162-Q, 1236-Q, 1284-Q
effect of grain size, 1406-Q
free energy, 621-P
friction, 25-Q, 1000-Q
gas welding
pressure, 444-K
grinding
surface, 931-Q
hardenability, 20-Q
hardness, 511-N
heat transfer, 259-J
heat treatment, 526-A, 144-G, 186-N, 1116-Q
heating and cooling, 259-J

Titanium alloys, (cont.)
hot forming, 318-G
impact strength
effect of heat treatment, 21-Q
effect of impurities, 21-Q
machinability, 184-G
machining, 5-G, 20-G
chemical, 133-G, 139-G, 180-G
macrostructure, 1543-Q
martensitic reactions, 162-N, 395-N, 621-P
mechanical properties, 190-A, 409-A, 471-A, 487-A, 492-A, 526-A, 174-J, 186-N, 558-N, 42-Q, 223-Q, 444-Q, 591-Q, 991-Q, 1045-Q, 1116-Q, 1162-Q, 1284-Q, 1543-Q
effect of heat treatment, 400-Q, 737-Q, 1447-Q
effect of high temperature, 314-A, 335-Q, 639-Q, 727-Q, 762-Q, 798-Q, 1446-Q
effect of low temperature, 680-Q, 736-Q
effect of radiation, 530-P
metallography
specimen preparation, 339-M
microstructure
effect of heat treatment, 339-M
primary, 369-M, 737-Q, 1128-Q
notch sensitivity, 841-Q, 925-Q
oxidation, 609-R
passivation, 745-R, 746-R
physical properties, 492-A, 526-A
effect of high temperature, 314-A
effect of radiation, 530-P
pickling and degreasing, 286-L
platinum electroplated, 124-W
powder metallurgy, 114-H
precipitation, 595-N
precipitation hardening, 578-M
aging, 174-J
properties, 138-A, 178-Q
quenching, 369-M
recrystallization, 174-J
rolling, 218-F
seam welding, 552-K
soldering, 426-K
solution hardening, 492-A
spinning, 171-G
spot welding, 451-K, 552-K
strain aging, 506-N
stress rupture properties and tests, 506-N, 925-Q, 1511-Q
stresses
residual, 931-Q
tempering, 369-M
tensile properties, 506-N, 511-N, 20-Q, 495-Q, 841-Q, 924-Q, 925-Q, 1128-Q, 1129-Q, 301-T

Titanium alloys, (cont.)
tensile properties and tests, 45-Q, 122-Q, 726-Q, 1132-Q
thermal diffusivity, 259-J
transformations, 186-N
isothermal, 161-N
stress-induced, 162-N
tubing
weldments, 389-Q
tubing and pipe
corrosion, 173-W
turning, 404-G
ultrasonic welding, 360-K
use in aircraft, 223-Q
use in airframes, 312-T
use in chemical processing equipment, 189-T
use in missiles, 61-T
use in nuclear reactors, 133-T, 196-T
use in tanks and pressure vessels, 179-T
wear, 25-Q, 37-Q
welding, 214-K
weldments
tensile properties, 1155-Q
x-ray diffraction, 262-M, 578-M, 400-Q
yield strength, 337-Q
zone melting, 264-C
Titanium-aluminum alloys
bend properties
strength and ductility, 699-Q
creep strength, 406-Q
dispersion hardening, 72-H
electron diffraction, 696-M
electrowinning, 344-C
forging practice, 283-F
mechanical properties, 344-C
microscopy, 696-M
microstructure, 693-M
rolling, 283-F
tensile strength, 283-F
Titanium-aluminum-columbium alloys
mechanical properties, 1163-Q
Titanium-aluminum-magnesium alloys
creep
strength, 980-Q
tensile properties, 980-Q
Titanium-aluminum-molybdenum alloys
properties, 213-A
Titanium-aluminum-vanadium alloys
creep strength, 1271-Q
ductility, 1271-Q
elastic properties, 1271-Q
hardness, 1271-Q
impact strength, 1271-Q
mechanical properties
effect of temperature, 756-Q
tensile properties, 1271-Q

Titanium carbide, 548-A, 127-C, 200-J
machinability, 392-A
mechanical properties, 1048-Q
oxidation, 579-R
phase diagrams, 126-M
sintering, 148-H
tools
cutting, 160-T
wear, 427-G
Titanium carbide cermets, 271-A
sintering, 82-H
solidification shrinkage, 82-H
wear, 702-Q
Titanium carbide compacts
infiltration, 142-H
mechanical properties, 142-H
Titanium carbide-nickel cermets
stresses
residual, 909-Q
Titanium-cerium alloys
mechanical properties, 459-Q
Titanium cermets, 50-H
stress rupture properties and tests, 251-T
Titanium-chlorine system, 138-M
Titanium-chromium alloys
crystal structure, 591-M
Titanium-chromium-copper alloys
age hardening, 667-N
crystal structure, 667-N
precipitation, 668-N
Titanium-chromium system, 166-M
Titanium-cobalt system, 166-M
Titanium-columbium alloys
creep tests
stress-relaxation, 725-Q
Titanium-columbium-vanadium system, 119-M
Titanium-copper alloys
eutectoid reactions, 777-Q
mechanical properties, 763-Q, 777-Q
tempering reactions, 560-N
Titanium-copper system, 166-M
Titanium extrusions
tensile properties, 1197-Q
Titanium forgings, 385-A
Titanium industry
statistics and economics, 205-A
waste control, 562-A, 424-G
Titanium ingots
heat treatment
induction, 316-J
Titanium-iron alloys
transformations, 552-M
Titanium-manganese alloys
fracture
brittle, 1221-Q
Titanium-manganese alloys, (cont.)
mechanical properties, 314-Q
metallography
diffraction methods, 358-M
stress rupture properties and tests, 1221-Q
Titanium-molybdenum alloys
crystal structure, 530-M
dislocations, 502-M
texture and preferred orientation, 627-M
precipitation, 530-M
transformations
diffusionless, 627-M
x-ray diffraction, 530-M
Titanium-nickel alloys
mechanical properties, 763-Q
transformation, 552-M
Titanium-nickel-copper alloys
mechanical properties, 763-Q
Titanium nitride
analysis
special separation, 139-S
Titanium ores
concentration, 65-B
crushing
grinding and sizing, 76-B
flotation, 39-B
leaching, 72-C
sources, 80-A
Titanium-palladium alloys
corrosion, 418-R, 661-R
by inorganic acids, 427-R, 448-R
by organic acids, 427-R
mechanical properties, 448-R
Titanium powder metal compacts
sintering, 72-H
Titanium powder metallurgy
cermets, 49-H
molding and compacting
extrusion, 50-H
rolling, 74-H
Titanium sandwich structures
brazing
furnace, 226-W
corrosion tests
salt spray, 332-K
mechanical properties, 332-K
oxidation, 332-K
Titanium-selenium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Titanium-selenium system, 100-M
electrical properties, 130-P
Titanium sheet
annealing, 16-J
bend properties and tests, 583-Q

Titanium sheet, (cont.)
cladding, 117-G
fatigue
effect of stress, 357-Q
forming, 381-G
fracture, 154-Q
hardness, 266-G
heat treatment, 357-A, 381-G
impact properties and tests, 154-Q
joining, 381-G
mechanical properties, 357-A
milling, 331-G
spinning, 117-G
spot welding, 499-K
standards and specifications, 191-S
Titanium sponge
hardness
tests, 478-Q
materials handling, 350-A
Titanium steel, 63-J
clad
arc welding
gas shielded, 281-K
shear strength, 281-K
corrosion, 145-R, 271-R
precipitation, 145-R
Titanium sulphide, 100-M
electrical properties, 132-P
thermodynamic properties, 131-P
Titanium systems
binary, 100-M, 166-M, 384-M, 526-M, 693-M
ternary, 194-M, 526-M
Titanium-tellurium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Titanium-thorium powder metal compacts
sintering, 72-H
Titanium tubing and pipe
corrosion
chemical
inorganic, 766-R
Titanium-tungsten powder metal compacts
sintering, 72-H
Titanium-vanadium alloys
plastic deformation, 294-N
transformations
isothermal, 294-N
Titanium weldments
metallography
polishing, 263-M
shear strength, 451-K
stress relief heat treatment, 162-J
tests, 120-K
Tool and forming materials, 149-A, 561-A, 609-K, 57-T, 106-T
aluminum bronze, 166-W
Tool and forming materials, (cont.)
ceramics, 233-G
copper alloys, 166-W
machinability, 35-G
wear properties and tests, 3-G
Tool steel
die casting dies, 130-E
forgeability, 93-F
Tools
cutting, 3-G, 4-G, 35-G, 85-G, 138-G, 234-G, 259-G, 348-G, 376-G, 396-G, 434-G, 457-G, 40-H, 40-K, 41-T, 57-T, 85-T, 231-T, 240-T, 254-T, 296-T
carbides
cemented, 5-G, 12-G, 26-G, 41-G, 47-G, 55-G, 56-G, 90-G, 130-G, 260-G, 308-G, 377-G, 17-T, 48-T, 122-T, 165-T, 173-T
standards and specifications, 38-S
ceramic, 97-G, 130-G, 173-T
cermets, 66-G, 71-G, 17-T, 30-T, 33-T, 135-T
design, 40-G, 397-G
friction, 272-G
grinding, 95-G
hard surfacing, 431-L
mechanical properties, 274-T
stresses, 101-T
thermal, 1151-Q
thermal properties, 274-T
titanium-carbide, 160-T
wear, 158-G, 287-G, 427-G, 447-Q, 843-Q, 1166-Q, 211-T, 267-T, 345-T
Tools and hardware
directories, 132-W
normalizing, 291-T
quenching, 291-T
Toolsteel, 270-A, 346-A, 501-A, 517-A
age hardening, 657-N
austenite formation and decomposition, 46-J, 173-J, 327-N, 657-N
bend properties, 300-Q
brazing, 1151-Q
carburizing, 219-J
cavitation corrosion, 707-R
composition analysis, 92-S
compression properties, 1188-Q
data books, 223-A
defects
surface, 199-F
distortion, 227-J
drawing
rods and shapes, 199-F
ductility, 1340-Q
fatigue strength, 236-L, 1188-Q, 1340-Q
finish machining, 394-G

Toolsteel, (cont.)
flaw detection
ultrasonic, 228-S
forging practice, 329-M
die rolling, 87-Q
upsetting, 87-Q
hard surfacing with, 381-L
hardness, 501-A, 295-J, 1340-Q, 707-R, 394-W
heat treatment, 311-J, 592-Q, 394-W
controlled atmosphere, 47-J
effect of composition, 46-J
induction, 230-J
high speed, 19-A, 174-T
annealing, 93-A
austenite formation and decomposition, 479-N, 1492-Q
austenitizing, 277-J
effect of composition, 31-J
carbides in, 621-N, 627-N, 642-N
composition analysis, 621-N
continuous casting, 10-D
dilatometry, 479-N
fracture, 136-J
grinding, 122-G
hardness, 44-J
heat treatment, 44-J, 965-Q
history, 228-A
impact strength, 44-J
mechanical properties, 965-Q, 41-T
microstructure, 214-M
nitriding, 136-J
quenching, 277-J, 479-N
tempering, 31-J
weldments
tensile properties, 1492-Q
x-ray analysis, 361-S
hot work, 472-A, 561-A
fatigue properties and tests, 1507-Q
heat treatment, 572-A, 71-J
machinability, 264-G
machining, 223-G
mechanical properties
effect of high temperature, 572-A
tensile properties, 264-G
impact properties and tests, 754-Q
investment casting, 243-E
machinability, 592-Q, 730-Q
machining, 236-G, 436-G
spark, 297-G
macrostructure, 329-M
mechanical properties, 315-A, 439-A, 517-A, 130-D, 300-Q, 370-Q, 592-Q, 1216-Q, 163-T
effect of high temperature, 727-Q, 730-Q
microstructure, 264-G
Toolsteel, (cont.)
physical properties, 730-Q, 1216-Q
polishing
electrolytic, 335-L
quenching, 11-J, 12-J, 230-J, 295-J
distortion, 329-M
interrupted, 158-J, 173-J
spark machining, 394-G
standards and specifications, 42-A, 45-S
stresses, 398-W
residual, 735-Q
thermal, 87-Q, 1151-Q
transformation, 735-Q
tempering, 158-J, 295-J
tensile properties, 726-Q, 1188-Q
use in aircraft, 163-T
use in forming dies, 279-W
volume and dimensional changes, 12-J
wear, 447-Q
Toolsteel powder
production
atomization, 116-H
properties, 116-H
mixing and blending, 75-H
Torsion properties and tests, 211-Q, 532-Q, 847-Q
Transformations, 414-N
diffusionless, 421-N, 596-N
effect of alloying, 143-N
effect of pressure, 189-N
isothermal
effect of vibration, 85-N
effect of heat treatment, 97-N
ferrous, 119-N
stress-induced
effect of pressure, 443-Q
Transformer sheet
annealing, 13-J
crystal structure
texture and preferred orientation, 226-M
effect of deformation, 445-P
magnetic properties, 445-P
microstructure, 255-M
rolling, 445-P
Transformer steel, 668-D
annealing, 54-J
bainite and bainite reaction, 85-P
carbides in, 563-N
crystal structure, 114-M
effect of deformation, 8-M
defects
surface, 283-D
elastic properties, 767-Q
electrical conductivity, 374-P
ferromagnetism, 400-P
grain size, 354-M
inclusions, 284-D, 354-M

Transformer steel, (cont.)
magnetic properties, 354-M, 85-P, 182-P, 243-Q, 767-Q
effect of deformation, 8-M
hysteresis loop, 42-P
permeability, 332-P
effect of deformation, 363-P
microstructure, 255-M
nucleation, 551-N
oxidation, 182-P
recrystallization, 551-N
segregations and inclusions, 255-M
straightening, 54-J
texture, 115-M
Transformers, 101-R, 75-W
welding, 268-K
Transition structures, 143-M
Trucks, 82-T
arc welding
gas shielded, 312-K
corrosion
galvanic, 644-R
Tubemaking, 77-F, 87-F, 96-F, 112-F 141-F, 207-F, 213-F, 159-W
drawing, 32-F, 281-F, 66-H
equipment, 121-F
piercing and sinking, 46-F, 80-F, 88-F, 158-F, 347-W
rolling, 286-F
equipment, 121-F
statistical analysis, 288-F
welding, 34-F, 42-F, 44-F, 94-F, 131-F 137-F
equipment, 202-F
induction, 110-F
Tubing
cladding, 240-L
corrosion, 240-L
flaw detection
magnetic induction, 163-S
forming, 129-G
Tubing and pipe
arc welding
gas shielded, 204-K, 226-K
submerged arc, 704-K
bending, 148-G
bend testing equipment, 398-Q
Tubing and pipe
cathodic protection, 8-R
centrifugal casting, 408-E, 417-E
corrosion
by soils, 41-R
galvanic, 753-R
corrosion prevention
packaging and wrapping, 277-R
defects
surface, 416-E
Tubing and pipe, (cont.)
explosive forming, 285-G
finishing, 574-L
fracture, 279-N
friction welding, 701-K
graphitization, 279-N
heat treatment, 477-K
inclusions, 416-E
mechanical properties, 401-K
permanent mold casting, 408-E, 417-E
resistance welding, 225-K, 705-K
rolling, 245-F
rubber coating, 323-L
sand casting, 417-E
seam welding, 203-K
standards and specifications, 348-S
tensile testing, 398-Q
welding, 402-K, 477-K
weldments
flaw detection
radiographic, 102-S
Tumbling, 126-L, 134-L, 203-L, 221-L, 243-L, 270-L, 291-L, 628-L, 421-W
media, 69-W, 382-W
prestressing, 236-L
tolerances, 653-L
Tumbling equipment, 228-W, 421-W
Tungsten, 165-A, 258-A, 260-A, 284-A 332-A, 359-A
adhesive joining
metal-to-metal, 594-K
adsorption
nitrogen, 259-P
oxygen, 313-P
analysis
special separation, 380-S
annealing, 167-K
applications, 532-A, 201-G, 212-G
arc welding
gas shielded, 352-K
atomic structure
coordination number, 618-P
interatomic bond, 479-M
brazing, 201-G
brittle transition temperature, 1087-Q, 1519-Q, 1523-Q
cleaning and polishing, 167-K
colorimetric determination, 10-S
corrosion, 76-A
chemical
inorganic, 65-R
organic, 65-R
crystal structure, 128-M
imperfections, 451-M
determination, 92-S
diffusion, 166-N
in iron, 84-N

Tungsten, (cont.)
drawing
deep, 201-G
effect of high temperature, 54-A, 507-A
electrical conductivity, 451-M, 618-P
effect of impurities, 377-P
electrical properties, 70-X
electrochemical properties
ionization potential, 666-P
electron emission, 235-P
electroplating of, 410-L
baths, 60-L, 584-L
electroplating on, 401-L
extraction and refining
arc melting, 93-H
chemical, 361-C
melting, 72-X
zone melting, 88-C
extrusion, 92-F
forging practice, 92-F
forming, 507-A, 400-G
hot, 309-G
forming and machining, 92-F, 181-G, 212-G
fracture
brittle, 1087-Q, 1519-Q
grain growth, 588-N
high temperature effects, 113-A
machining, 258-G
mechanical properties, 76-A, 464-A, 78-F, 92-F
effect of high temperature, 564-Q
mill practice, 507-A
oxidation, 464-A, 428-R, 573-R
physical properties, 464-A
pickling, 473-L
polishing
chemical, 473-L
powder compacts
sintering, 93-H
powder metallurgy, 44-H, 94-H, 127-M
recovery
after deformation, 451-M
recrystallization, 507-A, 361-C, 451-M, 1239-Q
reduction by gases, 361-C
research, 123-A
single crystals
elastic properties
proportional limit, 269-C
electrical conductivity, 269-C
optical properties
reflection, 668-M
tensile properties, 273-C
spot welding, 621-K
statistics and economics, 66-A

Tungsten, (cont.)
systems
binary, 333-M, 396-M, 673-M
tensile properties, 1239-Q
thermal properties, 529-P, 44-T
thermodynamic properties
effect of low temperature, 372-P
thin films
crystal structure, 238-M
vacuum fusion welding, 191-K
vapor deposition coating of, 303-L, 455-L, 681-L
weldability, 193-K
welding, 167-K
wiredrawing, 361-C
x-ray analysis
composition, 122-S
zone melting, 269-C, 270-C, 273-C, 281-C
vacuum, 272-C
Tungsten alloys
atomic structure, 545-M
crystal structure, 545-M
mechanical properties, 545-M
melting and casting, 85-C
physical properties, 545-M
powder metallurgy, 160-H
ultrasonic welding, 360-K
zone melting, 264-C
vacuum, 266-C
Tungsten boride
corrosion, 481-R
wear, 701-Q
Tungsten carbide, 260-A, 548-A, 305-T
diffusion in cobalt, 661-N
fracture, 1062-Q
machining
spark, 126-G
plastic deformation, 1062-Q, 1223-Q
sintering, 148-H
slip lines and bands, 1062-Q
wear, 457-Q, 1337-Q
Tungsten carbide cermets, 271-A, 55-H
Tungsten carbide-cobalt alloys
specific heat, 516-P
Tungsten carbides
cemented, 51-H
Tungsten cermets
sintering, 85-C
Tungsten-chromium steel, 112-W
Tungsten-cobalt alloys
analysis
special separation, 179-S
Tungsten-columbium alloys
crystal structure, 673-M
electrical conductivity, 673-M
hardness, 673-M

Tungsten-columbium alloys, (cont.)
melting temperatures, 673-M
oxidation, 657-R
recrystallization, 577-N
Tungsten electrodes
mechanical properties, 156-T
Tungsten ores
concentration, 59-B
Tungsten powder
electron microscopy, 12-M
fatigue strength, 1542-Q
metallography
specimen preparation, 12-M
molding and compacting
cold pressing, 361-C, 68-H
rolling, 74-H
particle shape and size, 51-H, 113-H
production, 361-C, 113-H
spectrographic analysis, 285-S
tensile strength, 1542-Q
Tungsten powder compacts
sintering, 361-C, 67-H, 104-H
Tungsten sheet
metallography
specimen preparation, 536-M
Tungsten systems
binary, 384-M
Tungsten wire
electrical conductivity, 548-P
hardness, 588-N
metallography
specimen preparation, 536-M
recrystallization, 2-N, 16-N, 588-N, 548-P
Turbine blades and rotors, 8-G, 156-Q 159-Q, 1027-Q, 34-T, 67-T, 223-T, 251-T
creep, 153-J
flaw detection
radiographic, 224-S
hard surfacing on, 1477-Q
investment casting, 88-E
materials, 254-A
alloy steel, 776-Q
steel, 391-Q, 306-S, 318-S, 207-T, 208-T, 227-T
stress-rupture properties and tests, 1022-Q
wear, 1477-Q
Turbines
gas, 21-J, 74-K, 77-L, 282-S, 22-W
forming and machining, 106-G
materials, 72-G
oil and hydraulic, 73-K
steam, 32-K, 33-K
arc welding, 349-K
corrosion
Turbines, steam, (cont.)
corrosion, (cont.)
by fuels, 556-R
by sulphur compounds, 556-R
materials
alloy steel, 349-K
Turning, 130-G
effect of temperature, 132-G
preparation for working, 62-F
Twinning
deformation
effect of pressure, 424-Q
thermal, 331-Q

U

Ultrasonic cleaning, 262-G, 421-K, 107-L, 245-L, 279-L, 453-L, 469-L, 484-L
radioactive tracer study, 474-L
Ultrasonic welding, 427-A, 94-K, 148-K 342-K, 554-K
Uranium, 56-A, 382-A, 260-C, 151-T, 299-T, 317-T
analysis, 87-S, 144-S
special separation, 37-S, 68-S, 120-S, 216-S
annealing, 412-P, 1052-Q
application in reactor fuels, 76-T
applications, 22-A
arc welding
gas shielded, 487-K
atomic structure
spatial arrangement, 647-M
clad
corrosion, 822-L
cladding on, 238-F, 822-L
cleaning and polishing
chemical, 449-L
electrochemical, 449-L
colorimetric analysis, 14-S
composition analysis, 23-S, 171-S, 172-S, 174-S, 176-S
compression properties and tests, 741-Q
corrosion, 300-R
by inorganic acids, 136-R
by waters, 185-T
fresh, 727-R
corrosion prevention, 727-R
creep, 258-P, 1318-Q, 1319-Q
rate, 630-P, 284-Q
creep strength, 284-Q
crystal structure, 73-M, 624-M, 406-P
dislocations
effect of radiation, 360-M, 507-M
imperfections, 300-R
effect of radiation, 360-M, 659-P

Uranium, crystal structure, (cont.)
texture and preferred orientation, 75-M, 245-M, 258-M, 296-M, 420-M, 609-M, 659-M, 466-N, 574-N, 598-P, 936-Q
determination, 11-S, 30-S, 151-S, 203-S
x-ray analysis, 167-S
diffusion, 36-N, 530-N, 531-N, 541-N, 555-N, 569-N
aluminum, 737-P
effect of radiation, 507-M
gases, 629-P
self-, 53-N, 609-N, 623-N
diffusion bonding, 108-G, 417-K, 571-K, 681-K, 531-N
effect of heat treatment, 50-K
effect of pressure, 50-K
diffusion coated, 250-L
drilling and reaming, 240-G
effect of irradiation, 658-P, 155-T
elastic properties, 744-Q
electrical properties, 518-N, 579-P
electroplating of, 418-L
electroplating on, 148-F, 663-L
extraction and refining, 17-C, 29-C, 95-C, 149-C, 166-C, 260-C, 343-C
arc melting, 193-C, 195-C
chemical, 4-C, 9-C, 16-C, 20-C, 63-C, 165-C, 248-C, 80-R, 363-R, 99-T
electrolytic, 93-C, 241-C, 313-C
halogenation, 8-C, 12-C, 14-C, 27-C, 335-C
induction melting, 141-C
ion exchange, 5-C, 6-C, 13-C, 80-C, 147-C, 150-C, 241-C
leaching, 80-C, 144-C, 145-C, 146-C, 364-C
melting, vacuum, 427-L
melting and casting, 11-C
oxidation, 68-C
precipitation, 59-C
solvent extraction, 36-C, 60-C, 61-C, 78-C, 100-C, 148-C
extrusion, 148-F, 187-F, 238-F
impact and cold, 108-G, 187-G
fatigue
thermal, 936-Q, 1175-Q, 1282-Q, 1319-Q
forming, 1052-Q
foundry practice
electric, 318-W
fractography, 361-M
fracture, 361-M
friction
effect of pressure, 565-Q
gases in, 555-N
grain growth
effect of temperature, 169-N

Uranium, (cont.)
grain size, 697-M
halide decomposition, 7-C, 247-C, 256-C, 277-C
hardness, 593-N
effect of radiation, 1307-Q
heat of reaction, 737-P
heat treatment, 195-C, 7-F
inclusions, 405-M
intermetallic compounds
crystal structure, 647-M
isotope separation, 277-C
machining, 64-G, 1052-Q
macrostructure, 1318-Q
magnetic properties, 25-P, 579-P
mechanical properties, 729-P, 394-Q, 1052-Q
melting temperatures, 548-M
metallography, 22-X
etching
cathodic, 663-M
specimen preparation, 73-M, 200-M, 364-M
microstructure, 405-M
effect of heat treatment, 385-N
effect of impurities, 42-M
effect of temperature, 42-M
mill practice, 7-F, 291-F, 1052-Q
nuclear properties, 245-P, 659-P
cross section, 729-P
resonance, 488-P
oxidation, 258-M, 136-R, 643-R
effect of high temperature, 390-R
permanent mold casting, 141-C, 187-F
physical properties, 729-P
density, 593-N
mass and volume, 658-P
plastic deformation, 1074-Q
lines and bands, 52-N
polarographic determination, 77-S, 94-S
powder
molding and compacting
hot pressing, 175-H
powder metallurgy, 18-H, 21-H, 94-H
powder production, 63-H
radiochemical analysis, 249-C, 208-S
radiological safety, 186-A, 275-A
recrystallization, 52-N, 466-N, 593-N, 416-Q
effect of heat treatment, 385-N
reduction by gases, 456-C
reduction by metals and gases, 248-C
rolling, 187-F
segregation, 77-S
single crystals
plastic deformation, 1072-Q
recrystallization, 574-N

Uranium, (cont.)
soldering, 407-K
solidification, 498-N
solubility
hydrogen, 611-P
solubility of rare earth metals, 391-P
solvent extraction, 247-A, 286-C
spectrographic analysis, 120-S, 173-S, 175-S, 209-S
statistics and economics, 67-A
stresses, 258-P
thermal, 1319-Q
swaging, 148-F
systems
binary, 40-M, 51-M, 70-M, 198-M, 234-M, 294-M, 295-M, 595-M, 624-M, 231-N
complex, 571-M
ternary, 70-M, 579-M
tensile properties, 416-Q
effect of radiation, 1307-Q
thermal analysis, 548-M
transformation, 598-P, 729-P
allotropic, 73-M, 38-N, 250-P, 729-P
effect of temperature, 24-N, 25-N
use in nuclear reactors, 394-A, 212-T, 234-T
fuels, 20-T, 21-T, 185-T, 203-T
vapor deposition coating on, 303-L
volume and dimensional changes, 507-M, 36-N, 78-P, 250-P, 258-P, 260-P, 406-P, 412-P, 598-P, 629-P, 630-P, 657-P, 729-P, 936-Q, 1175-Q, 1282-Q, 1319-Q, 1510-Q, 45-T
effect of radiation, 361-M, 398-P, 457-P
effect of temperature, 169-N, 57-P, 350-P
weldability, 193-K
welding, 460-K, 506-K
welding electrodes, 253-W
x-ray analysis, 177-S, 393-S
x-ray diffraction, 2-M, 737-P
x-ray microscopy, 25-P
zone melting, 249-C, 314-C
Uranium alloys
cladding, 223-F
crystal structure, 575-M, 570-N
effect of irradiation, 664-M, 656-P, 657-P,
electrical conductivity, 7-P
electrical properties, 33-P, 99-P
electron diffraction, 575-M
electron microscopy, 575-M
fatigue, 215-Q, 139-T
grain growth, 355-N
grain size, 664-M
Uranium alloys, (cont.)
heat treatment, 201-Q
intermetallic compounds
crystal structure, 221-M
magnetic properties, 33-P
mechanical properties, 201-Q
metallography
specimen preparation, 575-M
microstructure, 7-P
mill practice, 223-F
nucleation, 355-N
phase diagrams, 221-M, 488-M
physical properties
density, 7-P
quenching, 66-J
solution heat treatment, 567-N
transformations, 488-M
isothermal, 567-N, 570-N
use in nuclear fuels, 236-T
volume and dimensional changes, 656-P
effect of radiation, 52-P, 403-P
Uranium-aluminum alloys, 191-T
creep, 1288-Q
crystal structure
texture and preferred orientation, 152-M
extraction and refining
solvent extraction, 455-C
foundry practice, 217-T
mechanical properties, 217-T
tensile properties, 1288-Q
Uranium bars and rods
inspection, 253-G
machining, 253-G
Uranium carbide, 193-C
Uranium carbide-columbium carbide system, 203-M
Uranium-carbon alloys
atomic structure
spatial arrangement, 176-M
Uranium cermets
mechanical properties, 129-H
Uranium-chromium alloys
annealing, 155-J
quenching, 155-J
transformations
allotropic
isothermal, 37-N
Uranium-columbium alloys
oxidation, 139-W
Uranium-columbium-zirconium alloys
effect of high temperature, 201-T
Uranium extraction and refining, 52-C
oxidation, 47-C
reduction, 48-C
solvent extraction, 97-C
Uranium flaw detection
radiographic, 324-S

Uranium fuel, 23-H
Uranium ingots
  segregation, 324-S
Uranium isotopes
  nuclear properties, 39-P
Uranium-molybdenum alloys
  annealing
    isothermal, 410-N
  corrosion
    by inorganic acids, 450-R
  diffusion, 592-N
    effect of radiation, 605-N
  dilatometry, 410-N
  effect of irradiation, 237-N
  fatigue
    thermal, 592-N
  heat treatment, 201-Q
  macrostructure, 592-N
  martensitic reactions, 356-N
  mechanical properties, 201-Q, 285-Q
  microstructure
    primary, 410-N
  order-disorder, 231-N
  transformations, 518-N
    allotropic, 237-N
      effect of radiation, 605-N
    isothermal, 410-N
Uranium ores, 536-A
  concentration, 77-B, 200-C
    magnetic, 8-B
  extraction and refining, 35-A
  fluid bed process, 20-B, 21-B
  polarographic analysis, 94-S
  research, 35-A
  roasting, 77-B, 113-B
  sources, 450-A, 21-T
Uranium oxides
  sintering, 79-H
Uranium-oxygen system, 99-M
Uranium plate
  rolling, 149-F
Uranium-platinum system, 76-M
Uranium powder
  alloying, 20-H
  density, 58-H
  mill practice
    canning and sheathing, 124-H
  molding and compacting, 58-H, 124-H
    hot pressing, 63-H
  production, 16-H
Uranium powder compacts
  sintering, 58-H, 63-H, 127-H
Uranium powder metal parts, 395-A
Uranium powder metallurgy, 43-H
Uranium scrap
  reclamation, 120-A
Uranium sheet
  rolling, 149-F
Uranium single crystals
  volume and dimensional changes, 82-P
Uranium slag
  recovery, 121-A
Uranium systems
  binary, 431-A
Uranium-titanium alloys
  creep, 1288-Q
  tensile properties, 1288-Q
Uranium-titanium system, 166-M
Uranium-tungsten carbide cermets, 58-H
Uranium-zirconium alloys
  creep, 1288-Q
  diffusion, 350-N
  tensile properties, 1288-Q
  volume and dimensional changes
    effect of radiation, 388-P

V

Vacuum metallurgy, 97-A, 324-A, 429-A, 459-A, 474-A, 509-A, 579-A
  books, 206-D
  equipment, 206-D
Vacuum fusion welding, 191-K
Vanadium, 258-A, 284-A, 289-A, 293-A, 359-A, 382-A, 405-A, 178-K
  analysis
    special separation, 68-S, 380-S
  atomic structure
    interatomic bond, 479-M
  brittle transition temperature, 190-Q, 1087-Q, 1519-Q
  colorimetric determination, 231-S
  corrosion, 76-A
  determination, 30-S, 432-S, 438-S, 443-S
  diffusion of, 267-N
  ductility, 481-C
  extraction and refining
    arc melting, 359-C
    chemical, 243-C
    solvent extraction, 36-C
    vacuum, 359-C
  fracture, 414-Q
    brittle, 1087-Q, 1519-Q
  health and safety, 250-A
  mechanical properties, 76-A, 293-A
  metallography
    specimen preparation, 200-M
  nuclear properties, 694-P
  oxidation, 11-R
  plastic deformation, 414-Q
  plastic properties, 414-Q
  single crystals
    elastic properties, 632-Q
  smelting, 481-C

Vanadium, (cont.)
systems
binary, 348-M, 396-M, 423-M
tensile properties and tests, 414-Q
use in nuclear reactors, 234-T
weldability, 193-K
x-ray analysis, 20-S
zone melting, 132-C, 264-C
Vapor deposition, 386-L, 140-N
Vapor deposition coating, 1-L
vacuum, 542-L, 639-M
Vapor pressure, 105-M, 550-P
Ventillation equipment, 55-W, 65-W, 328-W
Viscosity
testing equipment, 663-P
Volume and dimensional changes
effect of stress, 190-P

W

Waste control, 4-A, 12-A, 13-A, 14-A, 15-A, 168-A, 177-A, 370-A, 70-B, 65-W
Water treatment, 92-B
economy, 12-B
Wax coating, 97-L
Wear, 194-Q, 283-Q, 296-Q, 537-Q, 1217-Q, 1509-Q, 15-W
effect of lubrication, 634-Q
effect of temperature, 132-G, 428-Q, 920-Q
lubricants and oils, 480-Q
radioactive tracer study, 442-Q, 450-Q, 457-Q, 458-Q, 242-S
Wear properties and tests, 779-L, 652-N 2-Q, 3-Q, 1199-Q, 1341-Q, 1424-Q, 430-W
friction, 4-G
Wear resisting metals, 469-A, 192-E, 773-L, 1158-Q, 1229-Q
Weld tests, 3-K, 53-K, 55-K, 58-K, 113-K, 131-K, 150-K, 153-K, 180-K, 393-K, 619-K, 171-N, 222-S, 223-S
Weldability, 304-K, 364-K, 575-K
Welding, 658-D, 15-F, 15-K, 30-K, 80-K, 85-K, 87-K, 89-K, 119-K, 143-K, 207-K, 277-K, 383-K, 442-K, 449-K, 460-K, 482-K, 518-K, 566-K, 575-K, 601-K, 663-K, 710-K
bibliographies, 141-K
china, 85-K
costs, 197-K
damping properties and tests, 290-K
Welding, (cont.)
design, 408-K, 446-K, 624-K
effect of deformation, 49-X
effect of irradiation, 130-K
effect of temperature, 293-K
elastic properties, 290-K
flaw detection, 21-K
physics, 56-K, 350-K, 475-K, 497-K, 502-K, 520-K, 595-K, 631-K, 655-K
plant management, 365-K
plug, 80-K
quality control, 19-G, 144-K, 248-K, 199-M
distortion, 241-K
repair, 83-K
research, 368-K
safety, 187-A, 503-K
Soviet Union, 96-K, 266-K
standards and specifications, 110-K, 450-K, 323-S
statistics and economics, 43-K
stresses, 388-K
torches, 19-L, 49-W
ultrasonic, 146-K
volume and dimensional changes, 168-K
Welding, brazing and soldering equipment, 68-A, 31-K, 85-K, 127-K, 147-K, 206-K, 338-K, 425-K, 6-W, 7-W, 8-W, 29-W, 38-W, 40-W, 62-W, 63-W, 100-W, 109-W, 110-W, 211-W, 214-W, 248-W, 249-W, 250-W, 254-W, 267-W, 306-W, 359-W, 363-W, 401-W, 409-W, 411-W
automation, 53-W, 233-W
ultrasonic, 245-K
Welding electrodes, 108-H, 312-J, 18-K, 35-K, 68-K, 70-K, 169-K, 186-K, 188-K, 235-K, 261-K, 276-K, 293-K, 308-K, 369-K, 391-K, 418-K, 464-K, 493-K, 606-K, 612-K, 626-K, 646-K, 648-K, 706-K, 45-L, 141-L, 345-L, 503-M, 512-Q, 1098-Q, 1107-Q, 92-W, 138-W, 157-W, 174-W, 185-W, 207-W, 236-W, 237-W, 238-W, 239-W, 263-W, 275-W, 296-W, 297-W, 303-W, 330-W, 372-W, 408-W, 413-W, 445-W
alloy steel, 136-W
aluminum alloys, 403-W
casting, 153-E
copper alloys, 403-W
cracks, 131-W
elastic properties, 923-Q
fatigue strength, 90-K, 208-K
iron powder, 187-K
materials, 253-W
nickel alloys, 403-W
notch sensitivity, 131-W

Welding electrodes, (cont.)
porosity and permeability, 271-W
standards and specifications, 25-K, 27-K, 312-S, 358-W
steel, 264-K, 403-W
Weldments
bend properties and tests, 1082-Q
bending, 337-G
corrosion
intergranular, 790-R
crystallization, 171-N
defects, 291-S
design, 1300-Q, 335-T
distortion, 230-K
fatigue, 261-Q, 353-Q
fatigue properties and tests, 722-Q
fatigue strength, 9-K, 188-K, 408-K, 511-Q, 644-Q, 1410-Q
fatigue tests
rotating beam, 1410-Q
flattening
finish forming, 337-G
flaw detection, 180-K, 149-S, 159-S, 301-S
mechanical, 302-S
radiographic, 31-S, 226-S, 423-S, 451-S
ultrasonic, 393-K, 84-S, 291-S, 322-S, 451-S, 452-S
fracture, 1435-Q
crack propagation, 1487-Q
heat treatment, 215-J
induction, 297-J
impact properties and tests, 586-Q, 1241-Q
mechanical properties, 203-K, 215-K, 304-K, 302-S
effect of deformation, 1451-Q
metallography
etching, 109-M
microstructure, 229-M
notch sensitivity, 1241-Q
peening, 205-J
plastic properties, 1435-Q
shrinkage, 639-P
solidification shrinkage, 350-K
stress concentration, 1300-Q
stress relief
heat treatment, 205-J, 206-J, 237-J, 297-J
stress rupture properties and tests, 166-Q, 1413-Q
stresses, 276-S
residual, 1427-Q, 1451-Q
Weldments, (cont.)
tensile properties and tests, 153-K, 644-Q
x-ray diffraction, 1038-Q
Wire
aluminum
drawing, 76-F
annealing, 315-J
ceramic coated
flaw detection
electrical, 273-S
continuous casting, 238-C
ductility, 279-F
forming
finish, 374-G
galvanized, 601-L
tensile properties, 1020-Q
torsion properties and tests, 1020-Q
heat treatment
fused-bath, 326-W
heating and cooling, 315-J
patenting
equipment, 220-J
pickling
waste control, 716-L
rolling, 194-W
steel
defects, 61-F
fracture, 232-Q
mechanical properties, 226-Q
microstructure, 232-Q
stress relief, 52-F
tensile properties and tests, 102-L
Wiredrawing, 9-F, 27-F, 43-F, 52-F, 61-F, 123-F, 233-F, 239-F, 279-F, 295-F, 119-L, 46-W, 69-W, 230-W, 342-W
cost, 133-F
equipment, 6-F, 169-F
lubrication, 49-F, 66-F, 104-G
stress analysis, 85-F
Wire industry
glossaries, 220-A
Wire mills, 133-F, 226-F, 342-W
lubricants and oils, 31-D
plant layout, 405-W
Wrought iron
age hardening, 1079-Q
corrosion, 366-A, 218-M, 323-R
ductility, 1079-Q
history, 189-A
mechanical properties, 760-P
microstructure, 218-M

Wrought iron, (cont.)
precipitation hardening
aging, 1079-Q
specifications, 312-S
strain aging, 760-Q
tensile properties and tests, 1079-Q

X

X-ray analysis, 490-M, 401-S
composition, 416-S, 79-X
X-ray diffraction, 25-M, 47-M, 48-M, 311-M, 317-M, 360-M, 467-M, 499-M, 650-M, 657-M, 272-N, 324-N, 1493-Q, 88-X, 90-X, 91-X, 92-X
equipment, 11-M, 362-M, 658-M, 671-Q
X-ray microscopy, 158-M, 588-M, 403-R
effect of deformation, 279-M

Y

Ytterbium, 243-P
spectrographic analysis, 259-S
Yttrium, 322-A
analysis
special separation, 37-S
compression properties, 1382-Q
ductility, 1382-Q
hardness, 1382-Q
reduction by metals, 374-C
solvent extraction, 394-C
spectrographic analysis, 29-S
spectrographic determination, 257-S
systems
binary, 384-M, 493-M, 606-M, 607-M
tensile properties, 1382-Q

Z

Zinc, 502-A
amalgamation, 191-C
analysis, 309-S
anodizing, 617-L, 760-L
applications, 284-T
atomic structure, 614-P
barrel plating of, 285-T
blast furnace practice, 175-C, 329-C
blasting, 775-L
chromate coating, 149-L, 546-L, 697-L
cleavage, 1520-Q
composition analysis, 16-S
compression properties, 129-Q
converter practice, 400-C
corrosion, 283-R
atmospheric, 300-P, 426-R, 446-R, 712-R
Zinc, corrosion, (cont.)
atmospheric, (cont.)
industrial, 529-R
marine, 633-R
by lubricants, 385-R
by organic acids, 291-R
by soils, 261-R
by sulphur compounds, 426-R
chemical
inorganic, 455-R, 528-R, 576-R
organic, 520-R, 682-R, 683-R
galvanic, 4-R
inhibition, 455-R, 683-R, 735-R
corrosion by waters
sea, 633-R
corrosion prevention, 697-L
corrosion tests, 633-R
electrochemical, 735-R
creep, 115-Q, 783-Q
rate, 947-Q
crystal structure, 206-M, 303-M, 613-M, 312-N, 614-P
dislocations, 35-M, 612-M, 947-Q, 1540-Q
imperfections, 309-M, 495-M
texture and preferred orientation, 9-M, 183-N, 343-N
dendritic growth, 666-N
determination, 13-S, 190-S, 235-S, 236-S, 285-T
die casting, 229-A, 107-E, 123-E, 189-E, 364-E, 518-E, 316-W, 333-W
cost, 275-E
design, 327-E
vacuum, 207-E
diffusion, 500-N, 527-N
in copper, 678-N
in copper-zinc alloys, 298-N
in iron-carbon alloys, 424-L
in silver-zinc alloys, 298-N
interfacial, 534-N
nickel, 211-N
self-, 947-Q
energy of activation, 578-N
diffusion coating, 231-L, 690-L, 273-R
dip coating of, 22-L, 29-L
on steel, 437-L
distillation
vacuum, 410-C
drilling and reaming, 118-G
electric furnace smelting, 327-C, 328-C, 397-C, 399-C, 417-C, 423-C, 447-C, 176-H
electrical conductivity, 437-P
electrochemical properties, 55-P, 241-P, 254-P, 331-P, 597-P, 667-P
electrochemistry, 114-P
electrodeposit structures, 666-N

Zinc, (cont.)
electroplating of, 79-L, 142-L, 222-L, 254-L, 497-L, 517-L, 612-L, 687-L, 721-L, 740-L, 769-L, 792-L, 810-L, 344-R
baths, 81-L, 516-L, 788-L
control, 534-L
effect of impurities, 354-L
history, 553-L
electroplating on, 504-L, 714-L
electrorefining, 284-C, 285-C, 388-C, 398-C
electrowinning, 324-C
effect of impurities, 133-C
equipment, 167-C
energy of activation, 115-Q
eutectics
formation, 405-N
extraction and refining, 522-A, 534-A
distillation, 5-B, 135-B, 109-C, 325-C, 326-C, 328-C, 330-C, 332-C, 345-C, 371-C, 416-C, 176-H
electric furnace, 240-C
electrolytic, 5-B, 191-C
leaching, 324-C, 342-C, 409-C, 426-C, 462-C
equipment, 341-C
levitation melting, 114-C
melting and casting, 331-C, 225-F
vacuum, 301-C
foundry practice
fluidity and castability, 502-E
fracture
brittle, 256-Q, 1523-Q
galvanizing of, 8-L, 11-L, 688-L
grain boundaries, 612-M
grain growth, 136-N, 183-N, 423-N, 424-N
energy of activation, 578-N
hardness, 946-Q
liquation, 332-C
machinability, 421-G
mechanical properties
effect of low temperature, 405-Q
melting
fuel fired, 369-C
melting temperatures, 27-P
metal spraying of, 76-L, 128-L, 276-L, 392-L, 507-L, 562-L, 689-L, 769-L, 775-L, 776-L, 789-L, 799-L
metallography
etching, 670-M, 666-N
polishing, 615-M
replica techniques, 666-N
specimen preparation, 613-M
metallurgy, 534-A
history, 522-A

Zinc, (cont.)
optical properties, 30-P
emission, 300-P
ores
sources, 204-A
oxidation, 710-R
paint, 691-L
painting on, 33-L
passivation, 114-P, 291-R, 519-R, 522-R, 735-R
permanent mold casting, 189-E
phosphate coating, 832-L
physical properties, 614-P
plastic deformation, 613-M, 560-Q
anisotropic, 946-Q
polishing
electrolytic, 710-L
powder metals
crystal structure, 692-M
reaction rate, 692-M
powder production, 176-H, 692-M
recrystallization, 615-M, 363-N, 423-N, 424-N, 444-N
effect of deformation, 136-N
reduction
by gases, 2-C
by metals, 292-C
rolling, 225-F
shear properties and tests
ultrasonic, 560-Q
single crystals, 256-Q
cleavage, 1520-Q
compression properties and tests, 732-Q
creep, 111-Q
elasticity, 204-Q
fracture
brittle, 365-Q
growth, 206-M, 343-N, 405-N
plastic deformation, 613-M, 365-Q, 1219-Q, 1540-Q
slip, 732-Q
recovery
effect of deformation, 282-N
smelting, 5-B, 135-B, 342-C, 614-P
equipment, 325-C
soldering, 243-K
specific heat, 30-P
effect of low temperature, 341-P
sprayed
corrosion tests
salt spray, 486-R
standards and specifications, 284-T
superlattice formation, 312-N
systems
binary, 269-M, 557-M, 432-P, 452-P,
ternary, 257-M, 314-M, 539-M, 540-M, 541-M, 690-M

Zinc, (cont.)
tensile properties and tests, 35-M
thermodynamic properties, 614-P
use in cleaning and plating equipment, 422-W
use in metal products and parts, 285-T
use in printing equipment, 225-F
viscosity, 437-P
zone melting, 261-C, 368-C
Zinc alloys
corrosion
atmospheric
tropical, 568-R
die casting, 449-E, 493-E, 390-S
extraction and refining
electrolytic, 262-C
hardness
micro-, 689-Q
mechanical properties, 441-Q
metallography
etching, 338-M
polarographic analysis, 12-S
precipitation hardening
aging, 105-J
sand casting, 493-E
specific heat, 432-P
standards and specifications, 390-S
tensile properties, 155-Q
volume and dimensional changes, 105-J
Zinc-aluminum alloys
corrosion, 420-E
elastic properties
Young's modulus, 1076-Q
mechanical properties, 5-Q
permanent mold casting, 420-E
Zinc anodes, 396-R
Zinc-antimony-cadmium alloys
electrical and electrochemical properties, 125-P
Zinc-antimony-cadmium system
magnetic properties, 125-P
Zinc castings
mechanical properties, 516-Q
volume and dimensional changes, 242-P
Zinc coated steel, 266-R
Zinc die castings
cleaning and polishing
chemical, 309-L
mechanical, 309-L
corrosion, 627-L
chemical
inorganic, 541-R
organic, 541-R
intergranular, 482-P
corrosion tests
immersion
total, 541-R
electroplating, 266-L, 495-L
Zinc die castings, (cont.)
electroplating on, 543-L, 627-L
machining, 78-A
mechanical properties, 493-E, 652-Q
painting, 64-L, 220-L
physical properties, 493-E, 652-Q
porosity, 274-E
volume and dimensional changes, 482-P
Zinc electroplate
corrosion
atmospheric, 463-R, 530-R
Zinc industry
statistics and economics, 219-A, 523-A
Zinc-iron alloys
magnetic properties, 4-S
Zinc-lead alloy powder
molding and compacting
rolling, 95-H
Zinc-lead alloy strip
corrosion, 95-H
Zinc-mercury alloys
solubility
in acids, 159-P
Zinc-nickel die castings
corrosion
atmospheric, 492-R
electroplating on, 492-R
Zinc ores
briquetting, 133-B
concentration, 22-B, 132-B, 134-B
crushing
grinding and sizing, 132-B
flotation, 64-B
fluid bed process, 140-B
roasting, 5-B, 32-B, 71-B, 96-B, 133-B, 139-B, 368-C, 614-P
sintering, 133-B
sources, 524-A
spectrographic analysis, 109-S
Zinc paint, 322-L, 704-L, 775-R
electrical conductivity, 351-P
tests, 351-P
Zinc pipe
corrosion by soils, 173-R
Zinc powder, 666-N
Zinc scrap
processing, 135-B
Zinc single crystals
growth, 18-N
Zinc sprayed coatings
corrosion tests, 356-R
Zinc spraying, 206-L
Zinc sulphides
crystal structure, 167-M
Zinc-sulphur-oxygen system, 114-C
Zinc systems
binary, 219-M, 584-M, 585-M, 614-M
ternary, 219-M, 614-M

Zinc-tin alloys
vapor pressure, 408-P
Zinc wire
rolling, 104-F
Zirconium, 146-A, 195-A, 251-A, 258-A, 338-A, 349-A, 359-A, 362-A, 382-A, 399-A, 406-A, 508-A, 299-T, 317-T
adhesive joining
metal-to-metal, 594-K
analysis
special separation, 37-S, 66-S
annealing
vacuum, 217-J
anodic coating, 156-L
applications, 316-K
arc welding
gas shielded, 291-F, 316-K, 487-K, 699-K
atomic structure
interatomic bond, 479-M
bibliographies, 196-A
bonded assemblies
electron microscopy, 634-M
books, 158-A
brazing, 219-K
clad
arc welding, 282-K
brazing
induction, 282-K
flash welding, 282-K
induction welding, 282-K
size
thickness and mass measurement
radiographic, 372-S
upset welding, 282-K
corrosion, 344-P, 744-R
by inorganic acids, 302-R, 389-R, 450-R, 451-R, 532-R, 827-R
effect of radiation, 294-R
chemical
inorganic, 561-R
stray current, 744-R
corrosion by waters
steam, 71-R, 181-R
crystal structure, 192-F, 33-M, 483-M, 849-Q
texture and preferred orientation, 609-M, 627-M
determination, 205-S
diffusion, 530-N, 541-N, 569-N
oxygen, 115-N, 529-N
diffusion bonding, 108-G, 571-K
diffusion coating, 250-L
diffusion in nickel, 656-N
dilatometry, 32-M
electrical conductivity, 697-P
electrical properties, 579-P
dielectric, 702-P
Zirconium, (cont.)
electrochemical properties, 827-R
ionization potential, 744-R
electroplating of
baths, 584-L
electroplating on, 401-L
extraction and refining, 581-A, 259-C
arc melting, 320-C
vacuum, 218-C
chemical, 23-C, 64-C, 457-C
halogenation, 335-C
leaching, 246-C
liquation, 74-C
melting
equipment, 339-C
melting and casting, 11-C
separation, 96-C
solvent extraction, 97-C
vacuum, 205-C
zone melting, 152-C
extrusion, 24-F
impact and cold, 108-G, 187-G, 1351-Q
lubricants
glass, 192-F
forging practice, 152-F
foundry practice
melting, 163-F
gas analysis, 21-S
grain growth, 66-N
grinding, 182-G
halide decomposition, 49-C, 245-C
hardness, 1419-Q
micro-, 33-M
heat of reaction, 705-P
heat treatment
fused-bath, 14-F
intermetallic compounds
crystal structure, 648-M, 653-M
magnetic properties, 579-P
mechanical properties, 381-A, 581-A, 344-P
effect of radiation, 1285-Q
melting furnaces, 193-W
metallography
etching
cathodic, 663-M
specimen preparation, 498-M
microscopy, 621-M
microstructure, 621-M
mill practice, 222-F, 483-M
heating for working, 14-F
ore preparation, 581-A
oxidation, 115-N, 11-R, 115-R, 167-R, 474-R, 789-R
effect of pressure, 413-R
internal, 529-N
passivation, 532-R

Zirconium, (cont.)
physical properties, 344-P
plastic deformation, 908-Q
slip, 1372-Q
powder
molding and compacting
hot pressing, 175-H
powder metallurgy, 17-H, 94-H, 120-H
production and consumption, 32-A
radiochemical
analysis, 208-S
determination, 456-S
ram reactor process, 245-C
recrystallization, 152-F, 697-P
reduction by metals, 159-C, 246-C
resistance welding, 291-F
safety, 482-A
scaling, 483-M
single crystals
plastic deformation, 849-Q
solubility, 635-M
in magnesium, 441-P
of hydrogen, 368-P
specific heat, 17-P
spectrographic analysis, 69-S
spectrographic determination, 239-S
standards and specifications, 482-A
systems
binary, 40-M, 307-M, 334-M, 368-P
complex, 635-M
ternary, 70-M, 113-M, 492-M, 596-M, 1276-Q
tensile properties, 1351-Q, 1419-Q
transformations
diffusionless, 627-M
tubemaking
drawing, 24-F
welding, 209-F
use in chemical processing equipment, 51-T
use in nuclear reactors, 31-T, 183-T, 191-T, 234-T, 295-T
fuel elements, 275-T
vapor-deposition coating, 307-L
weldability, 193-K
welding, 222-F, 460-K, 487-K, 588-K, 643-K
x-ray analysis, 441-S

Zirconium alloys
age hardening, 396-N
annealing, 234-F
arc welding
gas shielded, 260-K, 351-K
atomic structure
coordination number, 618-P
spatial arrangement, 648-M
brazing, induction, 246-K

Zirconium alloys, (cont.)
chemical kinetics, 275-P
cleaning and polishing
chemical, 772-L
colorimetric analysis, 234-S
corrosion, 304-L, 151-P, 518-Q, 1209-Q, 1280-Q, 660-R, 694-R
by waters, 1276-Q
steam, 342-R, 343-R, 580-R, 590-R, 743-R
corrosion tests, 729-R
creep, 485-Q, 1276-Q
crystal structure, 275-P
diffusion
oxygen, 182-N
diffusion bonding, 247-K, 319-K, 371-K, 417-K, 474-K, 528-K
effect of heat treatment, 343-R
effect of irradiation, 656-P, 206-R
electrical conductivity, 7-P, 618-P
electrical properties, 151-P
electron beam welding, 255-K, 668-K, 715-K
electron diffraction, 695-R
extrusion, 114-F, 234-F, 238-F
fatigue
thermal, 658-Q
fracture
brittle, 1284-Q
hardness
hot, 1105-Q
martensitic reactions, 218-N
mechanical properties, 256-A, 396-N, 518-Q, 1209-Q, 1276-Q, 1280-Q, 1284-Q, 694-R
metallography
replica techniques, 340-M
microstructure, 7-P, 1280-Q, 660-R
mill practice, 229-F
oxidation, 225-R, 580-R, 695-R, 696-R
passivation, 772-L
physical properties, 256-A, 518-Q, 1209-Q
density, 7-P
pickling, 304-L, 772-L
plastic deformation, 234-F, 485-Q
roll bonding, 344-L
rolling, 114-F, 234-F
defects
surface, 163-F
spectrographic analysis, 187-S
strain aging, 396-N
stress rupture properties and tests, 580-Q
tensile properties and tests, 658-Q
torsion properties and tests, 581-Q
tube making, 234-F

Zirconium alloys, (cont.)
ultrasonic welding, 360-K, 715-K
use in nuclear reactors, 133-T, 204-T, 144-W
vacuum fusion welding, 191-K
welding, 229-F, 622-K
zone melting, 264-C
Zirconium alloys tubing and pipe
diffusion bonding, 694-K
Zirconium-beryllium system, 81-M
Zirconium-boron system, 120-M
Zirconium carbide
oxidation, 579-R
Zirconium-columbium alloys
hardness, 1277-Q
tensile properties, 1277-Q
Zirconium-columbium-tin alloys
mechanical properties, 296-N
transformations, 296-N
Zirconium extraction and refining
arc melting
vacuum, 180-C
halide decomposition
radioactive, 183-C
induction melting
vacuum, 180-C
vacuum, 49-C
Zirconium extrusions
tensile properties, 1197-Q
Zirconium foil
rolling, 507-K
Zirconium ingots
porosity, 660-R
Zirconium-molybdenum-tin alloys
mechanical properties, 296-N
Zirconium ores
concentration, 65-B
electrostatic, 38-B
crushing
grinding and sizing, 76-B
flotation, 39-B
Zirconium powder
mill practice
canning and sheathing, 124-H
molding and compacting, 124-H
Zirconium powder compacts
infiltration
vacuum, 107-H
sintering, 77-H
vacuum, 107-H
Zirconium powders
alloying, 20-H
Zirconium-selenium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Zirconium-selenium system, 100-M
electrical properties, 130-P
Zirconium sheet
arc welding, 507-K
grinding
abrasive, 367-G
Zirconium sulphide, 100-M, 131-P, 132-P
Zirconium systems
binary, 431-A, 384-M
Zirconium-tantalum alloys
tensile properties, 1277-Q
Zirconium-tantalum-columbium alloys
hardness, 1277-Q
tensile properties, 1277-Q
Zirconium-tantalum-columbium system, 98-M
Zirconium-tellurium alloys
electrical properties, 132-P
thermodynamic properties, 131-P
Zirconium-tellurium system, 100-M
electrical properties, 130-P
Zirconium-uranium alloys, 64-C
corrosion by waters
fresh, 703-R
steam, 703-R
Zone melting, 19-C, 56-C, 135-C, 207-C, 242-C, 295-C, 304-C
equipment, 190-C, 265-C, 266-C, 270-C